Montana Tech
THE UNIVERSITY OF MONTANA

2009-2010 Catalog

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Montana Tech
The University of Montana

A unit of the Montana University System
Butte, Montana

CORRESPONDENCE

Address Correspondence to:

Montana Tech
1300 West Park
Butte, MT 59701-8997

Main Telephone:
(406) 496-4101
1-800-445-TECH (8324)

INQUIRIES TO MONTANA TECH SHOULD BE DIRECTED TO:

Controller/Business Manager	John Badovinac
Associate V.C. of Students/Dean of Students	Paul Beatty
Director of Enrollment Management	Tony Campeau
Director of Financial Aid	Michael Richardson
Director of Public Relations	Amanda Badovinac
Director of Residence Life	Jacob Floch

Important Notice to All Students

The following information pertains to student and institutional rights and responsibilities under this catalog.

This general catalog is published annually by Montana Tech as a guide for students, faculty and others interested in the institution. Students are expected to be familiar with all institutional regulations and information set forth in this publication or any amendment to or modification thereof.

Montana Tech reserves the right to change regulations and to add or withdraw courses at any time during the period this publication is in effect. The institution, with the concurrence of the Board of Regents of Higher Education, also reserves the right to add or withdraw degree programs and to change fees at any time. Effective dates of changes will be determined by the proper authorities and shall apply to prospective students and to those who are already enrolled.

Montana Tech places full responsibility upon the students for registering for the proper courses and for fulfilling all requirements for a degree as set forth in this catalog, as amended from time to time. Only the Office of Enrollment Processing may certify completion of degree requirements in accord with institution policy and procedures, with the approval of the faculty. The institution does not accept any responsibility for delays in graduation or attainment of career goals resulting from: errors in registration, cancelled courses, time schedule changes, changes in degree requirements, or similar related changes; or for errors resulting from consultation with and reliance upon any information acquired from a Montana Tech employee. Advisors assist students in understanding policies and procedures, but ultimately it always remains the responsibility of the student to know official degree and certifying requirements and to act upon that information in an effective manner.

Montana Tech of The University of Montana

Preamble

Originally chartered as The Montana State School of Mines, Montana Tech of the University of Montana has evolved into a dynamic institution composed of two colleges and one school (College of Letters, Sciences, & Professional Studies; College of Technology; School of Mines and Engineering); and the Montana Bureau of Mines and Geology.

Mission

To meet the changing needs of society by supplying knowledge and education through a strong undergraduate curriculum augmented by research, graduate education and service.

Vision

To be a leader for undergraduate and graduate education and research in the Pacific Northwest in engineering, science, energy, health, information sciences and technology.

Guiding Principles

To honor our heritage as a premier engineering institution.

To attract and educate motivated and capable students.

To provide a quality education that blends theory with practice.

To recruit, encourage and enable faculty to develop regional and national reputations in teaching and research.

To collaborate with others to serve the needs of the community, the State of Montana, and the nation.

Montana Tech
2009-2010 Academic Calender

First (Fall) Semester 2009-2010 ~ August 25, 2009-December 18, 2009

New Student-Scholar's Registration Event	Friday, March 27, 2009
Continuing Students Fall Semester 2009 Pre-registration begins	Monday, April 14, 2009
New Student Fall Semester Pre-registration Event	Friday, May 15, 2009
New Student Fall Semester Pre-registration Event	Friday, June 19, 2009
New Student Fall Semester Pre-registration Event	Friday, July 17, 2009
New Student Fall Semester Pre-registration Event	Tuesday, August 18, 2009
Fee Payment Due for Fall Semester 2009	Tuesday, August 11, 2009
*****NOTICE: STUDENT'S WHO HAVE NOT COMPLETED FEE PAYMENT OR SIGNED A PAYMENT CONTRACT BY 3:00 P.M. TUES. AUGUST 11TH <u>WILL BE DISENROLLED FROM CLASSES AND WILL BE REQUIRED TO RE-REGISTER!!!</u>*****	
Continuing Students (not new admits) registering after Fee Payment Due date, assessed a $40 late fee	Wednesday, August 12, 2009
Residence Halls Open at 12:00 Noon	Sunday, August 23, 2009
Semester Begins with New Student Orientation & Registration Program	Monday, August 24, 2009
Fall Classes Begin (Late Registration Continues)	Tuesday, August 25, 2009
Holiday (Labor Day) No Classes/Offices Closed	Monday, September 7, 2009
Late Registration Closes at 4:00 p.m. (10th Day of Classes ~ Last Day to Add a Class)	Tuesday, September 8, 2009
Last Day to Write a Challenge Exam (15th Day of Classes)	Tuesday, September 15, 2009
Last Day to Withdraw From a Class Without Class Appearing on Transcript (15th Day of Class)	Tuesday, September 15, 2009
Non-Paid Students Assessed Additional $40.00 Late Fee (per Regents Policy)	Wednesday, September 16, 2009
Faculty Post Freshman and COT Grades for Retention Tracking (20th Day of Class)	Wednesday, September 23, 2009
Last Day for Faculty Input of Midterm Grades via OrediggerWeb (40th Day of Class)	Tuesday, October 20, 2009
Last Day to Drop a Class with an Automatic "W" (50th Day of Class)	Tuesday, November 3, 2009
Continuing Students Begin Pre-Registration for 2nd (Spring) Semester	Monday, November 9, 2009
Holiday (Veterans Day) No Classes/Offices Closed	Wednesday, November 11, 2009
Fall Thanksgiving Break Begins at 5:00 p.m. (Classes meet until 5:00 p.m.)	Tuesday, November 24, 2009
Non-Instructional Day (No Classes Held, Admin. & Faculty Offices Open)	Wednesday, November 25, 2009
Holiday (Thanksgiving) No Classes/Offices Closed	Thursday, November 26, 2009
Holiday (Columbus Day Exchange) No Classes/Offices Closed	Friday, November 27, 2009
Thanksgiving Break Ends, Classes Resume 8:00 a.m.	Monday, November 30, 2009
New and Returning Students May Begin Pre-registration for 2nd (Spring) Semester	Monday, November 30, 2009
May 2010 Graduates - Last Day to Submit Application for Degree to Enrollment Services Office	Wednesday, December 9, 2009
Semester Exams (See Final Exam Schedule at www.mtech.edu/registrar)	Mon-Fri, December 14-18, 2009
Deadline for Faculty Input of Final Grades via OrediggerWeb - 12:00 Noon	Tuesday, December 22, 2009
Holiday (Christmas Day)	Friday, December 25, 2009
Holiday (New Years Day)	Friday, January 1, 2010

Montana Tech
2009-2010 Academic Calender
(Continued)

Second (Spring) Semester 2009-2010 ~ Jan. 12, 2010 - May 14, 2010

Holiday (New Years Day)	Friday, January 1, 2010
Fee Payment Due for Spring Semester 2010	Monday January 4, 2010
***** NOTICE: STUDENTS WHO HAVE NOT COMPLETED FEE PAYMENT OR SIGNED A PAYMENT CONTRACT BY 3:00 P.M. MONDAY, January 4 WILL BE DISENROLLED FROM CLASSES AND WILL BE REQUIRED TO RE-REGISTER!! *****	
Continuing Students (not new admits) registering after Fee Payment Due date, assessed a $40 late fee	Tuesday, January 5, 2010
Residence Halls Open at 8:00 a.m.	Monday, January 11, 2010
New Student Orientation & Registration Program (For Students Not Yet Registered)	Tuesday, January 12, 2010
Spring Semester Classes Begin at 8:00 a.m. – (Late Registration Continues)	Wednesday, January 13, 2010
Holiday (Martin Luther King Jr. Day) No Classes/Offices Closed	Monday, January 18, 2010
Late Registration Closes at 4:00 p.m. (10th Day of Classes - Last Day To Add a Class)	Wednesday, January 27, 2010
Last Day To Withdraw From a Class Without Class Appearing on Transcript (15th Day of Classes)	Wednesday, February 3, 2010
Last Day to Write A Challenge Exam (15th Day of Classes)	Wednesday, February 3, 2010
Non-Paid Students Assessed Additional $40.00 Late Fee (per Regents Policy)	Thursday, February 4, 2010
Faculty Post Freshmen and COT Grades for Retention Tracking (20th Day of Class)	Wednesday, February 10, 2010
Holiday (Presidents Day) No Classes/Offices Closed	Monday, February 15, 2010
Last Day for Faculty Input of Midterm Grades via Orediggerweb (40th Day of Class)	Thursday, March 11, 2010
Spring Break Begins After Last Class	Friday, March 12, 2010
Spring Break Ends	Friday, March 19, 2010
Classes Resume at 8:00 a.m.	Monday, March 22, 2010
New Student (for Fall 2010) – Scholar's Registration Event	Friday, March 26, 2010
Last Day to Drop a Class with an "Automatic W" (50th Day of Class)	Thursday, April 1, 2010
Spring Mini-break Begins at 5:00 p.m. (classes meet until 5:00 p.m.)	Thursday, April 1, 2010
Non-Instructional Day (Spring Mini-Break) - No Classes Held, Admin. & Faculty Offices Open	Friday, April 2, 2010
Classes Resume at 8:00 a.m.	Monday, April 5, 2010
Continuing Students Begin Pre-registration for Summer Session and Fall Semester 2010	Monday, April 12, 2010
Summer 2010 & December 2010 Graduates – Deadline to Submit Application for Degree	Monday, April 19, 2010
Semester Exams (See Finals Schedule at www.mtech.edu/registrar)	Mon - Fri, May 10-14, 2010
Commencement – 11:00 a.m. – Alumni Coliseum	Saturday, May 15, 2010
Deadline for Faculty Input of Spring Semester Final Grades via Orediggerweb 4:00 p.m.	Tuesday, May 18, 2010
New Fall 2010 Students - Pre-registration Event	Friday, May 21, 2010
New Fall 2010 Students - Pre-registration Event	Friday, June 18, 2010
New Fall 2010 Students - Pre-registration Event	Friday, July 23, 2010
New Fall 2010 Students - Pre-registration Event	Tuesday, August 17, 2010

2009 Summer Session ~ May 26, 2010 – July 31, 2010
(Full Session: 5/26 – 7/31. 1st Session: 5/26 – 6/24. 2nd Session: 6/29 – 7/31)

Summer 2010 Pre-registration Begins	Monday, April 19, 2010
Holiday (Memorial Day) No Classes/Offices Closed	Monday, May 31, 2010
1st Five-Week Session (6/1 – 7/2) & Full Session (6/1 – 8/6) Begins 7:30 a.m.	Tuesday, June 1, 2010
** FEE PAYMENT DUE ** (Students Attending 1st & Full Session only)	Tuesday, June 1, 2010
Orientation for New 1st and Full Summer Session Students 4:15 p.m. – Location TBA.	Tuesday, June 1, 2010
Last Day to Add a First Session Class (3rd day of 1st Session Classes)	Thursday, June 3, 2010
Last Day to Add a Full Session Class (10th day of Full Session Classes)	Monday, June 14, 2010
Last Day to Withdraw from a 1st Session Class with an Automatic W" (10th Day of 1st Session Classes)	Monday, June 14, 2010
FINAL EXAMS GIVEN FOR FIRST SESSION CLASSES - First Five-Week Session Ends	Friday, July 2, 2010
Last Day to Withdraw from a Full Session Class with an Automatic "W" (20th Day of Full Session)	Monday, June 28, 2010
Holiday (Independence Day Exchange) No Classes/Offices Closed	Monday, July 5, 2010
2nd Five-Week Session Begins (7/6 – 8/6) 7:30 a.m.	Tuesday, July 6, 2010
** FEE PAYMENT DUE ** (Students Attending 2nd session only)	Tuesday, July 6, 2010
Deadline for Faculty Input of Grades for 1st Session Summer Classes via Orediggerweb - 4:00 p.m.	Tuesday, July 6, 2010
Last Day to Add a Second Session Class (3rd Day of 2nd Session Class)	Thursday, July 8, 2010
Last Day to Withdraw From a 2nd Session Class with an Automatic W" (10th Day Of 2nd Session Class)	Monday, July 19, 2010
FINAL EXAMS GIVEN FOR 2ND AND FULL SESSION CLASSES - Second and Full Summer Sessions End	Friday, August 6, 2010
Deadline for Faculty Input of Final Grades for 2nd and Full Session Classes via Orediggerweb - 4:00 p.m.	Mon., August 9, 2010

Student Right-To-Know Act
Graduation/Completion & Transfer Out Rates

Montana Tech of The University of Montana is pleased to provide the following information regarding our institution's graduation/completion rates. The information is provided in compliance with the Higher Education Act ofo 1965, as amended. The rates reflect the graduation/completion status of the first-time, full-time undergraduate degree/certificate seeking cohort who enrolled during the specified year.
When reviewing this information please keep in mind:

- 150% of the normal time-to-completion equates to 6 years for a Bachelor, 3 years for and Associate, and 1 ½ years for a Certificate.
- Though we are not required to report transfer-out rates, we've reported that information because many local area students plan to attend Tech for a year or two prior to transferring to another institution to complete a degree not offered at Tech.
- Graduation (and transfer-out) rates do not include students who left the school to serve in the armed forces, on official church missions, or in the foreign service of the federal government.
- Students who died or were totally and permanently disabled are also exlcuded.
- This information does not identify the reasons why students may have withdrawn; therefore, students who withdrew for personal or medical reasons are included in the non-completer or transfer-out-group.
- A pound sign (#) denotes any cohort/sub-cohort with five or fewer students. Montana Tech is not required to disclose this information and chooses not to disclose due to student privacy issues.

Montana Tech of The University of Montana			
Year	**Number in Cohort**	**Number of Graduates within 150% of normal time.**	**Number of transfer-out students**
Fall 1999	274	115	105
Fall 2000	315	120	96
Fall 2001	271	111	96
Fall 2002	294	112	96
4 Year Total	**1154**	**458**	**393**
4 year average Student-Right-to-Know 150% normal time completion or graduation rate			**40%**
4 year average Student-Right-to-Know transfer-out rate			**34%**

Montana Tech College of Technology			
Year	**Number in Cohort**	**Number of Graduates within 150% of normal time**	**Number of transfer-out students**
Fall 2002	56	12	6
Fall 2003	69	16	9
Fall 2004	99	15	6
Fall 2005	108	10	17
4 Year Total	**332**	**53**	**38**
4 year average Student-Right-to-Know 150% normal time completion of graduation rate			**16%**
4 year average Student-Right-to-Know transfer-out rate			**11%**

Student Athletes Who Received Athletically-Related Student Aid			
Year	**Number in Cohort**	**Number of graduates within 150% of normal time**	**Number of transfer-out students**
Fall 1999	17	11	1
Fall 2000	14	7	5
Fall 2001	16	9	2
Fall 2002	29	20	4
4 Year Total	**76**	**47**	**12**
4 year average Student-Right-to-Know 150% normal time completion or graduation rate			**62%**
4 year average Student-Right-to-Know transfer-out rate			**16%**

Sport of Student Athletes who received athletically-related student aid.	**4 Year average Student-Right-to-Know 150% normal time completion or graduation rate.**	**4 Year Average Student-Right-to-Know transfer-out rate**
Football	77%	11%
Men's Basketball	33%	17%
Men's Golf	##	##
Women's Basketball	83%	17%
Women's Golf & Volleyball	62%	15%

Campus Security
Institutional Security Policies & Crime Statistics

Criminal action or emergencies are to be reported to Campus Security, 496-4357, and/or the Dean of Students (Paul Beatty, work 496-4198, cell 498-5343). Policy relating to procedures and facilities for students and others to report criminal actions or other emergencies on campus is published in the Student Handbook under Campus Security and What to do if . . . You need emergency help, security, or want to report criminal actions, or you are sexually assaulted.

Information about Sexual and Violent Offender Registry for the State (offenders living within Butte-Silver Bow are listed at http://www.doj.mt.gov/SVOR/searchlist.asp?County=SILVER+BOW.

Policy concerning security of and access to campus facilities is published in the Student Handbook under Physical Plant/ Campus Facilities. The Residence Hall Handbook, entitled "Housing at Montana Tech," addresses specific security and access related to campus living throughout the publication.

Montana Tech contracts for campus security services. Contracted security officers provide such services as investigation of thefts, handling of alcohol-related or other behavior problems on campus, parking control, and crowd control at games and concerts. Officers are trained in law enforcement, crisis management and advanced first aid. Campus security does not have the same enforcement authority associated with police; however, our campus security officers work closely with Butte-Silver Bow police. Policy and practice require accurate and prompt reporting to the appropriate police agencies.

Students and employees are informed about campus security procedures and encouraged to be responsible for their own security and the security of others through the Student, Faculty/Staff, and Residence Hall Handbook publications.

Crime prevention has been incorporated into the ongoing campus programming. Safety & Security topics & programs are incorporated into our Orientation & Hall Forums and addressed throughout the semester.

Montana Tech does not have recognized off-campus student organizations, and it is not our practice to monitor off-campus criminal activity.

Use, possession, manufacture, sale, or distribution of any illegally controlled substance on Montana Tech's property or at Montana Tech-sponsored activities is prohibited. This is in compliance with federal and state statutes, Montana Tech's Student Conduct Code, and the Drug-Free Workplace Act of 1988.

Montana Tech's Alcohol Policy and Drug Free Workplace Policy are published in the Student Handbook, Residence Hall Handbook, Faculty/Staff Handbook, and Semester Class Schedules.

Statistics concerning the number of arrests, or referrals for campus disciplinary actions if arrest was not made, are published on the college's website at www.mtech.edu/student_life/security/security.htm
Montana Tech's statistics are posted on the US Department of Education, Office of Postsecondary Education's Website. Definitions of crimes comply with the FBI uniform crime handbook and statistics are provided by the Butte Silver Bow Sheriff's Department.

General Information

Academic Regulations and Requirements
Admission
Expenses
Financial Aid
Student Life
Undergraduate Academic Programs

Montana Tech of The University of Montana is recognized among America's best values in undergraduate education. We possess an internationally esteemed, century-old tradition of excellence in higher education.

Founded as one of the four original campuses of the Montana University System in 1893, Montana Tech now has an enrollment of 2,250 students focused on education and research in science, engineering, health, business, and communications. The institution offers degree programs at the certificate, 2-year, 4-year, and graduate levels. The student body presents a national and global snapshot with over 34 states and 13 foreign countries represented.

All of the programs derive a special character and emphasis from the unique setting and continued tradition of high quality that has characterized Montana Tech since its founding. Montana Tech has a long-standing reputation for producing outstanding engineering graduates. We have added degree programs in the basic sciences, health care, and in fields related to the administration, application and societal impact of the engineering programs. The institution also offers a broad range of courses in the humanities and social sciences. These subjects are an essential part of every collegiate program and serve the students who wish to prepare for transferring into specialized programs at other institutions.

Montana Tech's commitment to research has resulted in an unprecedented growth in its funded research over the last several years. The institution's funding base has diversified to include local, state and national support from the private sector and the government alike. Undergraduate and graduate students are frequently involved with faculty and staff in research programs. Research areas range from small mammal studies in Biology to power grid reliability in Electrical Engineering to environmental remediation and new methods for developing oil, gas and mineral deposits.

The Montana Bureau of Mines and Geology, the geologic and hydrogeologic research arm of the State of Montana, is a department of the institution. The Bureau provides public service to a variety of constituents within the private sector and federal, state and local governments. The Bureau develops, gathers, analyzes, catalogs and disseminates information concerning the location and development of the mineral, energy and water resources of Montana.

MISSION STATEMENT
To meet the changing needs of society by supplying knowledge and education through a strong undergraduate curriculum augmented by research, graduate education and service.

VISION STATEMENT
To be a leader for undergraduate and graduate education and research in the Pacific Northwest in engineering, science, energy, health, information sciences and technology.

Tech affords a small college experience and features a 16:1 student-to-faculty ratio, creating ample opportunity for individual attention. Classes are taught by professors who possess a unique blend of academic and industrial experience. As a result, Montana Tech graduates, who have included Rhodes and Goldwater Scholars, excel in their postgraduate careers. Each year business, industry and government representatives visit the campus for both career and summer degree-related employment opportunities for students. Graduates traditionally enjoy a very high placement rate and garner starting salaries that exceed national averages in their respective degree areas.

HISTORY
Montana Tech is one of the 6 four-year institutions of the Montana University System. The other institutions are: The University of Montana-Missoula; The University of Montana-Western; Montana State University-Bozeman; Montana State University-Billings; and Montana State University-Northern. The Montana University System was established by an act of Congress in 1881 that dedicated 72 sections of the public domain for higher education in the state. The Enabling Act of 1889, which organized the State of Montana and its admission to the Union, confirmed this grant and added 100,000 acres for a school of mines.

A founding commission established by the Third Legislative Assembly of Montana laid the plans for the Montana School of Mines. Land for the original site was donated by public-spirited citizens. Construction began in 1896, and in 1900 the Institution enrolled its first students. As the world of industry and technology grew, Montana Tech expanded. The campus was enlarged through gifts and purchases. Programs were added to meet new corporate, industry and governmental needs.

The Montana University System was restructured in 1994. One of the new major educational components saw Montana Tech become affiliated with The University of Montana. Additionally, the College of Technology, came under the administrative umbrella of Montana Tech. The College of Technology provides occupationally-specific higher education programs in Business, Health, Information Technology, and Technical & Trades. Successful completion of a one- or two-year program leads to the award of a Certificate or an Associate of Applied Science degree.

LOCATION AND SURROUNDINGS
Montana Tech and the city of Butte are surrounded by some of the greatest copper, molybdenum, zinc and manganese deposits in the world. Gold, silver and talc mines operate within a half-day's drive of the campus. From the city's elevation of 5,767 feet, the ground rises abruptly to the east toward the 8,000-foot summit of the East Ridge. To the south, the 10,000 foot Highlands lift rocky peaks above forested hills, while in the west, the lofty Anaconda Mountains of the Pintlar Wilderness provide a rugged home for deer, elk, bear and mountain goats. All of these mountain chains are part of the Continental Divide.

Outdoor recreation is one of the attractions of life in Montana. Downhill skiing and snowboarding, camping, hiking, fishing, hunting and snowmobiling take place within a few miles of campus. Forests of fir, spruce and lodgepole pine provide opportunities for solitude or group fun in summers that are mild and winters that are crisp and cold.

Butte has a population of 38,000, with shops, theaters, restaurants, sports facilities and businesses. The city's rich history of mining is visible everywhere in the gallows frames of the now-abandoned underground mines and in the elaborate and beautiful architecture of the uptown area. Our ethnic diversity is the legacy of times when the city swarmed with miners and citizens from all over the world. The huge Berkeley Pit, historic district, and the World Museum of Mining attract thousands of visitors each year. The availability of space and the low cost of living in the city have brought numerous artists and craft persons to the area. Butte is unique and alive, and its residents are loyal, proud and persevering.

CAMPUSES AND BUILDINGS

North Campus

Overlooking the city from the shoulder of Big Butte, Montana Tech's North Campus can be seen for miles. Its tree-shaded perimeter encloses both the stately buildings of the institution's past and the modern facilities reflecting its present and its future.

Tech's North Campus, *1300 W. Park Street*, consists of the Science/Engineering Building, Engineering Hall, Main Hall, the Chemistry/Biology Building, the Petroleum Building, the Mining/Geology Building, the Health, Physical Education and Recreation (HPER) Complex, and the Engineering Lab and Classroom Building, all of which are used for classes. Support facilities for the academic programs include the Library and Auditorium, the Museum Building, and the greenhouse. Auxiliary service facilities include the Residence Halls, the Student Union Building, Mill Building, and off-campus apartments. The Chancellor's Residence, a stately brick home, is also on campus.

In addition to the buildings, Alumni Coliseum has been carved out of the hillside to provide space for football, baseball and other sports events. The campus also holds four smaller sports fields and outdoor tennis courts.

A short distance from the Coliseum is the World Museum of Mining, commemorating the development of mining from the pick-and-shovel days to the modern processes now in use. A private, nonprofit undertaking of interested citizens, the museum displays the tools and equipment used by miners over the years and depicts life in a mining camp growing to become a modern city.

South Campus

Tech's South Campus, *25 Basin Creek Road*, houses the College of Technology (COT) as well as the Nursing and Network Technology programs. It has nearly 60,000 square feet of classroom and laboratory space and a total of 96,000 square feet overall.

BUREAU OF MINES AND GEOLOGY

The Montana Bureau of Mines and Geology was established by the 1919 Legislative Assembly as a public service agency and a research department of the institution. The Bureau, located in Main Hall on the North Campus, is the only earth science research agency in Montana State government and is responsible for assisting in development of the state's mineral, energy and groundwater resources. Reports on Bureau research are made available to the public through formal publications and by replies to individual inquiries.

Bureau funds and projects are apportioned between applied research and public service. Work comprises field and laboratory study, collection of samples and information, interpretation of data, and compilation of statistics on all mineral resources – metallic and nonmetallic minerals, fuels, and groundwater. Projects are undertaken in cooperation with the U.S. Geological Survey and other federal, state, and local agencies. Laboratories are equipped with modern instrumentation for all essential work; new instruments of greater range, adaptability or efficiency are added periodically.

ALUMNI ASSOCIATION

The Montana Tech Alumni Association, an independent part of the institution, was first organized in 1904 for the purpose of promoting the interests of the Institution to potential students, alumni, community, state and nation. In 1953, the Association was incorporated as a nonprofit organization. The preamble to the charter, which was amended in 1978, states: "In order to secure unity among the graduates of Montana Tech (formerly Montana School of Mines/Montana College of Mineral Science and Technology), to foster an attachment to our Alma Mater, and to promote the interests of Montana Tech, we do hereby constitute ourselves an Association to be known as the Montana Tech Alumni Association." Each graduate with an associate (2 yr.), a bachelor or higher degree, including honorary degrees, is automatically a member. More information on this organization and its services can be obtained by writing to: *Montana Tech Alumni Association, 1300 West Park Street, Butte, Montana 59701 or by contacting Peggy McCoy, Director of Alumni Affairs, at alumni@mtech.edu*.

FOUNDATION

Established in 1967, the Montana Tech Foundation is an independent, nonprofit organization which qualifies under the provisions of IRS code 501(c)(3). The Foundation is dedicated to operate exclusively for the purpose of encouraging, promoting and supporting the educational programs and scholarly pursuits of Montana Tech of the University of Montana.

Governed by a Board of Directors compromised primarily of leaders in business and industry, the Montana Tech Foundation solicits and administers gifts and grants to enhance and enrich the teaching and research efforts of the faculty and to increase educational opportunities for Montana Tech's students. Gifts to the Foundation are administered according to the wishes of the contributors. The Montana Tech Foundation also manages endowment funds on behalf of the institution.

Working to develop effective ways to benefit the college is a joint effort between Montana Tech and the Montana Tech Foundation. With a common goal in mind, the college, with its faculty, staff, students, and programs, will continue to excel.

LIBRARIES

North Campus

Montana Tech Library is located on the North Campus and is the primary information source for the university. It provides resources and services which support the academic needs of students and faculty. The collection includes anytime, any-place on-line access to more than 30,000 journals, 500 newspapers and 13,500 e-books in more than 60 subject-specific databases. The library owns 80,000 topographic and geologic maps, extensive book and reference collections in print, and publications from the U.S. Government, the State of Montana, and other state and foreign governments. It is the only U.S. Patent Library in Montana and provides patent and trademark information and access to 8 million patents.

Services

Wireless access is available throughout the library, and student computers, printers and a scanning station are located on the first floor. Professional librarians teach students how to locate the library's continually expanding resources, and they also provide research help. Any book or article not owned by the library can be obtained at *no cost to students* through the Interlibrary Loan service called ILLiad. Articles are often delivered within 24 hours. Group study rooms and quiet study areas are provided for students on the second floor. Visit the library on-line at www.mtech.edu/library or call **406-496-4281**.

South Campus

The small South Campus Learning Center houses a limited collection of library resources related to the programs taught at the College of Technology. Trade manuals, magazines, and reference materials are available. The Learning Center also contains study areas and computers for student use. All resources and services on the North Campus are available to COT students. Visit the website at http://www.mtech.edu/cot/learning%20center/learningcenter.htm or call **406-496-3737**.

MINERAL MUSEUM

The Mineral Museum occupies the upper floor of the Museum Building situated on the southeast corner of the campus. The Museum is open year round. Guided tours for groups are available by prior arrangement. Call **406-496-4414** for more information.

The Mineral Museum collection contains more than 15,000 specimens with over 1,300 minerals from Montana and around the world on display. Prize specimens in the Montana Collection include a spectacular 27.5 troy ounce gold nugget recovered from a placer mining operation in the mountains south of Butte in 1989 and a 400-pound smoky quartz crystal, affectionately referred to as "Big Daddy", unearthed just east of Butte.

Brilliant blue sapphires from Yogo Gulch and beautiful polished agates, Montana's state stones, are displayed along with copper and molybdenum minerals, and talc – all examples of the industrial minerals that have figured so strongly in Montana's economic history. Azurite and malachite from Bisbee, Arizona, spectacular amethyst geodes from Brazil, and rhodochrosite from South Africa are just a few of the minerals from worldwide localities. The Fluorescent Room, where ordinary-looking minerals radiate extraordinary vibrant shades of pink, orange, and blue when exposed to ultraviolet light, is always a favorite.

The Museum has a gift shop where you can purchase mineral specimens and books relating to minerals and geology.

RESEARCH AND SERVICE

Research and service programs at Montana Tech emphasize professional development of faculty and students and improved development of mineral and energy resources in Montana and the nation. Upper division and graduate students are normally utilized as research assistants on research projects in order to provide exposure and experience with new technology and contemporary industrial and scientific problems. The Center for Advanced Mineral and Metallurgical Processing (CAMP) focuses on materials processing research including system control and optimization and metal recovery systems. Annual grant and contract activity now exceeds $8 million annually and involves over 30% of the campus faculty and 50% of Montana Bureau of Mines and Geology personnel.

CAMPUS TECHNOLOGY SERVICES

Our campus computer services emphasizes distributing computer support and focusing mission critical support service areas. The organization brings computer services closer to the end user and at the same time develops and focuses core networking and administrative services.

Computer Support Coordinators have been placed under the direction of the Dean of each College to facilitate and resolve college and departmental PC computer support needs. The Coordinators provide support for (but not limited to) desktop software, PC hardware service, computer laboratory setups, workstation configurations, and multimedia to the extent emphasized by each College's unique needs.

Three service areas are now in place: Network Services, Information Services, and On-line Services, each with well-defined work paths. The directors/mangers from these three areas comprise the Campus Technology Council which advises the administration on technical issues, developments and direction. Network Services is dedicated to supporting and delivering Information Technologies to the Montana Tech campus. Information Technology includes World Wide Web, e-mail, student information systems, human resources, distance learning, and collaborative information and resource sharing. The network provides delivery of all media and computer communication, facilitating both instructional and administrative needs. Network Services develops, monitors, secures, and maintains the entire network infrastructure. Information Services administers, manages, and coordinates the college's administrative computing functions, including management of the student information system and the student reporting data warehouse. Online Services supports our campus web server and the on-line course management system(s) (http://mymtech.mtech.edu). These systems utilize various technologies to deliver a rich online learning experience for the students and staff of Montana Tech. Online Services also consults with other departments on campus to research, develop, and deliver new computing ideas and technologies.

Montana Tech encourages the use of computers and the network as educational and problem solving research tools. A fully integrated local area network connects more than 1,000 computers and peripherals with over 500 workstations dedicated to student use. Microcomputer labs exist in most buildings on campus supporting student word processing, business applications, engineering data acquisition/analysis, e-mail, and the World Wide Web. All students receive an e-mail and access account upon registering. For student information and help on accounts, e-mail, troubleshooting, FAQ's and other computer and networking topics please refer to this link http://www.mtech.edu/cts. Become accustomed to using all of your computer resources.

Montana Tech is linked to the World Wide Web via the University of Montana (UM) on a 45 Mbps pipe and is a sponsored participant of Internet2 on UM's behalf. The Internet2 project exists to develop and integrate new innovations in networking. It was launched in 1966 by the university community. The universities that originally ventured on this project understood that fundamental advances and development in networking must be applied and pursued if they were to fulfill their teaching and research missions. Montana Tech has developed several Access Grid Nodes.

EQUAL EDUCATIONAL OPPORTUNITY POLICY

It is the policy of Montana Tech to provide equal educational and employment opportunity (EEO) to all persons regardless of race, color, religion, creed, sex, national origin, age, mental or physical disability, marital status, sexual preference, or political belief with the exception of special programs established by law.

Equal educational opportunity includes admission, recruitment, extracurricular programs and activities, housing, facilities, access to course offerings, counseling and testing, financial assistance, employment, health and insurance services, and athletics. Title IX of the Educational Amendments of 1972 prohibits discrimination on the basis of sex in any education program or activity receiving federal financial assistance by way of grant, contract, or loan.

Montana Tech will take affirmative action (AA) to equalize employment opportunities at all campus levels where evidence exists that there have been barriers to employment for those classes of people who have traditionally been denied equal employment opportunity.

Montana Tech makes a commitment to provide reasonable accommodation to any known disability that may interfere with an applicant's ability to compete in the selection process or an employee's ability to perform the duties of the job.

Montana Tech guarantees employment protection against retaliation for lawfully opposing any alleged discriminatory practice, including the filing of an internal grievance alleging unlawful discrimination, the filing of a union grievance, the initiation of an external administrative or legal proceeding or testifying in or participating in any of the above.

The chancellor has ultimate authority and responsibility for establishing equal employment opportunities as a policy at Montana Tech. The chancellor pledges to promote and support practices which protect the right of equal employment opportunities.

Also on file is the institution's Minority Achievement and Gender Equity Plan as approved by the Montana Board of Regents. All grievances, questions or requests for information should be referred to the AA/EEO Officer or the Chancellor's Office.

Students with Disabilities

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) require institutions of higher learning to provide students who have physical and/or learning disabilities "equivalent access" that will allow them an education equal to that of their non-challenged peers. While it is the institution's responsibility to provide appropriate support, it is the student's responsibility to make the initial notification that a physical and/or learning disability exists. Please provide appropriate documentation, which describes the type of disability, the extent of that disability, and gives information on recommended accommodations. Students wishing to request an accommodation of any type for a physical and/or cognitive challenge are directed to contact the *Montana Tech Student Life Programs Office, Engineering Hall, Room 101* **(406) 496-4198**; ***COT**, Counseling Office* **(406) 496-3730**. Students with disabilities are encouraged to contact the *Student Life Programs Office* at the earliest possible date. ADA also applies to faculty, staff, and guests of the University in terms of reasonable accommodation.

ENGINEERING DEGREES

The institution prepares students for professional service in nine engineering fields:

Environmental Engineering, Electrical Engineering, General Engineering (options in Civil, Mechanical, & Welding), Geological Engineering (options in Geotechnical, Mining ,& Petroleum), Geophysical Engineering, Metallurgical & Materials Engineering, Mining Engineering, Petroleum Engineering, and Software Engineering.

Baccalaureate degrees are available in all above fields. Master's degrees are available in all fields except Software Engineering. Other engineering-related Master's degrees are:

Project Engineering & Management, and Geosciences (Geochemistry, Hydrogeology, Hydrogeological Engineering, Geology, Geological Engineering, and Geophysical Engineering)

PRE-ENGINEERING

The pre-engineering program at the University of Montana is a two-year program that helps students determine if they are interested in engineering and prepares them to transfer to a university with an accredited engineering program. The exact curriculum a student would take varies between the different Engineering disciplines and the transfer school of interest. In general, the program focuses on developing a fundamental knowledge of physics, chemistry, and mathematics. In addition, students would take classes in English, communications, the social sciences, and humanities. Students in the pre-engineering program can transfer to a university of their choice. Students may be admitted to the 2 + 2 engineering program between the University of Montana and Montana Tech upon meeting the admission requirements. A student admitted to the program completes two years of study at the University of Montana and then completes his or her degree at Montana Tech.

Admission Requirements for 2+2 Engineering Program

To be admitted to the 2+2 Engineering Program with Montana Tech, a student must satisfy the following requirements:

1. Overall GPA of 2.5 or greater.
2. Completion of M 151 or placement into M 171
3. Completion on ENEX 100 or placement into ENEX 101

Students who intend to complete the 2+2 with Montana Tech, but who have not yet met the above requirements, will be admitted as pre-engineering majors. Students interested in pursuing an engineering degree at an engineering school other than Montana Tech will also be admitted into the pre-engineering program.

ARTS AND SCIENCES DEGREES

The institution awards baccalaureate degrees in:

Biological Science, Business and Information Technology (options in Accounting, Management and Information Technology), Chemistry (options in Biochemistry, Environmental Chemistry, Geology-Geochemistry, and Professional), Computer Science (options in Business Applications, Electronic Control Systems, Engineering Applications, Statistics Applications, & Technical Communication), General Science, Health Care Informatics, Liberal Studies, Mathematical Science, Network Technology, Nursing, Occupational Safety and Health (option in Applied Health Science), and Professional & Technical Communication. Also, Bachelor of Applied Science degrees in Biology and Business.

Moreover, transferable course work in public speaking, foreign languages, humanities and social sciences, law, premedical, physical education and more is available for those students wishing to begin a program at Montana Tech and transfer to another institution to complete their degree.

The institution awards Master's degrees in the following non-engineering disciplines:

Technical Communication (Post-baccalaureate Certificate also available) and *Industrial Hygiene.*

The institution awards the two-year *Associate of Science Degree* (untitled), and the *Associate of Science - Registered Nursing Degree (requires six semesters)*, as well as the following two-year Associate of Applied Science (AAS) degrees

Accounting Technology (options in Health Services and Human Resources), Business Technology (options in Administrative Computer Specialist and Medical Office Specialist), Civil Engineering Technology, Construction Technology-Carpentry, Drafting Technology, Health Care Informatics Technology (opt out for AAS after four semesters), Medical Assistant, Metals Fabrication, Networking Technology, and Radiologic Technology.

Additionally Certificate of Applied Science (one-year programs) are available in:

Automotive Technology, Bookkeeping, Computer Assistant, Carpentry, Drafting Technician, Medical Receptionist, Network Technician, and Office Assistant.

A onesemester Certificate is available in:

Lineman Program, Nurse Assistant, and Combination Welding

An Advanced Certificate of Completion is available in:

Diagnostic Medical Sonography

ACCREDITATION AND MEMBERSHIPS

The Northwest Commission on Colleges and Universities (NWCCU) has granted Montana Tech regional accreditation continuously since 1932. The Institution holds membership in the following organizations: American Association of State Colleges and Universities; the American Society for Engineering Education; the American Council on Education; the American Institute of Mining, Metallurgical and Petroleum Engineers; the Association of School and College Placement Officers; the American Association of State Geologists; the Northern Rockies Consortium for Higher Education; the Northwest Scientific Association; the Montana Academy of Sciences, The National Collegiate Honors Council; and other similar groups.

Programs accredited by Engineering Accreditation Commission of the Accreditation Board for Engineering & Technology (ABET/EAC):

Electrical Engineering, Environmental Engineering, General Engineering, Geological Engineering, Geophysical Engineering, Metallurgical & Materials Engineering, Mining Engineering, Petroleum Engineering, Software Engineering.

Programs accredited by American Chemical Society (ACS):

Chemistry

Programs accredited by Computer Science Accreditation Board of Engineering & Technology (CSAC/CSAB):

Computer Science

Programs accredited by Related Accreditation of Commission Board of Engineering & Technology (ABET/ASAC):

Industrial Hygiene (On-Campus Master's)

Programs accredited by National Institute for Automotive Service Excellence (NIASE):

Automotive Technology

Programs accredited by Montana State Board of Nursing:

Registered Nursing Programs

Programs accredited by National League of Nursing Accreditation (NLNAC):

Registered Nursing Program - Associate of Science Degree (ASRN)

Programs accredited by the International Assembly for Collegiate Business Education:

Business and Information Technology

Admission

Montana Tech encourages all prospective students who are interested in attending to apply for admission. Applications for admission are accepted from in-state, out-of-state, and international students. The Enrollment Services Office has counselors available to assist full-time, part-time, and non-degree applicants in the admission process. For admissions or additional information, please call us at (406) 496-4178 or 1-800-445-TECH (8324), or visit our website at: www.mtech.edu.

Application Processing occurs in the Office of Enrollment Services located in room 207 of the Mining-Geology Building. Prospective students are encouraged to visit the campus on weekdays when classes are in session or weekends by appointment. Contact Enrollment Services via email at: admissions@mtech.edu. You can also visit us at www.mtech.edu.

MEASLES IMMUNIZATION POLICY

If you were born after December 31, 1956, you must submit proof of two separate doses of measles and rubella immunity by immunization record or a physician's record of diagnosis. While measles and rubella immunization (with dates) is not an admission requirement, it is necessary to complete your file and must be submitted before you are allowed to register for courses. This policy is in effect at all units of the Montana University System. Students enrolled exclusively in distance-delivered courses are exempt from the measles requirements.

FRESHMEN STUDENTS

Freshmen are students who have graduated from an accredited high school (or have a GED) and have never attended a post-secondary school on a full-time basis (excluding summer school). Students who have attempted or earned fewer than 30 semester or 32 quarter credit hours on a part-time basis at a post-secondary institution while attending high school are also considered freshmen.

When to Apply - Freshmen Students

Freshmen applying for Fall admission are encouraged to apply by February 1. Students will not be considered for scholarships, financial aid or housing until they have completed an application. **All first-time, U.S. residents enrolling full-time at Montana Tech are eligible to apply for new student scholarships. Undergraduate scholarship awards are based primarily on academic merit and leadership ability. Scholarship applications should be received by the Enrollment Processing Office before the priority deadline of February 1.**

Application Procedure - Freshmen Students:

1. Complete and submit the Montana Tech Application for Admission.
2. Submit a $30 (U.S.) nonrefundable application fee. An application will not be processed until the application fee is received.
3. Submit all academic transcripts including: official high school transcript or GED test score report or home school and any official transcripts from other post-secondary institutions previously attended.
4. Submit the score report from the ACT or SAT test. **(Not required for College of Technology students.)**
5. Submit proof of two separate doses of measles and rubella immunization if you were born after December 31, 1956.
6. The COMPASS test is required for all students who are applying for a certificate and/or associate of applied science degree program. It is also required of any student who has been out of school for more than 3 years and has not successfully completed College Writing I or College Algebra within the last three years. To schedule an appointment to take the test, call the Enrollment Services Office at (406) 496-4256.

Home Schooling Admission Requirements

Students who have received their education through home schooling or who have graduated from a non-accredited high school can satisfy the requirement of high school graduation by:

1. Obtaining a High School Equivalency Diploma based on the G.E.D. (General Education Development) examination; or
2. Satisfactory performance on either the ACT (American College Testing Progran) or COMPASS examinations.

Home school students must also submit a transcript summarizing their academic history.

North Campus **- Admission Requirements:**

All first-time, full-time resident and non-resident freshmen who graduated from high school within the past three years are required to meet the following entrance requirements for admission:

Freshmen applicants must satisfy the following standards:

1. ACT Enhanced composite score of 22 or SAT combined score of 1530, OR
2. A high school cumulative grade point average of 2.50 (4.0 scale) or greater, OR
3. Rank in the upper half of their graduating class, AND
4. Meet math and English standards (see below)
5. Complete the College Prep Curriculum (see below)

Math and Writing Proficiency Standards

Student must demonstrate minimum Math and English proficiency. Math proficiency may be demonstrated with an ACT math score of 22 or SAT math score of 520. For current and complete Math and English proficiency standards, please visit the Montana Board of Regents website at www.mus.edu and view "Proficiency Standards" links. Montana Tech reserves the right to place students in the appropriate Math & English courses.

Freshmen applicants must also complete the full College Preparatory Requirements:

1. Four years of English.
2. Three years of Mathematics (Algebra I & II, & Geometry). Math in senior year encouraged.
3. Four years of Social Studies to include one year of Global Studies (World History or World Geography), one year of U.S. History, and a third year of either Government, Economics, Geography, Indian History, Sociology, or Psychology.
4. Two years of laboratory science (one year must be Earth Science, Biology, Chemistry, or Physics), the other year can be from one of those sciences or another college preparatory laboratory science.
5. Two years chosen from the following:
   – foreign language – visual and performing arts
   – computer science – vocational education units

Out-of-state applicants who have not completed the college preparatory requirements stated above may satisfy the requirements by providing evidence that they have:

1. Completed a similar college preparatory program required in their home state. Evidence of this completion must be certified by the high school. OR
2. If the applicant's state has no college preparatory program, meet two of the five numeric admission requirements stated above plus math and writing standards.

Students who did not graduate from high school but who have passed the General Education Development (GED) examination may be eligible for admission.

The following students are exempt from the above requirements:

Nontraditional age students (those who graduated from high school more than three years ago); students attending during summer session without the intent of registering during the regular academic year; part-time, non-degree-seeking students taking fewer than 8 credits per semester, exclusive of remedial courses.

Applicants who do not meet the admission requirements to North Campus degree programs or the college preparatory requirements stated above may be considered for an admission exemption. Due to the limited number of exemptions available, priority consideration will be given to those applying before February 1 for Fall; December 1 for Spring; and May 1 for Summer.

South Campus **- Admission Requirements:**

Applicants to Montana Tech College of Technology are considered and accepted on a first-come-first-served basis. It is advisable to submit an application early as some programs have waiting lists. Applications are accepted throughout the

year. Applicants must be able to provide proof of high school graduation or its equivalent (GED). Students applying for admission will be scheduled for the COMPASS exam. The COMPASS test is used by the College of Technology as a diagnostic and advanced placement measurement. The results of the test will be used to counsel students concerning their program choice, class schedule and credit load. No student will be admitted after the tenth instructional day of the semester.

TRANSFER STUDENTS

A transfer student is one who has registered or enrolled for credit at another post-secondary institution for one or more terms of full-time attendance or has attempted or earned at least 12 semester or 16 quarter credit hours as a part-time student. All official college transcripts are required in order to evaluate transfer credit. Transfer students will also be required to complete the COMPASS test if they have not completed college level math and/or English within the last two years.

When to Apply - Transfer Students

It is recommended that transfer applicants complete their file at least two months before the beginning of the semester so an evaluation of transfer credit can be completed before they register for classes.

Application Procedures - Transfer Students

1. Complete and submit the on file transfer or Montana Tech Application for Admission.
2. Submit a $30 (U.S.) non-refundable application fee (waived if attended another MUS affiliated campus.)
3. Submit official transcripts from all colleges or universities previously attended.
4. Submit ACT or SAT scores on high school transcript. These scores are not required of students who have been out of high school for more than three years, or have earned 30 semester credits of undergraduate course work. **(Not required at the COT)**
5. Submit proof of two separate doses of measles and rubella immunization if you were born after December 31, 1956.
6. Students who have not taken math within the last two years, or College Writing I at a post-secondary institution are required to take the COMPASS test for advising and placement.

Admission Requirements - Transfer Students

A transfer student must have an academic record with a cumulative grade point average of at least 2.0 or greater on a 4.0 scale or at least a "C" average, in order to be eligible for admission. The grade point average is based on all college-level GPA or "pass" credits attempted from all colleges or universities previously attended. Students on academic probation from a post-secondary educational institution may be eligible for admission. Refer to the section titled "*Academic Standing*." A post-baccalaureate student is considered admissible as long as his or her cumulative grade point average is at least 2.0 or greater on a 4.0 scale.

Transfer of Credit

All college or university-level credit earned at a regionally accredited post-secondary educational institution will be considered for transfer credit. Students planning to transfer to Montana Tech are strongly urged to consult with the Office of Enrollment Services and their prospective major department as far in advance as possible in order to ensure that the courses they take will satisfy course prerequisites and degree requirements at Tech. For additional information, refer to the section on *"Transfer Credit Policy."* A grade of "C-" or better is required for acceptance of credit.

Dual Admission (UM Helena FVCC)

Students will be governed by the catalog in effect when they are accepted for the dual admission status provided the catalog is not more than six years old when the students graduate. Students with dual admission to Montana University System schools who interrupt their attendance are governed by the catalog in effect when they are readmitted.

INTERNATIONAL STUDENTS

Montana Tech is authorized to issue the Immigration and Custom Enforcement (ICE) Form I-20AB for F-1 student visas and DS-2019 for J-1 student visas. **Students and Exchange Visitors issued an I-20 or DS-2019 are required to pay a $200.00 SEVIS fee prior to being issued a visa to enter the United States. For more information: www.ice.gov/sevis/**.

When to Apply - International Students

All of the items listed below under *"Application Procedures"* should be received by the Admissions Office according to the following schedule:

Fall Semester: **July 1**
Spring Semester: **November 1**
Summer Session: **March 1**

Admission Requirements - International Students

See requirements for Freshman, Transfer, or Returning students.

Application Procedures (Undergraduate) - International Student

A decision regarding your admission status will be made upon receipt of the credentials mentioned below. All items listed must be received before a decision will be made concerning your application (deadlines are applicable). If admitted, students will receive a letter of acceptance, an evaluation of transfer credit (if necessary and complete), and an I-20 form necessary for obtaining an F-1 student visa. **INCOMPLETE APPLICATIONS WILL NOT BE PROCESSED**.

1. **APPLICATION FOR ADMISSION (Undergraduate)**
   Please complete all items on the application form. Materials from applicants are filed alphabetically under the family name you indicate on your application. Use the same spelling of your name on all correspondence. Please check that your application is signed and dated.

2. **APPLICATION FEE (Non-refundable and will not be waived)**
   The $30 U.S. dollars (non-refundable) application fee is required of all applicants.

3. **ENGLISH REPORT**
   Applicants who are citizens of countries **other than** Australia, Canada, England, Ireland, New Zealand, Scotland, or Wales are required to certify English proficiency by supplying one of the following:
   A. Official TOEFL (Test of English as a Foreign language) score report showing a minimum score of 71 Internet based, 525 paper-based or 195 computer-based. Please obtain information concerning this test from: Test of English as a Foreign Language, P.O. Box 899, Princeton, NJ 08540, U.S.A.
   B. Certification of successful completion of ELS Language Centers level 109. Please obtain all information concerning ELS from: ELS Language Centers, Executive Offices, 5761 Buckingham Parkway, Culver City, CA 90230, U.S.A.
   C. Certification of grade "C" or higher on the English Language section of one of the General Certificate of Education, Ordinary Level (GCE-O), examinations administered in England.
   D. Students who have graduated from an accredited high school in the U.S. may satisfy this requirement by providing an official high school transcript along with two letters of recommendation from high school faculty/administrators regarding proficiency in English language skills.
   E. Students transferring to Montana Tech after one (or more) year of full-time enrollment at a college/university in the United States may satisfy this requirement by providing at least two letters of recommendation from faculty members regarding proficiency in English language skills.

4. **STATEMENT OF FINANCIAL SUPPORT**
   An original, current financial statement from your bank/sponsor must certify that funding will be available to cover estimated expenses during your first year at Montana Tech. ALL international students applying for admission must provide a certified financial statement showing at least $23,740 (U.S. dollars). (NOTE: The financial statement should cover expenses for dependents accompanying you to the United States by certifying an additional $4,000 for your spouse, and $1,000 for each child.) **Students may be required to have their first semester's tuition and fees on deposit at Montana Tech before their I-20 will be issued. This comes to $10,860 United States Dollars.**

5. **EDUCATIONAL CREDENTIALS**
   Academic eligibility, placement, and transfer of credit will be determined by the Office of Enrollment Management. Secondary school graduates must show the equivalent of at least a 2.00 (C) grade point average (GPA) on secondary school units. Students transferring college level credits to Montana Tech must show the equivalent of at least 2.00 (C) grade point

average (GPA). Admission to some engineering programs and nursing may be restricted. Please provide academic credentials as requested below:

A. **International students who have attended institutions outside the U.S. or Canada must request an evaluation of Academic Credentials from Educational Credential Evaluators, Inc. (ECE).** Students who have attended a foreign university should use the ECE application requesting a detailed report to be sent to you and to the Enrollment Services Office. ECE will require official credentials as described on the reverse of the ECE application; the Enrollment Services Office requires a DUPLICATE set of credentials. IMPORTANT! ECE evaluations of credit may not reflect actual college credits accepted by Montana Tech. Allow 8-12 weeks for ECE to complete the evaluation process.

B. **International students who have attended U.S. and Canadian institutions must submit the following**: Official transcripts from high schools/technical schools/colleges/universities you have attended. **Transcripts are required and will be evaluated by the Enrollment Services Office**. (Note: Before transferring to Montana Tech from a U.S. college/university, you should see your present foreign student advisor regarding transfer procedures. Contact the Enrollment Services Office at 1-800-445-8324 for a "Notice of Intent to Transfer" form to be completed by the Foreign Student Officer at your present U.S. college).

6. **IMMUNIZATION/HEALTH RECORDS**
A physician-validated record showing immunization for rubella, measles (two doses of measles vaccine after 1st birthday), and a recent (within the last year) skin test for tuberculosis. Each of these must be identified on the record in English and signed by a physician or registered nurse.

7. **MEDICAL HEALTH INSURANCE**
Proof of medical health insurance is required for all international students. Coverage is not required for dependents, but is recommended. Students without such insurance or with inadequate coverage are required to obtain medical health coverage through a campus-approved policy. Students are automatically enrolled in the campus insurance plan, and the premium for coverage is added to tuition. Students showing proof of adequate coverage may request a waiver of the campus insurance by contacting the Student Life Office. Please understand that health care in the United States is largely a private, not a governmental function. THERE ARE CHARGES TO THE STUDENT FOR MANY MEDICAL SERVICES. These may range from a few dollars for very simple procedures to thousands of dollars for extended hospitalization or major operations. All J-Visa international students and dependents are required to obtain minimum medical health insurance as required by the Department of Homeland Security through a campus endorsed policy.

FORMER STUDENT READMISSION

A former student who was not in attendance during the semester preceding the intended term of return, excluding summer school, is required to reapply for admission. **Returning students are required to follow the college catalog in effect at the time of reentry, including any changes to program requirements.**

When to Apply - Returning Students
It is recommended that students apply at least one month in advance of the semester, however, applications will be accepted until the 10th day of classes.

Application Procedures - Returning Student
1. Complete and submit an Application for Admission Short Form. The $30 application fee is not required for former students.
2. If applicable, submit official transcripts from all colleges or universities attended since leaving Montana Tech.
3. If you were born after December 31, 1956, and have not attended Montana Tech in the last five academic calendar years or were enrolled as a non-degree student, you **must** submit proof of two separate doses of measles and rubella immunization.

Admission Requirements - Returning Student
All returning or former students who have attended a college or university since leaving Montana Tech must meet the admission requirements for transfer students in order to be readmitted.

Former students who have not attended another college or university must be readmissable according to the policy in the section titled "Academic Standing." Students who are on a probationary status from Montana Tech are considered readmissable.

Students on first suspension are readmissable after one semester of non-attendance (remaining out-of-residence). If a student has been suspended twice from Montana Tech, he or she must be out of school for an interval of one academic year, and **must** receive approval for readmission from the **Academic Standards Committee**. Students suspended from the North Campus (undergraduate degree program) may be admissible to the South Campus (College of Technology program).

JUMP START/EARLY ADMISSION/DUAL CREDIT

Montana Tech initiated the Jump Start Program for high-achieving high school juniors and seniors who have an interest in early admission at Montana Tech to enroll in college-level course work while still enrolled in high school. Now, Dual Credit colleg-level courses are also taught at the high school by Montana Tech-approved instructors, and count towards BOTH high school graduation requirements and also appears on the student's Montana Tech transcript. Jump Start and Dual Credit courses are open to any eligible high school student and are taught at area high schools, on campus, or via the internet. Applicants must submit a completed Jump Start/Dual Credit Application and Registration Form to apply for participation in the program. Applicants must have a minimum 2.75 GPA and must receive the permission of their parents or guardians and their high school counselor or principal. Partial fee waivers are available (limits may apply) for students participating in this program. Contact the Technical Outreach Office at (406) 496-4565 for more information.

When to Apply - Jump Start and Dual Credit Students
Applicants for early admission should complete the application process at least two weeks prior to the beginning of the semester.

Application Procedures - Jump Start and Dual Credit Students
Application for early admission must be initiated by the student through the appropriate high school administrator. Such application must meet with the specific agreement, recommendation and approval of the student's parents or guardian, the student's high school, and the Enrollment Services Office. Students applying for early admission must complete and submit a Jump Start Application with all required signatures.

NON-DEGREE STUDENTS

A non-degree student is defined as a student taking fewer than 8 credits a semester and whose purpose in attending Montana Tech is not to pursue a degree. If a non-degree student subsequently decides to pursue a degree at Montana Tech, he or she must complete a regular undergraduate or graduate application form and submit additional documentation as required (see the Enrollment Services Office). Enrollment as a non-degree student does not guarantee admission to a degree program. A maximum of 45 credit hours earned as a Montana Tech non-degree student may be transferable to an undergraduate degree program. Any graduate course taken by a non-degree student must be approved in advance by the director of the Graduate School and the head of the department in which the student intends to pursue a graduate degree in order for the course to be applicable to the degree. Non-degree students must maintain satisfactory academic progress.

Application Procedure - Non-degree
1. A student must submit the Application for Admission Short Form, along with a $30 (U.S.) non-refundable application fee (waived if attended an affiliated MUS campus.) An application will not be processed until the application fee is received.
2. Students taking more than 7 credits must submit proof of two separate doses of MMR if born after December 31, 1956.

Admission Requirements - Non-degree
All non-degree students should be high school graduates or have received their GED. However, high school or college transcripts or standardized test scores are not required unless necessary to comply with course prerequisites or if the student chooses to seek a degree.

GENERAL INFORMATION FOR ALL STUDENTS

1. Any qualified applicant will be accepted for admission to Montana Tech regardless of race, color, creed, sex, national origin, or handicap.
2. Failure to submit all required credentials may result in cancellation of

registration.

3. The falsification or willful suppression by the applicant of any information requested on the application form may be grounds for cancellation of registration and exclusion from subsequent attendance at Montana Tech. Failure on the part of the applicant to provide all of the requested information will cause delays in processing the application for admission.
4. The term "official" in reference to academic credentials indicates that the documents are forwarded directly by the principal or registrar of each school attended to the Enrollment Services Office at Montana Tech. Faxed copies, or those "issued to the student" will not be accepted. An official transcript must have a signature, stamp or seal.
5. Information regarding residency classification for fee purposes is available from the Enrollment Services Office.
6. **GED:** A student may be admitted on the presentation of a high school equivalency certificate issued by the State Superintendent of Public Instruction under authorization of the Board of Public Education. The high school equivalency certificate based on the GED examination may not be used to satisfy the requirement of high school graduation until after the student's high school class has graduated. Further information regarding requirements and test center locations in Montana may be obtained from the Office of Public Instruction, Helena, MT 59620.
7. **WICHE-WUE:** On a space available basis, residents of states participating in the Western Interstate Commission on Higher Education (WICHE) Western Undergraduate Exchange (WUE) may be eligible for the WICHE-WUE Scholarship. Students approved for this benefit pay 150% of resident tuition instead of the non-resident tuition. This scholarship is available to qualifying newly admitted, first-time undergraduate students only. Post-baccalaureate and graduate students are not eligible. Currently participating states are as follows: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. Montana Tech reserves the right to change the requirements for admission into the WUE program without further notice. For current information about the WICHE-WUE Program, contact the Montana Tech Enrollment Services Office.

   Because Montana Tech participates in the WICHE-WUE Program, residents of Montana may enroll under similar terms in designated institutions and programs in other participating states. Montana residents may obtain information about WUE programs in other states from the **Office of the Commissioner of Higher Education, 2500 Broadway, Helena, MT 59620-3101, (406)444-6570; or from WICHE Student Exchange Program, P.O. Drawer P, Boulder, CO 80301-9752, (303) 497-0210.**
8. All eligible high school applicants may be considered for admission and given conditional acceptance on the basis of six or seven completed semesters of acceptable high school work. However, applicants must supply the Enrollment Services Office with final semester grades, certification of high school graduation, class size, rank in class, and meet the minimum admission standards and college preparatory requirements in order to be officially admitted.
9. **ATHLETIC ELIGIBILITY REQUIREMENTS:** First-time freshmen must meet two of the following three entry-level requirements before being allowed to participate in intercollegiate athletics:
   A. An ACT Composite of 18 or a SAT combined score (verbal & math) of 860 on the new re-centered scale.
   B. A high school GPA of at least 2.00 (4.00 scale).
   C. Rank in the upper half of your high school graduation class.
10. **ATTENTION UM AFFILIATE STUDENTS**: If you have attended any of the University of Montana-affiliated colleges in Butte, Dillon, Missoula, or Helena (excluding Carroll College) you may not have to pay the $30.00 application fee. To waive the application fee, please forward an official copy of your transcript(s).

TRANSFER CREDIT & OTHER COLLEGE-LEVEL COURSE WORK POLICIES

Montana University System Transfer of Credit Policies
www.mus.edu/borpol/default.asp

Board Policy Transfer of Credits (Policy 301.5):

A. All college-level courses from regionally accredited institutions of higher education will be received and applied by all campuses of the Montana University System, and by the community colleges, towards the free elective requirements of the Associate and Baccalaureate degrees.

   NOTE: College level courses shall be defined as those courses that are applicable toward an associate of arts, associate of science or baccalaureate degree at their respective institution. The receiving institution will determine in advance of a student's enrollment which courses within an associate of applied science degree program will be credited toward a given associates or baccalaureate degree. In all cases, such courses shall not include remedial or developmental courses.

B. In relation to the major, minor, general education, distribution requirements, and free electives of the Associate and Baccalaureate degrees, all campuses of the Montana University System, and the community colleges, are authorized to determine the applicability of credits earned at regionally accredited institutions of higher education.

C. In administering the policy in paragraphs A and B an institution shall include the credits earned by a student from an institution which is a candidate for regional accreditation after the student has successfully completed 20 semester credits with a 2.0 cumulative grade point average at the receiving institution.

D. Campuses of the Montana University System, and the community colleges, may give credit for education received from non-collegiate institutions on the basis of recommendations published by the American Council on Education and the National Program on Non-collegiate Sponsored Instruction from the Board of Regents of the State of NY (NYSED).

E. Institutions may make exceptions to give credit if the criteria described above are not met. However, the following principles should be followed:
   1. The chief academic officer, registrar, and admissions officer should review each case utilizing the following criteria:
      (a) There must be evidence that there is academic quality in the institution, both in the faculty and in program offering.
      (b) The student must earn at least a minimum 2.0 grade point average or its equivalent at the receiving institution.
   2. Institutions may determine policies relating to the acceptance of college credit from other countries.

F. Students may appeal the result of a transfer credit evaluation if they believe the results are incorrect. Contact the Enrollment Services Office for information about Montana Tech's transfer credit appeal policy. If a student exercises the appeal rights set out in this policy, the review and a final decision must be completed by the class pre-registration date for the following academic term. **The student must initiate the appeal process, in a timely manner, in order to give the institution time to complete its review before the deadline described in the preceding sentence.**

Board Policy General Education Transfer (Policy 301.10):
Refer to the Undergraduate Academic Programs section.

Board Policy Outdated Course work (Policy 301.5.2):
In evaluating course work from postsecondary institutions, the campuses within the Montana University System will:

1) guarantee that any postsecondary course work taken within five (5) years of being admitted or readmitted to the campus will be included in the transfer analysis of specific required classes in a major, minor, option or certificate.

2) guarantee that any postsecondary course work taken within fifteen (15) years of being admitted or readmitted to the campus will be included in the transfer analysis of general education course work.

3) guarantee that any postsecondary course work taken within fifteen (15) years of being admitted or readmitted to the campus will be included in the transfer analysis of elective course work.

Course work that falls outside these guarantee periods may be included in the evaluation, at the discretion of the individual campuses. Since it is a discretionary decision, it cannot be challenged by students.

The provisions of this policy will also govern the evaluation of "outdated" classes that have been completed at the institution doing the evaluation.

Board Policy Minimum Course Grades (Policy 301.5.3):

A. All students in the Montana University System and the three (3) community colleges must earn the following minimum grades in order to demonstrate their competency and preparation:

1. a "D-" or better in all classes that are used to satisfy so-called free or elective credits in an associate or baccalaureate degree program;
2. a "C-" or better in all classes that are used to satisfy a general education program;
3. a "C-" or better in all classes that are used to satisfy the prerequisites or required courses in a major, minor, option or certificate.

B. Individual programs may establish grade standards that are higher than the minimums set out in paragraph A , for some or all of the courses that are used to satisfy the prerequisites or requirements for a major, minor, option, certificate or general education. Students will be notified of that expectation.

C. All campuses of the Montana University System and the three (3) community colleges will adopt a grading system that includes the use of pluses and minuses in addition to letter grades. The grade point average calculation will also be the same throughout the System.

D. Students are required to meet the overall Montana University System standard of a 2.00 grade point average for satisfactory academic progress as specified in Board Policy 301.8.

General Information

Montana Tech reserves the right to make the final decision in regard to the evaluation and approval of course work presented for transfer credit. An evaluation of transfer credit will be performed for any student who has previously acquired college level credit for courses at regionally accredited institutions of higher education and who wishes to pursue a degree at Montana Tech.

The Board of Regents & Montana Tech recognize the following regional accrediting agencies:

New England Association of Schools and Colleges
Middle States Association of Colleges and Schools
North Central Association of Colleges and Schools
Northwest Commission on Colleges and Universities
Southern Association of Colleges and Schools
Western Association of Schools and Colleges

To qualify for a transfer credit evaluation, transfer students must submit ALL official transcripts to the Enrollment Services Office. **An official transfer credit evaluation will not be performed until all transcripts have been received, the student's application for admission is complete, and the student has been admitted**. An official transcript must have a signature, stamp or seal. Faxed copies, or those "issued to student" will not be accepted. Preliminary evaluation can be provided to the prospective student by contacting the Enrollment Services Office.

If all college-level transcripts are on file in the Enrollment Services Office 30 days before the semester begins, an evaluation will be performed and notification will be mailed to the admitted student within 10 working days. College transcripts received less than 30 days before the semester begins will be evaluated as soon as possible. Every effort will be made to evaluate transcripts within two weeks of the student's admission to the institution.

The Enrollment Services Office, in conjunction with the appropriate academic department, will review all eligible course work for transferability, and will determine the applicability of transfer credit to specific degree program requirements. **Transfer credit not applicable for some degree requirements will be applicable as additional free elective credit.**

The Montana Tech transcript will list all transfer courses acceptable in the degree program being pursued as the equivalent Montana Tech course or general degree requirement. Additional free electives will be posted as such. The transfer grade point average is not listed nor calculated into the Montana Tech grade point average. **Only the credits and grade points earned in courses taken at Montana Tech are used in the calculation of the grade point average**. A transfer student's Montana Tech transcript will list previous institutions attended from which transfer credit has been granted.

Challenge Procedure - Credit by Examination

All course challenges must be done within the first three weeks of a semester. Industrial work experience, military work experience, employer-sponsored courses or training, or self-study may provide justification for a student's request to challenge a course. By challenging a course, a student seeks to earn course credit by passing appropriate examinations rather than by attending class and meeting usual course requirements.

Any student wishing to challenge a course must obtain the Challenge Course Form and Instructions from the Enrollment Services Office, follow the instructions accordingly and pay the appropriate fees. The challenge will not be official until the Challenge Grade Form and examination results are received by the Enrollment Services Office and the appropriate fees have been paid. Grades from the successful challenge will be recorded on the student's transcript.

The following are guidelines for students wishing to challenge a course:

- Activity courses and courses for which a grade (including a W) has been received, or which have been taken for no credit may not be challenged. This includes courses previously failed ("F") courses in which a student has received an Incomplete ("I") or a course previously taken on an audit basis. Also Senior Design & Capstone courses may not be challenged.
- Otherwise, all college-level courses may be challenged if appropriate resources are available as determined by the appropriate Department Head.
- Students must complete a minimum of 12 credits at Montana Tech before filing for a challenge examination.
- Only students in good academic standing (2.00 grade point average or above) at Montana Tech may challenge courses.
- The maximum number of credits that may be earned by challenge examination is 16.
- All appeals are handled by the grade appeal system described in the *Grading System* section of this Catalog.
- The Challenge process will require the student to complete a written examination and, when necessary, an oral examination and/or laboratory assignment.
- Students must have all challenges resolved PRIOR to filing for graduation.

College Level Examination Program (CLEP)

Montana Tech will accept as transfer credit most Subject Examinations under the CLEP Program. **CLEP General Examinations will not be accepted for credit**. Please contact the Student Life Office at Montana Tech for further information.

College and University Credit

Montana Tech maintains and updates transfer credit guidelines with numerous regional community colleges, as well as with a number of technical institutes in Canada. Copies of these agreements are generally available from these institutions, or from the Montana Tech Enrollment Services Office. Course equivalencies may be viewed via the Montana University System Office web site, http://mus.edu/transfer/index.asp. All courses listed on official transcripts from regionally accredited institutions of higher education will be eligible for transfer credit to Montana Tech. All college-level courses will be reviewed for transfer credit and applied to degree program requirements. Credit will not be granted for course work taken at any institution not accredited by a recognized regional accrediting association. Credit will be granted from an institution which is a candidate for accreditation upon the student successfully completing 30 credits at Montana Tech.

Correspondence Credit

A maximum of 30 credits from regionally accredited schools may be granted toward a baccalaureate degree for correspondence, extension, and continuing education courses. The department head where the course resides must approve credit for correspondence course. A maximum of 10 credits may be applied to an associate degree.

Military Credit/Dantes

Credit may be granted for courses or training received while in the military based on the American Council on Education's "*A Guide to the Evaluation of Educational Experiences in the Armed Services*" and the "*National Guide to Educational Credit for Training Programs*."

Technical Level Course Work from Colleges of Technology

Course work taken prior to Fall 1991 from Montana Vocational Technical Centers is NOT TRANSFERABLE. The Colleges of Technology were once called Vo-Tech and were not accredited until Fall 1991, when they became part of the MUS system and began granting AAS degrees. Technical level course work earned from vocational-technical schools or colleges of technology, including Montana Tech College of Technology (Montana Tech COT courses ending with a "T" or numbered between 0100-0999, unless specifically excluded), may be transferred as free electives at the undergraduate level and will be considered for transfer toward specific degree requirements for the Associate of Science or Baccalaureate Degree. A grade of "C-" or above is required. The student's department head will make the final decision of acceptance of technical level course work toward specific degree requirements within the student's Associate of Science or Baccalaureate Degree program. Those students seeking the Bachelor of Applied Science Degree and who have completed an Associate of Applied Science Degree will receive a block transfer of A.A.S. credit as noted in the program descriptions within this catalog.

International Baccalaureate

The college welcomes applications from students in the IB program. Students may receive course credit and advanced placement for IB higher level work on a course-by-course basis. Contact the Enrollment Services Office for the latest information on acceptance of IB course work by the college.

Tech Prep

Montana Tech College of Technology has established and maintains articulation agreements with a number of area high schools through the "*Tech Prep*" program. Course(s) from a high school with which the institution has an approved articulation agreement must have been completed within two calendar years of the initial enrollment in the college's program. It is the student's responsibility to submit the petition for Tech Prep credit. Tech Prep credit will be granted based upon the following guidelines:

An articulating student shall:

- graduate from an accredited high school that has a current Tech Prep Articulation Agreement;
- apply for admission to the participating college through the regular admissions process and provide an official high school transcript showing the articulated Tech Prep classes;
- complete and submit the petition for Tech Prep Credit indicating those classes for which Tech Prep credit is being petitioned;
- achieve a grade of B (3.0) or better in the articulated high school class(es);
- meet the specifically agreed-upon competencies and conditions stated in the Agreement for each class for which Tech Prep credit is being petitioned, including passing competency tests where applicable;
- pursue a certificate or AAS degree from the participating college in a program of study approved to accept Tech Prep credits;
- utilize the agreement within two (2) academic years of high school graduation;
- successfully (2.0 GPA) complete a full semester of resident college classes (minimum of 12 credits) and continue to make satisfactory progress in higher level courses within the program of study.

Tech Prep credits will:

- appear on the College of Technology transcript only after the student's successful (minimum 2.0 GPA) completion of a full semester (12 credits) at Montana Tech
- apply towards completion of the designated program at the participating college of technology
- not be calculated in determining grade point average
- result in the waiver of regular tuition and fees for credit(s) granted under the agreement

For further information, please call the Enrollment Services Office at 406-496-4256.

Advanced Placement (AP)

Montana Tech will generally accept the Advanced Placement (AP) Examination from The College Board for transfer credit if the student has scored at least 3 or above on the appropriate AP examination and if an official score sheet has been received by the Enrollment Services Office. Some courses may require a minimum score of 4 for AP credit to be granted. Contact the Enrollment Services Office for current information.

AP Course Description	MT Tech Equivalent	Min. Score	# Credits Received
AB Calculus	M 142 or 171	3	3
BC Calculus	M 171	3	3
Biology	BIOL 1116	3	4
Chemistry	CHMY 141 & 143	4	3,3
Chemistry	CHMY 141	3	3
Computer Science A	C.S. 2106	3	3
Computer Science AB	C.S. 2106 & 2116	4	3,3
English (Literature)	WRIT 101 & LIT 126	3	3,3
English (Language)	WRIT 101	3	3
Environmental Science	BIOL 1826	3	3
European History	HSTR 102	3	3
French	FRCH 101 & 102	3	5,5
German	GRMN 101 & 102	3	5,5
History (World)	HSTR 101	3	3
Human Geography	GPHY 121	3	3
Macroeconomics	ECNS 202	3	3
Microeconomics	ECNS 201	3	3
Physics C: Mechanics	PHYS 1046	3	3
Physics C: Electricity & Magnetism	PHYS 2086	3	3
Physics B	PHYS 1026 & 1036	3	4,4
Psychology	PSYX 100	3	3
Spanish	SPNS 101 & 102	3	3,3
Statistics	STAT 216	3	3
U.S. History	HSTA101 & 102	3	3,3
U.S. Govt. & Politics	PSCI 210	3	3

Expenses

TOTALS FOR ACADEMIC YEAR 2009-2010 PER SEMESTER

	LOWER DIVISION			UPPER DIVISION			GRAD/POST BAC		COLLEGE OF TECHNOLOGY		
CRD HRS	TOTAL RES FEES	TOTAL NON-RES FEES	TOTAL WUE FEES	TOTAL RES FEES	TOTAL NON-RES FEES	TOTAL WUE FEES	TOTAL RES FEES	TOTAL NON-RES FEES	TOTAL RES FEES	TOTAL NON-RES FEES	TOTAL WUE FEES
1	278.96	707.16	374.91	298.46	771.46	404.16	312.36	853.86	182.53	389.43	235.13
2	504.82	1,361.22	696.72	543.82	1,489.82	755.22	571.62	1,654.62	307.08	720.88	412.28
3	730.68	2,015.28	1,018.53	789.18	2,208.18	1,106.28	830.88	2,455.38	431.63	1052.33	589.43
4	976.54	2,689.34	1,360.34	1,054.54	2,946.54	1,477.34	1,110.14	3,276.14	556.18	1383.78	766.58
5	1,202.40	3,343.40	1,682.15	1,299.90	3,664.90	1,828.40	1,369.40	4,076.90	680.73	1,715.23	943.73
6	1,428.26	3,997.46	2,003.96	1,545.26	4,383.26	2,179.46	1,628.66	4,877.66	805.28	2,046.68	1,120.88
7	1,731.66	4,729.06	2,403.31	1,868.16	5,179.16	2,608.06	1,965.46	5,755.96	929.83	2,378.13	1,298.03
8	1,957.52	5,383.12	2,725.12	2,113.52	5,897.52	2,959.12	2,224.72	6,556.70	1,054.38	2,709.58	1,475.18
9	2,183.38	6,037.18	3,046.93	2,358.88	6,615.88	3,310.18	2,483.98	7,357.48	1,178.93	3,041.03	1,652.33
10	2,409.24	6,691.24	3,368.74	2,604.24	7,334.24	3,661.24	2,743.24	8,158.24	1,303.48	3,372.48	1,829.48
11	2,635.10	7,345.30	3,690.55	2,849.60	8,052.60	4,012.30	3,002.50	8,959.00	1,428.03	3,703.93	2,006.63
12	2,860.96	7,999.36	4,012.36	3,094.96	8,770.96	4,363.36	3,261.76	9,759.76	1,552.58	4,035.38	2,183.78
13	2,869.33	8,007.73	4,020.73	3,103.33	8,779.33	4,371.73	3,270.13	9,768.13	1,552.58	4,035.38	2,183.78
14	2,877.70	8,016.10	4,029.10	3,111.70	8,787.70	4,380.10	3,278.50	9,776.50	1,552.58	4,035.38	2,183.78
15	2,886.07	8,024.47	4,037.47	3,120.07	8,796.07	4,388.47	3,286.87	9,784.87	1,552.58	4,035.38	2,183.78
16	2,894.44	8,032.84	4,045.84	3,128.44	8,804.44	4,396.84	3,295.24	9,793.24	1,552.58	4,035.38	2,183.78
17	2,902.81	8,041.21	4,054.21	3,136.81	8,812.81	4,405.21	3,303.61	9,801.61	1,552.58	4,035.38	2,183.78
18	2,911.18	8049.58	4,062.58	3,145.18	8,821.18	4,413.58	3,311.98	9,809.98	1,552.58	4,035.38	2,183.78
19	2,919.55	8,057.95	4,070.95	3,153.55	8,829.55	4,421.95	3,320.35	9,818.35	1,552.58	4,035.38	2,183.78
20	2,927.92	8,066.32	4,079.32	3,161.92	8,837.92	4,430.32	3,328.72	9,826.72	1,552.58	4,035.38	2,183.78
21	2,936.29	8,074.69	4,087.69	3,170.29	8,846.29	4,438.69	3,337.09	9,835.09	1,552.58	4,035.38	2,183.78
22	2,944.66	8,083.06	4,096.06	3,178.66	8,854.66	4,447.06	3,345.46	9,843.46	1,552.58	4,035.38	2,183.78
23	2,953.03	8,091.43	4,104.43	3,187.03	8,863.03	4,455.43	3,353.83	9,851.83	1,552.58	4,035.38	2,183.78
24	2,961.40	8,099.80	4,112.80	3,195.40	8,871.40	4,463.80	3,362.20	9,860.20	1,552.58	4,035.38	2,183.78
25	2,969.77	8,108.17	4,121.17	3,203.77	8,879.77	4,472.17	3,370.57	9,868.57	1,552.58	4,035.38	2,183.78

Tuition Resident and Non-resident Fees: Tuition supports the cost of instruction. Tuition is charged to all students on a per credit hour basis up to twelve credits.

Tuition/Post Baccalaureate and Graduate: The tuition charges for students either working towards a master's degree or those who already have a degree. The rate is 120% of the undergraduate tuition.

Tuition/Western Undergraduate Exchange: Tuition for students enrolled under this program is 150% of the undergraduate resident tuition.

Program Fees: Program fees are charged per semester to students who have declared majors in high-cost programs. Our current program fees are:

Nursing RN	550.00
Radiologic Tech	200.00
Metals Fabrication Technology	125.00
Automotive Technology	125.00
Health Care Informatics	65.00
Professional Technical Communication	40.00
School of Mines and Engineering	30.00 - 90.00
Pre-Apprenticeship Lineman Program	3,620.00
Network Technology AAS	125.00

Figures refer to cost for one semester. **The Board of Regents reserves the right to adjust fees at any time.** More current information may be obtained by referring to the current semester's Schedule of Classes, www.mtech.edu/businessoffice or contacting Business Services, 1300 West Park Butte, MT 59701 (406) 496-4250.

Students are encouraged to have funds on deposit in a bank for fees, board, room and other necessary expenses and to be able to write a check for the exact amount during registration periods. Foreign checks on currency are not accepted. Credit card payment is accepted using Visa, MasterCard, or Discover cards.

Student registration is not complete until all fees are paid and the semester changes are accepted on OrediggerWeb. Fee payment is is due by the date published in the academic calendar and the Class Schedule.

Mandatory Fees Assessed All Students:

Academic Facility Fee: A per-credit-hour fee to all North Campus and COT students up to 12 credits for classroom and lab deferred maintenance, ADA requirements, updates on safety and health codes, and preventive maintenance projects.

Activity Fee: A flat fee charged to North Campus and COT students for support of associated student activities.

Athletic Fee: A per-credit-hour charge to North Campus students to maintain NAIA status, and help maintain compliance with gender equity laws. This fee entitles students to attend MT Tech athletic events. Optional for COT students.

Building Fee: A per-credit-hour charge up to 12 credits to North Campus and COT students for long term debt and for maintenance and renovation of auxiliary buildings.

Computer Fee: A per-credit-hour charge up to 12 credits to North Campus and COT students to purchase computer equipment, software, maintenance, or related items which will benefit the instructional programs.

Equipment Fee: A per-credit-hour charge up to 12 credits to North Campus and COT students for the purchase and maintenance of equipment in educational programs, including library and other related capital acquisitions.

Health Fee: A flat charge to North Campus students taking 7 credits or more for support of on-campus health services. Optional for COT students.

HPER Fee: A per-credit-hour charge to all north campus students up to 12 credits to fund expanding the weight room facilities in the HPER and thereafter dedicated to the operation and maintenance of the HPER. Approved with an escalator fee increase of 5%.

Learning Center Fee: A flat charge to North Campus and COT students for tutoring costs and expansion of support services in the Learning Center.

Registration Fee: A $30 fee paid by each North Campus and COT student applied to instructional costs.

SUB OP Fee: A per-credit-hour charge to North Campus students and a flat fee to COT students for the operations, use and maintenance of the Student Union Building.

SUB-Renovation Fee: A per-credit-hour charge to North Campus students to fund Series E 1998 Bonds and SUB Phase II-Student apartment renovation project payments. The fee will end after Spring 2020 semester.

Technology Fee: A per-credit-hour charge up to 12 credits to North Campus and COT students to be used for the acquisition, renewal, licensing, maintenance, and operations of campus core and distributed systems and related campus network needs for the support of the institution.

Additional Mandatory Fees Assessed to Non-Resident Students:

Non-Resident Building Fee: A per-credit-hour charge to North Campus and COT students up to 12 credits.

Other Fees:

Career Services Fee: A one-time $25.00 fee charged to all 2nd semester juniors for placement services.

Dishonored Checks: A charge of $25.00 will be assessed on checks returned from the bank. Any check tendered in payment of registration fees and not honored by the bank upon which it is drawn may result in cancellation of a student's registration. The student will be assessed the late registration fee $80.00 maximum in addition to the $25.00 service charge.

Distance Learning (exclusion fees): Distance learning courses are excluded from the Academic Facility, Activity, Athletic, and Health fees and assessed a Distance Learning fee of up to $100 per-credit-hour. Fees excluded from Distance Learning courses are Learning Center and Sub-Renovation Fees.

Fee policy on Drop/Add: Changes in credit loads (Drops and Adds) will be computed in accordance with the regular institutional fee schedule. Classes can be added only through the 10th regular classroom day, and no refunds will be made after the 15th regular classroom day. Refunds will be based on the day a student officially withdraws from a class or the college.

Graduation Fee: A $75.00 fee charged to the degree applicants to cover costs associated with the graduation ceremony and other activities and expenses related to graduation. This does not include cap, gown, or announcements.

Health Insurance: A $704.50 charge per semester (subject to change) to all students registered in seven credits or more. In order to waive the insurance premium, the student must decline coverage on Orediggerweb during the registration period.

I.D. Fee: A $15.00 non-refundable fee for initial and $10.00 replacement fee for the student identification card. Required of all registered students.

Orientation Fee: A $45.00 non-refundable fee paid by each new student. Used to fund orientation activities.

Other Course Fees: The Board of Regents may approve additional fees at anytime. Course fees assigned to pay for specialized activity, field trip, pass-through fees, laboratory consumables or materials used by students to create a product that becomes the students' property after use in a specific course. Audited courses are assessed the same fees as courses taken for credit.

Vehicle Registration Fee: Any vehicle parking on the north or south campuses must display current campus vehicle registration between the hours of 8:00 a.m. and 4:30 p.m. Monday - Friday year round. A charge of $50.00 per vehicle is assessed, and a second decal may be purchased for $10.00. Faculty/Staff vehicles must display an "A" decal, students living in Prospector or Centennial Hall must display a "D" decal, and all other students parking on campus must display a "B" decal. All vehicle decals may be purchased at the Physical Plant Facilities on the North Campus.

REFUND SCHEDULE

The registration fee is nonrefundable.

90% of all remaining fees will be refunded to the end of the *5th* regular classroom day following the close of regular registration.

75% of all remaining fees will be refunded to the end of the *10th* regular classroom day following the close of regular registration.

50% of all remaining fees will be refunded to the end of the *15th* regular classroom day following the close of regular registration.
Summer refund schedules differ because of the shorter length of the terms. Contact the Business Office at **496-4250** for refund information. The date set in determining refunds is the official withdrawal date as determined by the Director of Enrollment Management.

OTHER REGISTRATION COSTS AND POLICIES

Summer Programs and Continuing Education: Fee, room/ board costs for Summer Programs and fees for registration in Continuing Education are contained in separate publications. These publications can be obtained by contacting the Enrollment Services Office.

Collaborative Programs: Students participating in a collaborative program, an instructional program offered by two or more campuses of the Montana University System, must apply and register at both institutions.

Late Registration: A student who does not complete registration, including payment of fees and finalization (validation of the schedule/bill by a cashier or on Orediggerweb), during the scheduled registration period (see current Schedule of Classes) is assessed a late registration fee of $40.00. After the fifteenth class day, an additional $40.00 late fee is assessed to all students registered and not paid.

Deferred Fee Payment Plan: A deferred fee payment plan is authorized, provided that: (a) at least one-third of the total fees are paid at the time the student enrolls; (b) two-thirds are paid within 30 days, and; (c) the full amount is paid within 60 days of the date of enrollment. Students opting for this plan are obligated for the full amount of that semester's fees regardless if they withdraw. This plan is not available for the summer semester.

An *administrative charge of $30* is levied each semester when a student elects to defer payments. Failure to make scheduled deferred payments makes students ineligible for future deferments and may be cause for cancellation of a student's enrollment with no refund of amounts previously collected. A *late fee of $15* will also be charged to the student. Copies of transcripts are not issued until all amounts due the college have been paid. Students with outstanding debts are not eligible for re-enrollment. For further information, contact the Enrollment Services Office at *(406) 496-4212*.

Non-Payment: No person who owes Montana Tech any fees, fines or other charges will be permitted to (1) receive grade reports; (2) register; (3) secure official transcript or record; or (4) access any facilities or services, regardless of the relationship thereof to the amount owed, until the full amount due has been paid or satisfactorily adjusted with the Business Office.

DETERMINATION OF IN-STATE FEE STATUS

The Montana University System classifies all students as either in-state or out-of-state. This classification affects admission decisions and fee determinations. The basic rules for making the classifications are found in Board of Regents' Policy. **It is each student's responsibility to secure and review a copy of the policy.** Failure to be aware of the rules will not be cause for granting any exceptions to them. A copy of the policy is available from the Enrollment Services Office. It is important to bear in mind that each residency determination is based on the unique set of facts found in each individual's case. If you have questions concerning your particular case, be sure to contact the Enrollment Services Office.

Montana Residency Requirements: For purposes of determining eligibility for in-state tuition, a resident of Montana is a person with at least a twelve-month continuous period of domicile in Montana with a documented/dated intent to become a resident of Montana. Documented indicators of such intent by an individual include: registering the person's own automobile in Montana; acquiring a Montana driver's license; registering to vote in Montana; purchasing a principal residence; filing an individual Montana resident income tax return.

It is presumed that the domicile of a minor or an unemancipated person is that of the person's parents or legal guardian. It is presumed that a parent or legal guardian who is a Montana resident and takes the student as an exemption for federal income tax purposes or supplies a majority of the support for the student will constitute grounds for in-state eligibility for the student.

It is presumed that a person absent from Montana in excess of 30 days during the 12-month period upon which in-state status is claimed lacks the necessary intent to acquire Montana residency. This presumption does not apply to absences from the state for purposes of post-secondary education or service in the armed forces of the United States provided the individual has not taken any actions in contradiction of the claim of Montana residency. Enjoyment of a status, receipt of benefits, or exercise of a right or privilege inconsistent with or in contradiction of Montana residency may be a basis for classification as out-of-state.

A student who is registered for more than half of a full-time credit load (seven or more credits/semester), is presumed to be present in the state primarily for educational purposes and such attendance period may not be applied to the 12-month residency requirement. Therefore, it is presumed that the person is not eligible for in-state status. **Complete information is available in the "Student Guide to Residency Policy," available from the Enrollment Service Office.**

COSTS OF ON-CAMPUS SERVICES

Housing and Dining Services: Students living in the residence halls are required to contract for a meal plan with Dining Services. Room and board rates are the same for in-state and out-of-state students. Occupants may select any plan to obtain the number of meals preferred.

Residence Hall	**Per Semester**	**Academic Year**
Double	$1,394.00	$2,788.00
Single	$1,573.00	$3,146.00
Suite Double	$1,499.00	$2,998.00
Suite Single	$1,657.00	$3,314.00
Board (Residents)	**Per Semester**	**Academic Year**
7-Days/Week Meal Plan	$1,742.00	$3,484.00
5-Days/Week Meal Plan	$1,642.00	$3,284.00
Upper-class	$1,109.00	$2,218.00
Family Housing Rates		
	Furnished	**Unfurnished**
2-Bedroom	$381.00/Month	$340.00/Month
3-Bedroom	$433.00/Month	$391.00/Month

Telephone/Communication Fee: On-campus residents (Residence Hall) - $78.00/ semester; Family Housing Residents - $34.50/month.

Housing Deposits/Refunds
RESERVATION DEPOSIT
All students requesting residence hall accommodations must submit a one-hundred dollar ($100) reservation deposit with the housing contract. This deposit guarantees a reservation in a residence hall and is a commitment, on the student's part, to live there.

A. This deposit is refundable in full only if the Office of Residence Life is notified by June 1.

B. If no cancellation is received before the effective date of this contract, the student does not attend Montana Tech, or if a student attends Montana Tech but does not finally reside in Montana Tech residence halls, the student forfeits the reservation deposit.

C. The one-hundred dollar ($100) reservation deposit submitted with the contract becomes a damage deposit once a student takes occupancy of the room. This deposit is refunded at the end of the contract period if there are no damage fines or other fees assessed against the student.

Financial Aid

Financial Aid Services
Financial aid consists of (a) scholarships and grants (the awarding for which no repayment is expected) (b) self-help in the form of loans (money to be repaid after the termination of studies) and (c) employment (jobs to provide a certain income during the year). Financial aid is offered to those students who cannot, through their own and their parents' reasonable efforts, meet the full costs of a college education.

Financial aid programs are funded from a number of sources (state and federal appropriations, private philanthropy, alumni and others). The amount of money available, academic requirements, and other eligibility criteria vary from program to program.

Students desiring further descriptions of specific programs may obtain information from the Enrollment Services Office by phone (406) 496-4256 or fax (406) 496-4710. (*Inquiries concerning graduate scholarships, fellowships and assistantships should be directed to the Graduate School.*)

Application Procedures for Federal & State Assistance: All applicants for financial assistance must file the Free Application for Federal Student Aid (FAFSA). Application procedures and eligibility criteria are subject to change without notice. The applicant must be unconditionally accepted for admission in a degree/certificate-seeking program at Montana Tech and/or be in good standing at Montana Tech. The application process must be completed by March 1 for priority consideration for the following academic year. Applications received after this date will be processed and funded in the same order they are received. You must apply each and every year for financial aid by completing the Free Application for Federal Student Aid at www.FAFSA.ED.GOV. Each student aid applicant must also complete a Montana Tech Student Data Form. These forms are available at the Office of Enrollment Services and on the website www.mtech.edu.

Under Public Law 97-252, all students applying for Federal Financial Assistance are required to complete and sign a "Selective Service Draft Registration Compliance Form" before funds can be disbursed to the student. All student aid applicants will be required to furnish the necessary documentation to verify information used in filing their financial aid applications if the student is selected for verification.

The Enrollment Processing Office reserves the right to make the final determination regarding the type(s) and amount(s) of aid awarded based upon an evaluation of the applicant's eligibility for a particular type of aid and upon the availability of funds.

Payment to Student: College scholarships, federal and state financial assistance including Federal Stafford Student Loan, Federal Unsubsidized Stafford Student Loan, and Federal PLUS Loans will be applied toward the student's direct college costs of attendance (i.e., tuition, fees and residence hall room and board charges) on registration day. Should there be funds in excess of actual charges assessed, these will be payable to the student within three working days following the day the student registers. If there is a balance due on the tuition and fees, room and board charges after scholarships, grants and loan assistance have been applied, the student will be responsible to pay the amount due the college or set up the necessary deferred payment plan, should the student be eligible. All federal/state financial assistance and college scholarships will be disbursed in equal installments for each registration period. If a student has been awarded a work opportunity through the College Work-Study Programs, he or she should report to the Enrollment Services Office for employment information. Work-Study wage payments are made monthly as earned.

Disbursement of student loan checks (Federal Stafford Student Loans and Federal PLUS Loans) is governed by federal law and certain limitations apply. Contact the Enrollment Services Office if you have questions.

Return of Title IV Funds: If a student receiving Federal/State Student Financial Assistance (other than Federal/State Work Study) withdraws from school during the first 15 days of regularly scheduled classes and is eligible for a prorated refund of fees, that refund shall be recovered to the appropriate Federal/State funds from which the fees were paid. On-campus room and board charges will be prorated and recovered throughout the period for which the student has paid his or her room and board and will be applied to the appropriate Federal/State funds. A repayment by the student over and above the refund recovery of funds may be required dependent upon the date of the withdrawal. The complete Return of Title IV Funds Policy is on file on Montana Tech website.

Financial Need: Students are expected to contribute to the cost of their own education before assistance can be provided from federal student aid funds. This contribution is determined by the U.S. Congress in a formula they have established.

Determination of Financial Need: Montana Tech is a member of the College Scholarship Board and adheres to the Principles of Student Financial Aid Administration adopted by College Scholarship Service members. One of these principles states that "Parents are expected to contribute (toward college costs) according to their means, taking into account their income, assets, number of dependents and other relevant information. Students are expected to contribute from their own assets and earnings." This is also a requirement of the formula established by the U.S. Congress governing Financial Aid.

The maximum amount of aid a student can receive will be the difference between the academic year's expenses and the amount that the student and parents can reasonably be expected to pay towards those expenses. Financial aid budgets for students living off campus take into consideration that students will share apartments and other costs. The budgets are estimates and not necessarily the expenses actually incurred by the student. Budgets for students living on campus are the same with the exception of an actual cost allowance for room and board based on the current academic year double occupancy rates.

Satisfactory Academic Progress For Financial Aid Purposes:
Students receiving or applying for financial assistance must be judged capable of maintaining satisfactory academic progress for financial aid purposes at the college. Each student receiving financial assistance is furnished with a detailed explanation of "Satisfactory Academic Progress For Financial Aid Purposes", and this information is also available to all students online. All first-time student aid recipients, whether entering this institution for the first time or currently in attendance, are measured under the current "Academic Progress For Financial Purposes" policy.

The preceding information does not reflect the entire policy and is intended to provide a brief overview only. To view the entire financial aid policy, please go to the Montana Tech webpage for further information.

Use of Funds: Student aid funds are made available only for purposes directly related to obtaining an education at Montana Tech, including tuition and fees, living expenses, books and supplies, and modest personal expenses. Use of funds for purposes other than these will be considered cause for reconsideration of the award.

Course Load and Program: To be considered for Federal/State financial assistance, students must be enrolled in a program leading to a degree or certificate or in a recognized program for transfer to another institution. For course load requirements, contact the Enrollment Services Office.

Additional Awards: Recipients of Financial Assistance, including spouse if married, must report any scholarships, long-term educational loans, gifts, etc. received during the academic year that were not reported in the recipient's application for Financial Assistance. Failure to inform the Enrollment Services Office of such additional income can result in cancellation of Financial Aid Awards.

Review: The college reserves the right to review and cancel awards at any time because of changes in financial, marital or academic status or because of the recipient's failure to observe reasonable standards of citizenship. All Federal Perkins Loans, Federal Pell Grants, Montana Higher Education Grants, MTAP/Baker grants, Federal SEOGs and Federal Work-Study job opportunities are awarded subject to the availability of Federal and State Funds.

Renewal: All financial aid commitments are made for one year or less and recipients must reapply for assistance each year. All awards are subject to review of academic progress each semester for financial aid purposes. March 1 is the priority deadline for applications.

Federal Financial Assistance

Montana Tech of the University of Montana is a participating institution as established under federal legislation. The following federal financial assistance programs are available to students with demonstrated financial need.

Federal Pell Grants: Federal Pell Grants are available to undergraduate students who have not yet received and are not yet eligible to receive a B.A. or B.S. degree. They need not be repaid.

SMART GRANT 3: A student could be eligible by filing the appropriate FAFSA for the award year. Eligibility requirements include 1) US Citizen 2) Be enrolled at least half time 3) Eligible Academic program or Major 4) At least 60 credits accepted by the school for transfer students with at least a 3.00 cumulative GPA 5) At least a 3.00 cumulative GPA for current students that have reached 60 credits 6) Federal Pell Grant eligibility 7) Demonstrated need. Eligible students can receive $4,000.

SMART GRANT 4: Same as SMART GRANT 3 except the student must have 90 earned credits. All other requirements are the same.

ACG 1 or Academic Competitiveness Grant: A student could be eligible by filing the appropriate FAFSA for the award year for first-year students who graduated after January 1st, 2006. Eligibility requirements include 1) US Citizen 2)Be enrolled at least half time 3) Enrolled in an eligible program as defined by ACG 4) Federal Pell Grant recipient 5) Demonstrated need 6) In his or her first Title IV academic year of undergraduate study 7) Completed a rigorous secondary school program of study. Eligible students can receive $750.

ACG 2 or Academic Competitiveness Grant: Same as ACG 1 except must have graduated after January 1st, 2005. 1) Has earned at least 30 credits with at least a 3.00 cumulative GPA. Eligible students can receive $1,300.

Federal Work-Study: Federal Work-Study employment permits students to work up to 20 hours per week when classes are in session and up to 40 hours per week during vacation periods. Full-time Federal Work-Study jobs are also available during certain periods of the summer vacation months. Substantial financial need is required for all students employed under the Federal Work-Study Program.

Federal Perkins Student Loans: Federal Perkins Loans are available to students enrolled or accepted for enrollment who have demonstrated need. These are low interest loans with repayment beginning after school is completed. Repayment may be deferred while the student is enrolled in another higher educational institution.

Federal Supplemental Educational Opportunity Grants: The Federal Supplemental Educational Opportunity Grants are specifically intended to make higher education possible for undergraduate students with exceptional financial need. Award guidelines are promulgated by Federal law.

Federal Subsidized Stafford Student Loans: Federal Stafford Subsidized Student Loans are available to undergraduate and graduate students through private lending institutions (banks/credit unions/savings and loan associations). A student must be enrolled or accepted for enrollment and must demonstrate financial need in order to be eligible. Interest rates for students who have outstanding balances on Stafford Student Loans and were disbursed prior to October 1, 1992 will remain at the same rate as those previous loans. Interest rates for new borrowers will be variable annually but in no event greater than 8.25 percent. Check with your lender for current interest rates.

Federal Unsubsidized Stafford Student Loans: New federal laws created a new program of unsubsidized Federal Stafford Loans for students who do not qualify, in whole or in part, for subsidized Federal Stafford Loans. Unsubsidized loans may be made for periods of enrollment beginning on or after October 1, 1992. The College and lender will inform you if your loan is unsubsidized. The terms of your unsubsidized loan are the same as the terms for subsidized Federal Stafford Loans, except the federal government does not pay interest on your behalf. You must pay for all of the interest that accrues on your unsubsidized loan during the time you are enrolled in school, during the grace period, and during any periods of deferment or repayment.

Federal PLUS Loans: Federal PLUS Loans are for parent borrowers on behalf of the undergraduate student. This loan will provide additional funding for educational expenses. The maximum interest rate for PLUS Loans is 9 percent, but interest rates are variable annually. Check with your lender for current interest rates. Like Federal Stafford Loans, Federal PLUS Loans are made by a lender such as a bank, credit union, or savings and loan association.

State Financial Assistance

Grant and work-study opportunities are available to students who qualify as a Montana resident and meet the criteria for eligibility for the programs. The student must fill out the federal financial aid application and submit it by March 1st.

Montana Higher Education Grant and Montana Guaranteed Student Loan Program Grant: Grants are awarded to Montana residents on the basis of need to augment their total financial aid package. They need not be repaid.

Montana Work-Study: Montana Work-Study employment permits undergraduate students to work up to 20 hours per week when classes are in session and up to 40 hours per week during vacation periods. Full-time Montana Work-Study jobs are also available during certain periods of the summer vacation months. Financial need is required for all students employed under the Montana Work-Study Program.

MTAP/Baker Grants: Awarded to a Montana resident who meets established criteria.

Freshman Cash Scholarships: Freshman scholarships for high school graduates are available for students who have demonstrated unusual ability and who have a strong interest in a degree area offered by the college. The amount of such aid depends upon the student's scholastic record and character.

NOTE: All students graduating from high school on or after 1991 must complete the prescribed College Preparatory Program in order to qualify for Regents Honor Scholarship and other state-supported scholarships, fee waivers, or grants awarded on the basis of academic achievement.

Graduate Assistantships: Assistantships are granted for either teaching or research. Assistantships usually require a prescribed number of hours of work a week on a specified project. Teaching assistants often assist in teaching one or two sections of an undergraduate class or laboratory. Research assistants may be assigned to a research project being conducted by a staff member; research done on an assistantship may or may not be applied to the student's thesis, depending on the type of research and the terms of the assistantship.

The time requirement for assistantships is stipulated to be 20 hours per week. The number of courses which an assistant may take is subject to the advice of his or her advisor or thesis supervisor.

A limited number of teaching or research assistantships are available and are assigned through the graduate departments. Information may be obtained from the Graduate School Administrator.

Scholarships

Montana Tech has received endowments and donations from private sources to establish institutional scholarships for undergraduate students. Additionally, the college awards state-supported scholarships as provided by the State of Montana.

Continuing Student Scholarships: Montana Tech annually awards scholarships to continuing students of demonstrated academic ability and, in some cases, need. **Continuing students must complete the online scholarship application (available after the beginning of spring semester) by February 1.** Additional information concerning continuing student scholarships is available through the Enrollment Services Office.

New-Student Scholarships: Montana Tech has an excellent new-student scholarship program with $1,000,000 awarded annually to academically qualified freshmen and transfer students. All first-time students enrolling full-time at Montana Tech are eligible to apply for new student scholarships.
Undergraduate scholarship awards are based primarily on academic merit and leadership ability, although merit and need are criteria for two awards. Scholarship applications are accepted after October 1, but should be received by the Enrollment Services Office before the priority deadline of January 1. Below is a general

guideline to the application process for new student scholarships:

1. Apply to Montana Tech for admission.
2. Submit a scholarship application along with most recent academic transcripts and test scores (ACT or SAT). **Test scores are not required of College of Technology or transfer students.**

New students should contact the Enrollment Services Office for current scholarship information and an application. ***NEW STUDENTS SHOULD COMPLETE THE ONLINE SCHOLARSHIP APPLICATION BY THE PRIORITY DEADLINE OF JANUARY 1*.**

Veterans Benefits for Education Assistance Under Public Law 95-202 and Public Law 815

A Veterans Coordinator, located in the Enrollment Services Office, is available to assist veterans, their dependents, and National Guard/Reserve personnel with procedures for enrolling at Montana Tech and applying for educational benefits under federal guidelines. The Veterans Coordinator will act as an intermediary between veterans and the Veterans Administration Office.

A veteran may be eligible to receive benefits under various chapters of the GI Bill. When applying for educational benefits, it is essential that the veteran's status is known and that the veteran provides all necessary paperwork. The veteran must be enrolled and pursuing an approved program of education or training to be eligible for benefits.

Chapter 30/The GI Bill may provide benefits for persons who first entered active duty after July 1, 1985.

Chapter 31/Vocational Rehabilitation is for veterans who have service-connected disability. Contact the Veterans Administration, Fort Harrison, MT 59636 or call toll free 1-800-827-1000 to apply for these benefits.

Chapter 35/Dependents may be available for surviving dependents of veterans who died of a service-connected disability, or who have total and permanent service-connected disabilities.

Chapter 1606-Guard/Reserve may be eligible for benefits and should contact their Education Officer to determine eligibility. Veterans applying for these benefits must have a completed Notice of Basic Eligibility (NOBE) and Commanding Officer's Certification to submit with application.

A Veterans' Fee Waiver may be available for veterans who have exhausted their benefits. For more details look under **Fee Waivers** or contact the Director of Financial Aid.

A certified copy of the veteran's DD 214, number 4 copy, is needed to apply for benefits for all chapters. Also, copies of marriage and children's birth certificates including some personal history are required when completing the application for dependent benefits.

The following chart indicates the minimum credit hours for which veterans must be registered to receive benefits:

Benefits	Undergraduate Students	*Graduate Students
Full	12	9
Three-Quarter	9, 10, 11	7, 8
One-Half	6, 7, 8	5, 6
Fees Only: Less than	6	Less than 5

Summer Semester differs: please contact the Veterans Coordinator.

*Master's Industrial Hygiene on-line Full-time equals 6 credits during Fall & Spring, 3 credits for Summer.

All veterans and eligible persons receiving subsistence allowances under the GI Bill are required to report **PROMPTLY** to the Veterans Administration any changes which may affect the amount of money being received. Veterans must report when they drop or add courses, withdraw from school, change marital status or if they stop attending classes for any reason. **ALL Drop/Add cards for veterans are to be turned into the Veterans Coordinator for proper processing.**

The Veterans Administration expects veterans to make satisfactory academic progress, regularly attend classes, and pursue a final objective. The Veterans Coordinator may notify the Veterans Administration if the veteran does not comply with these exceptions.

If you have any questions or need assistance contact the Veterans Coordinator at (406)-496-4256 or toll free 1-800-445-TECH.

The VA provides two 800 phone numbers for veterans to obtain information, from processing paperwork to when checks are being issued (**1-800-827-1000**, FT Harrison, MT and **1-888-442-4551**, St. Louis, MO). Also visit their website at: http://www.va.gov/index.htm

Other Financial Assistance

Deferred Payment of Fees: A deferred-payment plan is available to full-time students, payable in three equal installments. A contract for deferred payment of fees will be executed at the time of registration. There is a $30.00 service charge per semester. One-third is due at the time of registration. A $15.00 penalty will be assessed for payments not received on or before the due date. Should a student fail to meet either of the remaining installments, his or her remaining balance may be placed with the State Department of Revenue for collection, according to Title 17, Chapter 4, MCA. See page 14 for a more detailed explanation of the defeered payment program.

Student Employment: Throughout the year, numerous student jobs are available to full-time students. These openings are advertised online through Career Services.

Undergraduate Tuition Waivers: The In-State Fee Waiver waives tuition for full-time students to a maximum of 18 credit hours. The Out-of-State Fee Waiver waives the non-Resident Tuition for full-time students to a maximum of 18 credit hours. Actual fees assessed are based on the student's actual enrollment and the fee schedule in effect at the time.

Graduate Tuition Waivers: Fee waivers may be awarded to graduate students who demonstrate financial need. Contact the Graduate School Administrator for more information.

High School Honor Scholarships Tuition Waivers: Tuition will be waived at any unit of the Montana University System for a recipient of a High School Honor Scholarship. The scholarship must be utilized within nine months after high school graduation and will be valid through completion of the first academic year of enrollment, exclusive of any credit earned prior to high school graduation.

National Merit Honor Scholarship Tuition Waivers: Tuition will be waived for the National Merit Examination finalists and semi-finalists from Montana. This scholarship will be valid through the first academic year of enrollment, exclusive of any credits earned prior to high school graduation. The holder of the scholarship must enter one of the units of the Montana University System within nine months of the date of issue.

Community College Honor Scholarship Tuition Waivers: Tuition will be waived for a recipient of a Community College Honor Scholarship. A recipient must utilize the scholarship within nine months after receiving the associate degree from the community college. The scholarship is intended for residents of the State of Montana.

Athletic Tuition Waivers: Tuition and out-of-state tuition (where applicable), may be waived up to 18 semester credit hours. This award is granted through the Athletic Department for participation in intercollegiate athletics.

Native American Student Tuition Waivers: Tuition may be waived for any person one-fourth (1/4) Indian blood or more. Such a person must have been a bona fide resident of the State of Montana for at least one year prior to enrollment in Montana Tech and must demonstrate financial need. The applicant must also complete and file an affidavit certifying his or her eligibility with the Enrollment Services Office.

Honorably-Discharged Veteran Tuition Waivers: Tuition may be waived for all honorably-discharged persons who served with the United States armed forces in any of its wars and who are bona fide residents of the State of Montana. This waiver shall not apply to persons who qualify for education stipends or other veterans' benefits under applicable sections of Title 38 of the U.S. Code and shall apply only to those who have at some time qualified for benefits but who are no longer

eligible. Certain other limitations may apply. **Please check with the Director of Financial Aid for more information.**

Montana Peace Officer/Firefighter Survivors Tuition Waivers: Tuition will be waived for the surviving spouse or child of a peace officer or firefighter who was killed in the course and scope of employment if no other governmental agency is providing comparable benefits.

Montana Senior Citizen Tuition Waivers: Tuition will be waived for students classified as in state residents who are at least 65 years of age.

War Orphans Tuition Waivers: Tuition will be waived, with the approval of the Commissioner of Higher Education, for the spouse and children of any resident of Montana who meets either of the following tests: (1) while serving in the armed forces of the United States is declared by the Secretary of Defense to be a prisoner of war or missing in action in the conflict in Southeast Asia after January 1, 1961, or; (2) while serving the United States in a civilian capacity is declared by the Secretary of State of the United States to be missing or captured in connection with the conflict in Southeast Asia after January 1, 1961.

Eligibility for this waiver will continue until completion of the bachelor's degree or certification of completion, as long as the student meets the requirements for satisfactory academic progress. No eligible person will be disqualified by either the return of the prisoner of war or person missing in action or by the reported death of such person.

Custodial Student Tuition Waivers: Tuition will be waived, with the approval of the Commissioner of Higher Education, for residents of the Mountain View School at Helena, the Pine Hills School at Miles City, or other similar facilities. The same benefit will be granted to students from similar private, non-sectarian charitable institutions located in Montana. Such persons must be high school graduates and be recommended by the Department of Institutions or the administration of the private institutions, as appropriate.

Employee Tuition Waivers: Tuition will be waived for University System faculty and staff members who are at least 3/4-time salaried employees on the date of registration. Each unit may adopt regulations to limit the amount of credit for which an employee or staff member may register and to control the times at which courses may be taken.

According to the Montana University System Board of Regents Policy 940.13, unless otherwise limited, CERTAIN Undergraduate and Graduate Fee Waivers may be continued, subject to the student maintaining satisfactory academic progress. There are also maximum limits to eligibility requirements.

Staff Dependent Partial Tuition Waivers: Employees must have completed 5 years of employment at 3/4 time or more without a break in service as of the first day of the academic term in order to be eligible for the dependent tuition waiver benefit. Employees who utilize the faculty and staff tuition waiver are not eligible for a dependent partial tuition waiver during the same academic term. For each qualifying employee, only one dependent may utilize a dependent partial tuition wavier in an academic term. An eligible dependent includes the employee's spouse and any child who is claimed as a dependent for federal tax purposes during the calendar year that includes the first day of the semester for which the tuition waiver is utilized who is unmarried and under the age of 25.

The tuition waiver benefit for dependents will be for 50% of the residential tuition. Employees must be employed at least ¾ time for five or more consecutive years in order to be eligible for the dependent tuition waiver benefit.

This benefit applies to non-union staff and administrators and to employees included in a bargaining unit only after the Dependent Tuition Waiver has been incorporated in a ratified collective bargaining agreement.

Additional details are available in the Guidelines for Administering Dependent Tuition Waiver Policy at the following website:
http://www.umt.edu

Financial Aid Probation: Financial Aid Probation is a warning that the student has not completed the minimum acceptable credits. A student who is on probation will be placed on financial aid suspension if he or she fails to achieve satisfactory progress during the next term of attendance.

Financial Aid Suspension: A student is on financial suspension until (1) a written appeal is approved through the Office of Enrollment Processing, or (2) the student completes a successful term at Montana Tech of the University of Montana without benefit of financial aid and a subsequent request for reinstatement is approved through the Office of Enrollment Processing, a successful term will be determined on a case-by-case basis by the Office of Enrollment Processing, or (3) returning students may begin receiving financial aid after suspension if their potential for success has improved, this is defined by ceasing attendance for at least one year at a post-secondary school thereby allowing time to assess personal matters.

Satisfactory academic progress policy represents minimal standards of completion for financial aid eligibility and does not necessarily coincide with program eligibility requirements or with requirements students must fulfill at the beginning of a term to initially receive student aid. Effective July 1997, satisfactory academic progress at Montana Tech of the University of Montana is outlined in the following policy.

A student may be placed on financial aid suspension for credit hour completion, Cumulative GPA deficiency, or for maximum time frame of attempted credits including transfer credits. Non-degree students are not eligible for federal financial aid.

CREDIT HOUR COMPLETION

Students who have been academically suspended from Montana Tech of the University of Montana by the Academic Deans Council will immediately lose eligibility for financial aid. Academic reinstatement does not reinstate financial aid eligibility. A separate financial aid appeal for reinstatement of aid is required.

Based on credits attempted each term, a student must successfully complete the number of credits outlined in the following chart:

ENROLLMENT	CREDITS COMPLETED	PROGRESS
12 + credits	12 or more	Satisfactory
	6-11	Probation
	0-5	Suspension
9-11 credits	9 or more	Satisfactory
	6-8	Probation
	0-5	Suspension

1-8 credits **ALL CREDITS MUST BE PASSED OR AID WILL BE SUSPENDED.**

If a student is placed on financial aid suspension or probation, the student must register at the enrollment status at which they were funded the following semester to satisfy satisfactory progress requirements. Satisfactory completion means a student has received a minimum grade of D or P (Satisfactory in pass/fail class). Grades of I (incomplete), F (failed), W (withdrawn), and AU (audit) are not considered adequate or acceptable in maintaining academic progress. Repeated courses and non-credit remedial courses will be counted in both attempted and completed credits.

Continuing education courses and auditing of a class do not count as enrolled credits for financial aid.

Financial Aid Appeal Process: A student who has been placed on financial aid suspension may submit a written appeal with appropriate documentation attached to the Office of Enrollment Processing. Inappropriate course selection is not an acceptable reason for failure to maintain satisfactory academic progress. A financial aid appeals committee will review the mitigating or unusual circumstances listed in the appeal, how well the student has demonstrated he or she is now making good progress toward earning his or her degree, all supporting documentation provided and the student's entire academic record.

If the appeal is approved, the student must maintain progress toward his or her degree in all subsequent semesters. If progress is not maintained, the student will be returned to suspension status, which would require the student to successfully complete all deficiencies at Montana Tech of the University of Montana without the benefit of aid.

If the appeal is denied, the student must bring himself/herself into good standing without the benefit of aid by successfully completing all deficiencies at Montana Tech of the University of Montana. The student must submit a subsequent appeal to the Enrollment Processing Office upon completion of the deficiencies.

A student whose financial aid eligibility is suspended for exceeding the maximum time frame requirement must attach to the written appeal a plan of study, signed by his or her advisor. If the appeal is denied for maximum time frame, the student is ineligible for financial assistance at Montana Tech of the University of Montana for that academic level. The student cannot bring himself/herself into good standing at Montana Tech of the University of Montana by attending without the benefit of aid.

If a student's appeal is denied, he or she may request reconsideration by the appeal committee if new information or documentation not included in his or her appeal can be provided. The decision of the appeal committee is final.

Appeal forms must be submitted no later then October 31 for Fall Semester, no later than March 31 for Spring Semester, and no later than June 1 for summer term. This deadline applies regardless of date of notification to the student of his or her suspension status from the Office of Enrollment Processing. It is the student's responsibility to know if he or she will not maintain the standards of this policy. In other words, a student is suspended whether or not he or she received notification from the Office of Enrollment Processing. Further, it is the student's responsibility to initiate all appeals. Reinstatement of financial assistance will be subject to funds available at the time the appeal is approved.

Exceptions or amendments to any of the specific provisions regarding satisfactory academic progress standards may be made at any time, without publication, due to changes in federal, state, and/or institutional regulations or policies.

Financial Aid Appeals Committee: If a student is placed on financial aid suspension, he or she has the opportunity to appeal this decision based on mitigating circumstances as determined by the committee and federal requirements. All students at Montana Tech who receive or don't receive federal/state financial aid are measured by the satisfactory academic progress policy which is available for every student enrolled at the school, which should be read and understood for financial aid eligibility. Students that are placed on financial aid suspension will receive a letter that states the suspension status at the end of the semester in which the suspension status occurred. Appeal forms are available on the financial aid website which outline the requirements for an appeal to be reviewed by the committee. All appeals will be reviewed within 10 working days and the student is notified of the outcome of the appeal through a letter sent to the student.

Student Life

FACILITIES

Student Union & Mill Building - North Campus

The Student Union contains the Marcus Deli, Residence Hall dining facilities, meeting rooms, offices for Student Activities and Student Government, Digger Den game room, Student Health Center, Student Copper Lounge, Mailroom/Copy-Center/DIGGERCARD Center, and offices for the student newspaper and radio station. The Digger Den, in addition to providing pool tables, pinball machines, video games, board games, stereo music, TV/VCR and study area facilities, has an unobstructed view of the Anaconda-Pintler Wilderness area. The revitalized Mill Building features an upscale coffee shop, the Tech Bookstore, a quiet study lounge, a large open air mezzanine, a computer lab/classroom, and a smaller upstairs social lounge for Montana Tech students. Students that live on or off, are welcome to utilize all Union and Mill facilities. For information please phone (406) 496-4335, or see www.mtech.edu/student_life/links.htm

Apartment Housing

Montana Tech has a total of 60 two- or three-bedroom apartments located approximately one mile from campus. Housing apartments are leased giving priority to students with dependents. Tenants are responsible for their own electricity/gas service, but all other utilities including local phone service and data connection to the campus network, are included in their rent. Public-use facilities include a coin-operated laundry room and playground. To receive information or an application, call the Office of Residence Life located in Prospector Hall at (406) 496-4425.

Residential Housing - Single Student

Montana Tech provides co-educational residence hall facilities for approximately 300 students. These facilities offer single and double rooms as well as three- and four-person suite-style units. Theresidence halls sponsor an array of activities and programs, such as intramural teams and social and educational activities. Residence hall facilities include computer labs, laundry room, kitchen, study lounges and reception desk to facilitate students' use of vacuum cleaners, athletic equipment, mail service, and change.

Each Residence Hall room is furnished with a desk and chair, super twin (39 x 80) bed(s) which can be bunked, a large 4-drawer bureau or wardrobe unit, closet/shelf space or sink, wastebasket, and each is wired for phone and cable abilities. Students furnish their own bed linens, blankets, bedspreads, towels and pillows.

All students may apply for Residence Hall housing. **All North Campus first-year students having accumulated fewer than 30 semester credit hours are required to live on campus**. (All degree and certificate seeking COT students are encouraged, but not required to live on-campus.) Exceptions may be requested by students who are married or living with their immediate family within commuting distance from Montana Tech. For information on residence halls and apartment housing, contact the Residence Life Office at (406) 496-4425, or see www.mtech.edu/housing.

Tech Dining Services

Food service options are available for all students. A board plan is mandatory for all students living in the residence halls . Three meals per day are served weekdays, and two meals per day on weekends. Additional snacks or meals may be purchased at the Marcus Deli in the Student Union and the Coffee Shop in the Mill Building. Lunch service is provided in the Commons on the South Campus. Commuting students may purchase flex dollars or an incentive program to facilitate on-campus meals and convenience store shopping. For information on Tech Dining Services, call (406) 496-4196, or see www.mtech.edu/dining_services.

SERVICES

Academic Advising

Each student is assigned a faculty advisor at the time of admission. Freshmen and transfer students specifying degree majors are assigned faculty advisors from the academic department they have selected. Students undecided as to a specific major are assigned faculty advisors according to their general area of interest.

Questions concerning work in a particular course should be discussed with the course instructor. Questions on scheduling and following the academic program can be answered by the student's advisor at any time, but particularly during early registration advising sessions. Students register for classes during an advising session with their advisor.

Students seeking re-assignment of advisor should file the "Change of Major/Advisor" form available at the Enrollment Services Office.

Campus Media

Campus communications include the newspaper, **The Technocrat**, and the radio station, **KMSM-FM**. Each offers students opportunities to learn about media fields, handle journalistic responsibilities, develop artistic or photographic skills, and develop management skills in the areas of financing, publishing, broadcasting or printing information relevant to the Tech community. A number of the positions available in these areas offer a gratuity or a salary. All media groups have professional advisors who offer expertise and assistance.

Counseling & Testing

The Student Life Office at the North Campus and the counseling services at the South Campus offer personal counseling, programs, and testing services that promote personal development. The Office provides skill development and wellness-related resource materials. Individual assistance and group presentations on topics such as career counseling, test anxiety, time management, alcohol education, and personal development are also available. Individual and group testing in a variety of areas is available to students. Interest and personality assessments are administered and interpreted. In addition, the Student Life Office coordinates the College Level Examination Program (CLEP) at Montana Tech. For information please contact the Student Life Office (406) 496-4477 or see www.mtech.edu/counseling

Drug-Free Schools & Communities Act of 1989 & Campus Security Act of 1990

The health and safety of students, faculty, staff and visitors is a primary concern to Montana Tech. In compliance with the Drug-Free Schools and Communities Act and Campus Security Act; policies, procedures, publications and programs are designed to ensure a safe and productive learning and working environment. The specific policies, procedures and publications are located in Montana Tech's Student Handbook and our Annual Report of crime-related information is available to all members of the campus community.

Health Programs

The Montana Tech Student Health Center provides medical services on weekdays during the course of the fall and spring semester. A registered nurse is on duty from 10 a.m. to 2 p.m. daily, and a physician is on duty from 11 a.m. to 1 p.m. Monday through Friday. The Health Center is located on the lower level of the Student Union on the North Campus, 1300 W Park St.

All services are available at no charge to enrolled students on the North Campus who have paid the Health Center fee, the service and fee is optional for South Campus students. The only exceptions are certain medications and vaccines for which a minimum charge is made. The Health Center does not provide long-term treatment of chronic illness, hospitalization, X-ray services, commercial lab tests, or payment for medications for which prescriptions are written. Students may use the Health Center during office hours and, in most cases without an appointment. If the Health Center is closed or the student is not on campus, care may be obtained at a physician's office, ExpressCare, or at St. James Health care Emergency Room. However, the charges incurred in doing so are the responsibility of the student and are not covered by the health fee.

Health Insurance

All students registered for seven credit hours or more will automatically be enrolled in the mandatory insurance plan for the entire semester. The health insurance fee will automatically be assessed to your semester tuition and fees. Students already insured with another plan can waive the college's mandatory insurance on Orediggerweb.

Montana Tech Identification Cards *(DiggerCard)*

Montana Tech Identification (ID) cards are available to the following: registered Montana Tech students (and certain classes of students from other UM affiliates), college and bureau staff, and faculty. Montana Tech ID cards are **NOT** available to the general public. IDs are validated each term for students who have paid fees, and for currently employed faculty/staff. The Digger Card Center is located adjacent to the Mail/Copy Center in the Student Union Building (SUB).

If an ID card is lost or mutilated, the replacement fee is $10.00. A nominal charge of $15.00 is assessed for an initial ID Card. Use of a Montana Tech ID Card is governed by the above policies. DiggerCards are non -transferable and must be shown to authorized campus representatives upon request. (Return postage for a

lost card is guaranteed by the Montana Tech DIGGERCARD Center.)

Other Campus Services: The rates charged for services such as orientation services, copying facilities, testing programs, etc. are too varied to present in this publication. For more information concerning these services, contact the department providing the service.

International Student Assistance
The Student Life Programs Office works with international students to maintain proper immigration status with the U.S. Citizenship and Immigration Services (USCIS). All international students should contact this office immediately upon arrival on campus and maintain contact during the period of their studies. In addition, the Student Life Programs Office provides counseling for international students experiencing the difficulties of transition from one culture to another. International student admissions is handled by the Enrollment Services Office.

New Student Orientation
The major goal of New Student Orientation is to integrate new Montana Tech students into the day-to-day operation of the college as quickly and smoothly as possible. Additional goals are to maximize contact with peers, to bring students into contact with relevant parts of the Montana Tech system, to minimize the anxiety of new students; and to inspire students with a favorable attitude toward learning. Information giving the dates of Orientation and an outline of the program is sent to all new students who have been accepted for admission.

Career Services
Career Services offers career-related assistance to students at all academic levels, from incoming freshmen through graduating seniors, graduate students, and alumni. Career Services provides a full array of career and employment services including: career coaching and interest assessments; career workshops and individual appointments to help with professional communication, including resume and cover letter writing; career strategies; interview tips and networking; on-campus recruiting and internship coordination. We encourage you to get involved in the career development process early in your academic career.

Create your DIGGERecruiting account through our website, www.mtech.edu/career. Manage your career by posting your resume, viewing student employment, internship and summer jobs posted online, participating in on-campus recruiting and RSVPing for other career events throughout the year. Career Services develops relationships with employers to help students across all disciplines to find degree-related employment. Get Into Career Services!

The Internship Program is a structured program in which students include periods of supervised, degree-related employment as an integral part of their academic degree work. The student may receive academic credit for the work experience and is usually compensated at the normal salary level for the position.

Career Services tracks experiential learning including summer jobs, internships and full-time placements. This information helps us to assist prospective students with choosing Montana Tech, develop relationships with new employers, and also aid employers to remain competitive in hiring our students and graduates.

Stop by Career Services any time to introduce yourself, meet the staff, and ask about specific services you need. These services assist with clarifying career goals and developing the skills necessary to achieve success throughout your career. You will be happy you did!

Student Employment
Student employees are those whose efforts are directed toward receiving a formal education and are employed part-time. Work-study employment is subject to additional requirements established by the federal government and the Office of Enrollment Management (Financial Aid). Off-campus, non work-study employment is not governed by the university's policies and procedures. Working off campus in a non-work-study position is done at the sole discretion of the student. Students seeking part-time employment, work study, non-work-study, on campus and off campus can find positions online in DIGGERecruiting.

Tech Learning Centers
North Campus
The Tech Learning Center (TLC) offers a variety of services to help students achieve their full academic potential. Tutors, who are approved by the academic departments, are available to help students with course work in an assortment of subject areas. The Center works closely with Student Life and Academic Departments to help ensure student success. The TLC is located in Engineering Hall, Room 102.

South Campus
The Learning Center, located in the library, is open to all South Campus students during school hours. Computers are provided for student use. Free tutoring is available for students requiring assistance with course work or with basic English or Math. Academic counseling and study skills - related workshops are offered as well as accommodations for students with special needs.

Standards, Codes of Conduct
Every fall, each student is supplied with a Student Handbook listing College regulations governing conduct, including discrimination, alcoholic beverages, drugs, distribution of literature, as well as the process for filing a complaint. Anyone having additional questions concerning these regulations should contact the Associate Vice Chancellor for Student Affairs/Dean of Students.

The Community Expectations Program has been established to assist students in resolving disputes and grievances and to create better understanding of rights and responsibilities. More detailed information may be obtained in the Student Handbook or by contacting the Associate Vice Chancellor for Student Affairs/Dean of Students.

Vehicle Registration and Parking Regulations
All vehicles using the North and South campuses parking must be registered with the Physical Plant Office and also must display a valid decal issued through that office. Students are responsible for understanding and complying with all campus traffic parking regulations. A copy of these regulations is available at the Physical Plant Office.

Student Activities
Student Government committees, professional societies, living group organizations, special events, honor societies and interest group clubs add a balance to the Montana Tech community. Participants take part in leadership development and management training, while cultivating friendships, learning outside the classroom, and having fun.

Athletics
Montana Tech has a long and distinguished athletic tradition encompassing more than 80 years of competition and involving outstanding athletes, coaches and administrators.

The primary purpose of athletic competition at Montana Tech is to develop the mental, emotional, spiritual and physical maturity of the student/athletes. The competitive spirit among Orediggers, whether it is on the intercollegiate, club or intramural level, has always been excellent. An outstanding staff of professionally trained coaches allows the college to offer intercollegiate programs in football, basketball and golf for men, and volleyball, golf, and basketball for women. The club sports program includes soccer, rugby, racquetball and handball.

Montana Tech has modern athletic facilities which include: 1) the HPER Complex, a 50,000 sq. ft. facility housing basketball and volleyball areas with seating for 2000, a 25-meter swimming pool, six racquetball courts, and a strength room with weights and cardio equipment; 2) a field complex large enough to accommodate a practice football and soccer field plus four tennis courts. The HPER complex also includes a mat room; 3) Alumni Coliseum, which is used for football has permanent seating capacity for 3000, and; 4) Leonard Field, which provides space for varsity, intramural and club sports.

Campus Recreation Programs
Intramural sports program are available for students interested in participating in team or individual recreational programs. This program is funded, in part, through activity fees allocated by the Associated Students of Montana Tech. Campus Recreation features competition in wallyball, basketball, softball, flag football, swimming, water polo, handball, volleyball, racquetball, pool, and tennis. The Campus Recreation Office is located in the Health, Physical Education and Recreation complex (HPER).

A wide selection of outdoor equipment can be rented from the Campus Recreation Office. This equipment is rented to students at minimal rates to provide opportunities to enjoy the many outdoor pursuits located near Butte. Equipment includes cook sets and stoves, sleeping bags, tents, backpacks, rafts, daypacks, and firstaid kits. For more information contact (406) 496-4737 or see www.mtech.edu/recreation.

Clubs
ASMT recognizes a variety of clubs. These groups reflect academic interests, hobbies, philanthropic causes, athletics, music, drama, religion, cultural affiliations and career goals. Many of these organizations sponsor speakers, field trips, attendance at national conferences and other experiences which enhance students' educational experience while at Montana Tech.

A complete listing of the clubs recognized by ASMT is available in the Student Union Office. Persons interested in joining a club are allowed the opportunity to sign up during Rush Week, a time when all clubs gather together to share interests and purposes with students interested in becoming members. Rush Week is held once a semester within the first two weeks of classes. Many clubs accept members throughout the academic year. Call the Student Union Office ***(406) 496-4335*** for more information.

Student Activities Committee
The Student Activities Committee is responsible for programming events and activities designed to enhance the social and cultural aspects of life at Montana Tech. Student fees provide the budget for this committee to bring local and national performers to campus. Many of the events are free to students, while others are offered at minimal cost. Comedians, bands, theater acts, hypnotists and concerts are examples of entertainment brought to campus. Membership on the Student Activities Committee is open to any interested student.

Student Government
The Associated Students of Montana Tech (ASMT) is comprised of all students enrolled in seven or more credits. The purpose of this organization is, in part, to advance the interest and promote the welfare of Montana Tech and its students and to foster and maintain harmony among those connected with or interested in Tech, including students, alumni, faculty, staff, regents, and friends.

Through funds collected as student fees, ASMT strives to ensure a full academic and social life for all students with its organizations, publications, clubs, major school functions and activities. The Executive Branch of ASMT is made up of the student body president, the vice president and treasurer. The Legislative Branch of ASMT serves as the Student Senate. Its membership consists of the ASMT vice-president and eleven student senators which includes a senate seat for the South Campus. As the representative governing body of ASMT, the Legislative Branch is responsible for disbursing Student Activity fees, organizing and planning extracurricular campus activities, student publications, intramural athletics and student clubs. The Legislative Branch also provides leadership and a strong voice for the student body, enforces regulations made by the student body, works to integrate the various campus organizations, and promotes the ideas and traditions of Montana Tech. Additionally, a three-member Judiciary Branch interprets the ASMT constitution, bylaws, parliamentary procedures, and Montana Tech Community Expectations Program.

In addition, the Montana Tech Residence Hall provides its own living group governance via the Residence Hall Association (RHA). The South Campus also organizes and sponsors a Student Council to provide student leadership opportunities.

Montana Tech Community Expectations Program: The primary purpose of this program is to assist individuals to achieve their maximum educational and personal potential and to allow members of the Montana Tech community to resolve differences and grievances to the mutual benefit and satisfaction of all concerned. It is also a necessary purpose of this program to maintain effective community standards and to protect the rights of individuals. In this regard, the community has the right to protect itself against the behavior of individuals who consistently or repeatedly demonstrate a disregard for the welfare of individuals in the larger community.

Any individual within the college community who feels that his or her rights have been infringed upon by student conduct may process a referral to the College Community Expectations Program. In cases where an individual feels that his or her rights have been infringed upon, that individual may also elect to file a complaint with legal authorities, take no action, or discuss the situation with the other individual involved rather than process a referral.

Referrals are made to the ASMT Judicial Branch or the Student Affairs Administrative Hearing Board. Cases of serious misconduct, repeated misconduct, sexual assault, or where professional guidance and confidentiality are deemed essential, will be routed to the Student Affairs Administrative Board.

Copies of the Community Expectations Program Handbook are available at the Student Life Office, Engineering Hall, Room 101 at the north campus, the Counseling Office at the south campus and www.mtech.edu/student_services.htm.

NETWORK & COMPUTER USE POLICIES

The University System is covered with system-wide Network and Computer Use Policies approved by the Board of Regents; the "System Wide Policies" apply to the University System as a whole, i.e., The University of Montana and Montana State. Likewise, and more specific, both units have promulgated policy sets which govern their respective realms; the "UM Wide Policies" apply only to this branch of the university system. Montana Tech is covered not only by these policies, but also by those which we have set forth. Links to all policies are provided at http://www.mtech.edu/netserve/policies.htm

The policies determine the standards for appropriate use of computing and networking systems and facilities at Montana Tech. The use of computers and network systems in no way exempts any Montana Tech student, faculty, or staff from the normal requirements of ethical or legal behavior. Although some rules are built into the system, these restrictions cannot limit completely what an individual can do or see. Each member of the community is responsible for his or her actions whether or not the rules are built in, and whether or not they can be circumvented.

Members of the Montana Tech community are expected to follow certain principles of behavior in using computers and network systems; in particular, to observe and respect policies and procedures governing:

1. the privacy or restrictions placed upon data or information stored in or transmitted across computers and network systems, even when that data or information is not securely protected;
2. an owner's interest in propriety software or other assets pertaining to computers or network systems, even when such software or assets are not securely protected; and
3. the finite capacity of computers and network systems which limit use so as not to interfere unreasonably with the activity of others.

The policies apply to all users of Montana Tech's computer and network systems. It is the user's responsibility to know the contents contained therein. Those who violate these standards of behavior will be denied use of Montana Tech's computer and network systems. Violators may also be subject to penalties under the institution's regulations, as well as under State and Federal laws.

Academic Regulations and Requirements

Absences from Classes (Approved 3/9/05)
It is Montana Tech policy that faculty should make reasonable accommodation for students to make-up work missed (or the equivalent) because of an excused absence. Students expecting to incur excused absences should consult with their instructors early in the term to be sure that they understand the absence policies for each of their courses. Excused absences include official Montana Tech events or activities, or personal matters deemed appropriate by the instructor.

Official Montana Tech Events or activities for the purposes of "excused absence":

NAIA sanctioned sporting events
Academic Team competitions (i.e., concrete canoe, steel bridge, human powered vehicle, ethics bowl, environmental design, etc.)
Travel for professional meetings related to major
Class field trips
Others as approved by the Chancellor

Academic Advising & Course Placement
Academic advising is an integral part of the College's larger mission of educating students for life. It is a systematic, developmental process that assists students in achieving educational and career goals and in acquiring skills and attitudes that promote intellectual and personal development.

The advising relationship links Montana Tech with its students, articulates the College's purposes through committed, caring faculty, and gives meaning to the assumptions which guide its curricula. In essence, academic advising is a pledge to assist each student in fulfillment of his or her potential.

Full-time degree-seeking students attending regular semester (Fall or Spring) classes are assigned an advisor. Lists of advisors by department are available from the Enrollment Services Office or Department Administrative Assistants. Advisors help students meet their education goals and answer questions concerning various aspects of academic procedure and policy at Montana Tech. Advisors' signatures are required on official registration forms (part-time/non-degree students enrolled in seven or fewer credits excluded) and *Change of Enrollment* cards; students should visit with their advisor to discuss past achievement, current progress, and future plans. Students may change advisors at the Enrollment Services Office.

As part of the College's efforts to assure student success, all first-time students are automatically placed in appropriate Mathematics (M) and writing (WRIT) courses. Placement is based on students' ACT or SAT exam scores or on COMPASS Exam scores (taken by all College of Technology students and all undergraduate students who graduated from high school more than three years prior to applying to Tech).

Administrative Withdrawal
Unless prior arrangements have been made, an instructor may request administrative withdrawal of a student from a class if the student does not attend the first three class meetings or the equivalent. Faculty retain the right to administratively remove students who do not have the required prerequisites.

Cancellation of Courses
Montana Tech reserves the right to cancel any course through the first meeting of the class due to low enrollment.

Change of Major/Change of Advisor
Currently enrolled students who wish to change their advisor and/or major must contact the Enrollment Servcies Office for the appropriate forms and procedures. A student's official program of study is not officially changed until the completed and signed forms have been provided to the Enrollment Services Office.

Course Audits & Course Listeners
Students are sometimes permitted to audit courses in which they are interested. Fees for auditing courses are the same as for credit, although no college credit is granted. No courses may be changed from credit to audit after the last date permitted for an automatic withdrawal from a course. **NOTICE: Changing a course from credit to audit could result in reclassification to part-time status or lower for financial aid or enrollment confirmation purposes (e.g., loan deferments).** In order to receive the audit notation on the student's permanent record, an auditor is expected to fulfill the attendance requirements for the courses involved.

Course Listener - No student may attend a class (as a "listener") without having been officially registered in the class. If it is determined that a student attended a class without registering for that class, the student will be graded by the instructor, and will be assessed the full cost of the class.

Course Repeats
A student may repeat a course up to three times with the intention of improving a previous grade. **A student must submit a *Repeat Course Card* at the time of registration in order to assure recalculation of the grade point average.** Failure to submit a *Repeat Course Card* will result in the GPA **not** being recalculated. Credits, grade, and grade points of the most recent attempt are used in computation of the grade point average (GPA), and satisfactory completion of the course toward meeting degree or curricular requirements. Results of all attempts appear on the transcript. **A student may enroll in a given course only three times. After three attempts, which includes withdrawals, enrollment into the course for a fourth time will require permission from the Director of Enrollment Management and the Vice Chancellor for Academic Affairs. *Nursing students must meet a more strict standard for course repeats. See the Nursing section for details.*** Certain activity courses including band, chorus and intercollegiate athletics may be repeated for credit and grade. These courses are designated with a (R) in the course descriptions. See *"Course Descriptions" section* for credit restrictions.

Course Sequences & Prerequisites, Corequisites
Before enrolling in a course, all prerequisites for that course must be completed with passing grades. Corequisites for a course, if not completed prior to registration, must be taken and successfully carried at the same time. **Each instructor has the authority to enforce the printed prerequisites listed for his or her courses within the first 10 days of classes of the semester.** Withdrawal from the corequisite necessitates withdrawal from the course for which it is required.

The suggested program sequences presented for each department are provided to give guidance to students in planning their schedules. Courses may not be available according to the stated course sequence because of the class size limitations, faculty availability, etc. Continuing students are pre-registered before new students to accommodate continuing students program requirements. Therefore, schedule modifications may be necessary for individual students.

Course Substitutions
A course substitution requires the approval of the student's advisor, the department head of the student's major, Dean of the student's School, and the Director of Enrollment Management. The *Petition for Course Substitution* form is available from the Enrollment Services Office.

Course Syllabus Policy
An updated course syllabus is required to be provided by the professor for each class taught in the current term, **before the first class meeting**, to the Department Head **in which the course is taught**.

Course work - Outdated
Upon readmission after a term of non-attendance, a student will re-enter under the current catalog year. The student must meet degree requirements as set forth in that catalog or subsequent catalog. The student's department will evaluate all course work as it applies toward the student's degree using the following guidelines (subject to minimum grade requirements):

1) MT Tech guarantees that any postsecondary course work taken within five (5) years of readmission to the campus will be included in the analysis of specific required classes in a major, minor, option or certificate.
2) MT Tech guarantees that any postsecondary course work taken within fifteen (15) years of readmission to the campus will be included in the analysis of general education course work for degree requirements.
3) MT Tech guarantees that any postsecondary course work taken within fifteen (15) years of readmission to the campus will be included in the analysis of elective course work.

Course work that falls outside these guarantee periods **MAY** be included in the evaluation, at the discretion of the individual department.

Individual programs in the Montana University System may have a stricter standard for outdated course work.

Credits
A credit represents 50 minutes of lecture instruction per week for one semester. The actual time required for each credit may involve any combination of lecture and/or the equivalent of recitation or laboratory work.

Credit Load
*Request to Take More Than 19 Credits in a Semester***:** Students wishing to take more than 19 credits per semester must complete and submit a permission form stating justification for the higher credit load. Signatures of the student's advisor, department head and the Director of Enrollment Management are required. This form is available from the Enrollment Services Office, and must be submitted prior to the close of registration (10th day of classes).

Grades & Grade Points
Grades are recorded at the end of each semester according to the following grading system:

A-Excellent	B-Good	C-Average	D-Poor	F-Fail
I-Incomplete	W-Withdrawal	N-Continuing		P-Pass

Montana Board of Regents' Policy 301.5.3 establishes minimum grade standards for the Montana University System. One of those standards requires that all campuses calculate a student's grade point average using common weights or value points for similar grades.

Effective Fall Semester 2005, the following values will be used to determine grade point averages in the Montana University System:

A	=	4.0
A-	=	3.7
B+	=	3.3
B	=	3.0
B-	=	2.7
C+	=	2.3
C	=	2.0
C-	=	1.7
D+	=	1.3
D	=	1.0
D-	=	0.7
F	=	0.0

Grade point averages calculated before Fall Semester 2005, using the values in place on each campus at the time, will not be recalculated using the new weights or values.

Each student's grade points are accumulated to determine the cumulative grade point average. This average is computed by dividing the total grade points achieved by the total credits attempted. "Credits attempted" include all courses for which grades of A, B, C, D, or F were given. Grades of W, P and I are not included. **A maximum of ten HPER activity credits can be counted in a student's grade point average**. It is understood that additional HPER activity courses may be taken, but the grades earned will not count in the GPA calculation. The student's grade point average is computed only for grades received at Montana Tech; grade points from transfer courses are not included in the student's grade point average.

A separate transcript and GPA is maintained for students at the various levels of the College. These levels include Technical, Undergraduate, Post-Baccalaureate, and Graduate.

Semester Grade Reports are available to students via their secure *Orediggerweb* (http://Orediggerweb.mtech.edu) account approximately one week following the date grades are due each term, including summer school. Students who wish to have their grades mailed to them must provide a self-addressed/stamped envelope to the Enrollment Services Office. **Midterm grade reports** are available to all College of Technology students and undergraduate freshmen (those students who have earned 29 credits or less) prior to the last date to drop a class with an automatic "W" (45th day of the semester). See the academic calendar in the front of this catalog, in the Semester Class Schedule, or via the Montana Tech web site.

Pass/Fail: Students registered in physical education activity courses have the option of registering in these courses for a letter grade or under the pass-fail system. Determination of the grade type under which the student wishes to enroll in HPER activity classes must be made by the close of registration (10th day of classes). Additionally, other courses as determined by departments are also offered as pass/fail.

Grade Appeals
When a student believes a faculty member has improperly recorded a final grade, the student needs to follow the procedural steps for an informal and/or formal grade appeal. **The "burden of proof" in the grade appeals process shall rest with the student**.

Informal Grade Appeal
1. Regardless of the circumstance, the student must attempt to resolve the matter via a personal conference with the course instructor within 14 days after receiving the semester grade. (Nursing Department grade appeal process outlined in Nursing Student Handbook)
2. If the student is unable to arrange a conference, or if the student & the instructor cannot reach a mutually satisfactory resolution to the problem, then the student may request in writing that the Department Head convene a meeting with the student and the course instructor within 14 days of the written request. If a Department Head or Dean is the instructor involved in the appeal, the student may request in writing that the Vice Chancellor for Academic Affairs appoint another Department Head or Dean to convene the informal meeting.
3. If the grade issue is not resolved at this meeting, the student may request a formal grade appeal.

Formal Grade appeals initiated *after the first 30 days of the start of the next regular semester are not accepted*. (Nursing Department grade appeal process outlined in Nursing Student Handbook)

Formal Grade Appeal - Committee Hearing
1. An appeal for a formal grade review must be submitted to the Vice Chancellor for Academic Affairs within 14 academic days after the informal grade appeal process has failed. The request must include a written explanation of the circumstances that the student believes justifies an appeal to change a final grade for a course, and a written statement describing the informal attempt to resolve the issue.
2. If the Vice Chancellor for Academic Affairs determines that grounds for a formal grade appeal exist, he or she will request the Academic Standards Committee to review the issues and will request appropriate course materials and records from the student and from the course instructor.
3. The Academic Standards Committee shall examine all evidence (verbal and/or written) that the student and instructor present and will determine whether to recommend a final grade change. The primary consideration afforded the student will be whether or not the student was dealt with fairly with respect to other students in similar circumstances.
4. By majority vote, the Committee shall recommend letting the final grade remain unchanged, shall recommend the assignment of a new letter grade, or recommend alternative action(s) necessary to resolve the grade appeal.
5. If a new final grade or alternative action(s) is/are recommended by the Academic Standards Committee, the Vice Chancellor for Academic Affairs will meet with the involved faculty member to review the recommended action.
6. The Vice Chancellor for Academic Affairs will make a final decision.

Every attempt will be made to complete the entire appeal process within **30 days** of the initiation of the formal appeal process.

The review by the Academic Standards Committee and Vice Chancellor for Academic Affairs shall be the final campus appeal for the assignment of a final grade. (Approved at April 21, 1994 Faculty Meeting).

Honor Roll
A full-time undergraduate or technical student (enrolling in and completing a minimum of 12 credits) who earns a 3.25 GPA during the semester will be listed on the semester Honor Roll. Those earning a 3.5 GPA will receive recognition for being listed on the Dean's List. A student who earns a 4.0 GPA will receive a letter and certificate from the Chancellor commemorating his or her inclusion on the Chancellor's Honor Roll. If a student receives a final grade of "I" (incomplete) or "N" (no grade), his or her name will not be included on the honor rolls or Dean's List. The Office of Public Relations releases the Honor Roll to the media.

Incomplete (*revised Fall Semester 2005*):
1. **Assigning a Grade of "Incomplete."** A grade of "Incomplete (I)" is assigned only when the student has been in attendance and has done passing work up to a time within three weeks of the close of the semester, or within one week of the

close of the summer session. It may be assigned only upon agreement of the student and course instructor when extenuating circumstances make it impossible for the student to complete course requirements on time (Extenuating circumstances include serious illness, car accidents, death of a family member, etc. It does not include lateness due to procrastination, the student's desire to do extra work to raise his or her grade, allowing a student to retake the course, etc.). If a grade of "Incomplete" is submitted, the instructor will assign a revised grade in the event the missing work is not completed. The instructor must also specify conditions and requirements for completing the deficient work, as well as any deadline shorter than the maximum time period allowed as indicated above. At the end of each semester, the Enrollment Services Office will send an Incomplete Grade Report (IGR) to departmental administrators detailing every "I" grade submitted by his or her faculty that semester and the conditions for student completion.

2. **Completion of "Incomplete" Grades.** Regardless of a student's subsequent enrollment, final grades for incompletes received in the Fall semester must be assigned by the last day of the following Summer semester. Final grades for incompletes received in the Spring semester or Summer Session, must be assigned by the last day of the following Fall semester. When a student has completed the deficient work, the instructor will assign a final grade. An incomplete that is not completed within the time limit specified above would automatically be changed to the reversion grade assigned by the instructor at the time the incomplete was submitted. Instructors may assign a final grade anytime within the time period specified above. In the event the instructor leaves the university, the Department Head may assign the final grade. An incomplete remains on the student's permanent record and is accompanied by the final grade (i.e., I/A, I/B, I/C).

3. **"Incomplete" Grades on Record at End of Final Term.** A student cannot graduate with a grade of "Incomplete" on his or her record. At the end of the term in which the student will graduate, a grade of "Incomplete" in any course on that degree level (technology, undergraduate, graduate, etc.) reverts to the grade that the instructor had specified on the incomplete grade submission form. Reverted grades are included in the computation of the student's cumulative grade-point average at graduation. Nonetheless, a student who has graduated may make up the incomplete work within the usual time limit in an effort to raise the grade on the permanent record.

ACADEMIC STANDING

Some rules are necessary to determine academic standing and class ranking of enrolled students. The following rules apply to all students.

Academic Probation and Suspension

All students must maintain a 2.00 cumulative GPA to avoid being placed on academic probation. If during any semester a student's cumulative GPA is less than 2.00, the student will be placed on academic probation. Students on academic probation will normally be limited to a maximum of 15 credits per semester while on probation. **Freshmen students admitted to Montana Tech "at-risk" or who are placed on probation are required to take *MT 1016 - College Success*. Transfer or returning students admitted on probation MAY be required to enroll in *College Success*.**

To be removed from probation, a student must, during the probation period, meet the required standard minimum academic progress each semester (2.00) until the cumulative grade point average reaches the required level (2.00). If in any semester while on probation a student falls below the minimum standard for academic progress, the student will be academically suspended from the College.

Students suspended once for unsatisfactory scholarship must remain out of residence for one semester. Students suspended more than once will not be readmitted until after an interval of one year and must receive the approval of the Academic Standards Committee for readmission. A student readmitted after suspension is on probation until cumulative grade point requirements are met. The student may be required to take MT 1016 - *College Success*, and may be required to take specific classes as a condition of readmission.

Students suspended from the North Campus (undergraduate program) may be admissible to an appropriate program at the College of Technology without remaining out of residence.

Petition Procedure for Academically Suspended Students

First Suspension: A student desiring authorization to re-enter the College after being suspended for the first time, who has not remained out of residence for a regular semester, must submit a written petition to the Academic Standards Committee through the Office of the Vice-Chancellor for Academic Affairs. Write to: Academic Standards Committee, c/o Office of The Vice-Chancellor for Academic Affairs, or bring the petition to the office on the third floor of the Mining Geology Building.

Multiple Suspensions: A student desiring authorization to re-enter the College after being suspended more than once must submit a written petition to the Vice Chancellor for Academic Affairs. Normally, a student who has been suspended more than once must be out of residence for at least one year prior to submitting a petition. The Academic Standards Committee reviews all petitions for readmission.

Class Standing

Undergraduate Students (Seeking an Associate of Science or Bachelor's Degree)

LOWER DIVISION		*UPPER DIVISION*	
Freshman	1-29 credits earned	Junior	60-89 credits earned
Sophomore	30-59 credits earned	Senior	90 + credits earned

In order to be classed in the Upper Division, a student must have earned at least 60 credit hours and have a grade point average of at least 2.00. Normally, only students in the Upper Division may register for junior and senior (3000 & 4000 level) courses.

Technical Level Students (Seeking a certificate or A.A.S. at the College of Technology)

First	1- 14 credits earned	Third	30 – 44 credits earned
Second	15 -29 credits earned	Fourth	45 + credits earned

ACADEMIC DISHONESTY

The following will be considered acts of academic dishonesty or cheating:

1. **Plagiarism.** A student will be considered guilty of academic dishonesty, if the student submits a term paper, essay, speech, laboratory report, or other assignment, in which all or part of the words or ideas are copied from the published or unpublished work of another individual without giving the original author proper credit for the words or ideas.
2. **Copying from the paper of another student while taking an examination.** A student will be considered guilty of academic dishonesty if he or she deliberately looks at and copies from another individual's examination paper during an examination.
3. **Using unlawful aids to pass an examination.** A student will be considered guilty of academic dishonesty if he or she brings to class and uses crib notes, books, electronic devices not approved by the instructor or any other material to assist him or her in passing the examination unless the instructor of the class has specifically given permission to use such materials.
4. **Aiding another student.** A student will be considered guilty of academic dishonesty if he or she willfully assists another student in any act of academic dishonesty. Such a person is equally guilty as the person plagiarizing or copying.
5. **Unauthorized Signatures:** The use of a person's signature without permission is a serious matter and the consequences can be severe. Possible consequences include:
   - Being dropped from the course by the instructor, department chair, dean of the college, or the University.
   - Loss of tuition paid for the course.
   - University disciplinary action such as probation, suspension, expulsion, and correction of all course grades.
   - Loss of priority for the course or courses during registration.

The above applies to all documents used by Montana Tech that may require a signature.

Actions to be taken when cheating is discovered are as follows:

1. Instructors are responsible for taking reasonable precautions to prevent and discourage cheating in their classes and must report all cases to the Vice Chancellor for Academic Affairs Office.
2. If it is determined that a student is deliberately cheating on an examination or a written or oral assignment, he or she should receive a grade of "F" on that examination or assignment as a minimum penalty. The instructor may drop the student from the course with an "F" grade.

3. In reported cases of repeated cheating, the Academic Standards Committee may consider applying additional penalties beyond those imposed by the individual instructors, including expulsion.

Any student who thinks that he or she has received unfair treatment in regards to cheating should request a hearing with the Disciplinary Appeals Committee not later than one school week after notification of the action taken by the instructor or by the Academic Standards Committee.

CHANGE OF ENROLLMENT

Change of Enrollment - Adds/Drops/Withdrawal from College

All changes of enrollment (adding a class, dropping a class or withdrawing from college) must be recorded with the Enrollment Services Office. If such changes are not recorded with the Enrollment Services Office, the student will receive F grades in those courses. Students may add courses through the 10th instructional day with the approval of the instructor and their academic advisor. Students may also withdraw from classes during the first 15 days of classes and such withdrawals will not appear on their transcript. Students may withdraw from any class after the 15th day and through the 45th day of classes and receive an automatic W in the subject. References to the 10th, 15th and 45th instructional day refer to a traditional 75-instructional-day semester. A shorter but equivalent timeline is used for shorter instructional terms (summer school and short courses). **Students are responsible for fee payment for even a partial term of attendance, and should refer to the refund policy in this catalog or the Class Schedule.**

Withdrawal from Individual Classes Through the 45th Instructional Day

If a student withdraws from a class through the 15th day of classes, the class does not appear on the student's transcript. A student who withdraws from a class from the 16th through the 45th instructional day will automatically receive a grade of W (withdrawal) in that class. Thereafter, through the last instructional day of a semester, a grade of F will be assigned in all courses from which the student withdraws, unless it is determined that the withdrawal is for "extraordinary reasons."

Withdrawal From All Classes Through the 45th Instructional Day

A student may request complete withdrawal from all classes by obtaining and completing a *Request for Complete Withdrawal From College* form, available at the Enrollment Services Office. If a student withdraws from all classes by the 15th day of classes, the term of attendance does not appear on the student's transcript. If a student withdraws from all classes from the 16th through the 45th day of classes, he or she will automatically receive a grade of W in all enrolled classes. Thereafter, through the last instructional day of a semester, a grade of F will be assigned in all courses from which the student withdraws, unless it is determined that the withdrawal is for "extraordinary reasons" (see next column). Complete withdrawal through the 45th instructional day requires clearance from the following:

1. Academic Advisor, 2. Counseling Office, 3. Financial Aid Office, 4. Library, 5. Business Office.

Instructors will record a student's last date of attendance on the form. After receipt of the completed form in the Enrolmment Services Office, the student will be notified of the action taken by the Director of Enrollment Management.

Complete or Partial Withdrawal for Extraordinary Reasons (After the 45th Instructional Day)

A student may request withdrawal from a portion of, or his or her entire academic course load after the 45th instructional day by obtaining and completing the *Request for Withdrawal After the 45th Instructional Day*" form. Withdrawal after the 45th instructional day is termed "for extraordinary reasons." Extraordinary reasons can include: extended illness or hospitalization documented by doctor's excuse, or job transfer documented by employer. If it is determined that extraordinary reasons exist, and the instructor(s) concur, the student will receive a grade of W in those courses from which he or she has requested withdrawal. Determination of extraordinary reasons for withdrawal requires:

1. Completion and submission of the *Request for Complete or Partial Withdrawal After the 45th Instructional Day*" form to the Enrollment Services Office, **along with documentation of the extraordinary reasons**.
2. Recommendation of approval for a grade of W from:
   a) The instructor of each course from which the student requests withdrawal;
   b) The student's academic advisor;
   c) The Department Head of the student's major, and
   d) The Director of Enrollment Management.

Additionally, signatures will be required from the Student Life Office, the Business Office, and the Financial Aid Office. After receipt of the completed form, the student will be notified by the Enrollment Services Office as to the determination of the request.

DEGREE REQUIREMENTS (UNDERGRADUATE, TECHNICAL)

Catalog in Effect for Purposes of Meeting Degree Requirements

All degree candidates must meet the degree requirements listed in the Montana Tech Undergraduate Catalog in effect when they first entered the College or any subsequent undergraduate catalog that is in effect up to graduation, provided there has not been a break in attendance of the academic school year (*excluding summer school, Internship enrollment, and field course work*). Students who desire to receive a certificate or a degree must file the appropriate *Application for Degree* with the Enrollment Services Office no later than the Monday before finals week the semester prior to the term in which they expect to complete their certificate or degree requirements. See the yearly academic calendar for specific dates.

Baccalaureate Degrees

The following are the requirements for a baccalaureate degree at MT Tech:

Bachelor of Science Degree

1. The student must meet all the requirements of one of the curricula listed for the Bachelor of Science degree. Students can choose to complete the degree requirements in the catalog they enter under or any subsequent catalog published while they are continuously enrolled, but they must complete those requirements within six years from the date of the chosen catalog.
2. At least 50% of the student's upper division (3000/4000 level classes) credits must be completed through Montana Tech, including any Senior Design/Capstone course work required for the degree.
3. The student must achieve a minimum cumulative grade point average of 2.00 on all course work attempted (with repeats counted as indicated previously) as well as on all course work in the departmental major. No course below a "C-" will transfer or be acceptable toward degree requirements.

Bachelor of Applied Science Degree

In May 1996, the Board of Regents authorized Montana Tech to award the Bachelor of Applied Science (BAS) Degree. The BAS Degree is primarily designed for students who have earned an Associate of Applied Science Degree at a two-year institution and wish to move efficiently into a baccalaureate degree program. The BAS degree allows the transfer of the Associate of Applied Science Degree and credits toward a baccalaureate degree without significant loss of time or credit. Depending upon the program chosen, a student may transfer up to 60 credits (AAS transfer) toward this innovative degree. The Bachelor of Applied Science Degree is available in **Business and Biology.**

Formal admission into the BAS program at Montana Tech requires the completion of an Associate of Applied Science degree not later than the first year of attendance at Montana Tech. In order to receive the BAS degree, students must complete the general education core, as defined in this catalog. In addition to completion of the general education requirements, the designated tracks required for the BAS degree in business, and biology, **each require a minimum of 39 upper division credits and 18-28 credits in the specified track support area.** The support area credits may be counted towards the upper division credit total. If students have completed parts of the general education core in the AAS program, then additional credits would be required within each track. **Minimum credits required for a Bachelor of Applied Science Degree = 120.**

Second Baccalaureate Degree

1. Montana Tech recognizes the first baccalaureate degree as having met the general education and skill requirements of the college.
2. The course stipulations of the major for the second degree, including necessary prerequisites, as defined by the department, must be met.
3. A person who earned his or her first degree at Montana Tech must complete at least 15 additional upper division credits in residence at Tech, including any Senior Design/Capstone course work required for the degree. A person who earned his or her first baccalaureate degree elsewhere must complete at least, 50% of his or her upper division (3000/4000 level classes) credits through Montana Tech, including any Senior Design/Capstone course work required for the degree.

4. The student must notify the Enrollment Services Office and the heads of the respective academic departments in writing of his or her intent to pursue a second degree at least a full semester prior to receipt of the degree.
5. The student must achieve a minimum cumulative grade point average of 2.00 on all course work attempted (with repeats counted as indicated previously) as well as on all course work in the department. No course below a "C-" will transfer or be acceptable toward degree requirements.

Policy for Second Option within a Baccalaureate Degree

1. The college recognizes that students may wish to pursue more than one option in degree programs that offer more than one option within their degree.
2. The course stipulations for the second option, including necessary prerequisites, as defined by the department and the Director of Enrollment Management, must be met.
3. The student must notify in writing the Director of Enrollment Management and head of the academic department of his or her intent to pursue a second option within his or her degree. This must be done at least one semester prior to scheduled completion of the degree/options.

Associate of Science Degree

Requirements for an Associate of Science degree follow:

1. Completion of the Undergraduate General Education Core (30 - 31 credits). Exception: Associate of Science RN Nursing Students must complete 18 specific credits from the General Education Core.
2. The remaining elective credits must reflect an approved undergraduate academic program.
3. The student must achieve a minimum cumulative grade point average of 2.00 for undergraduate level academic work attempted at Montana Tech. No course below a "C-" will transfer or be acceptable toward degree requirements.
4. An Associate of Science degree requires a minimum of 60 earned semester credits.
5. At least 30 semester credits must be earned at the College, and the student must be enrolled during the year in which the degree is awarded.
6. Students who desire to receive the Associate of Science Degree must file an *Application for Associate of Science Degree* with the Enrollment Services Office no later than the Friday before finals week the semester prior to the term in which they expect to complete their certificate or degree requirements. See the yearly academic calendar for specific dates.
7. Students **may not** apply for an Associate Degree in the **same academic year** in which a Bachelor's Degree is to be received.

Certificate of Applied Science & Associate of Applied Science Degree

Students must complete all required courses within their specified program in order to receive an Associate of Applied Science Degree or a Certificate of Applied Science. A majority of credits must be completed at Montana Tech. Certificates and AAS degrees require courses in English, Math, and human relations. AAS degrees require a minimum of 12 related general education credits.

Policy for Second AAS Degree

1. The college recognizes the first Associate of Applied Science (AAS) degree as having met the college's general education requirements and skill requirements at the AAS level.
2. The course stipulations for the second degree, including necessary prerequisites, as defined by the department and the Director of Enrollment Management must be met.
3. A person who earned his or her first Associate of Applied Science degree at Montana Tech must take a minimum of 15 semester hours in residence. A person who earned his or her first AAS elsewhere must earn at least 25% of the credits toward the AAS degree at Montana Tech.
4. The student must notify the Enrollment Services Office and the heads of the respective academic departments in writing of his or her intent to pursue a second degree at least one semester prior to scheduled completion of the degree.

Policy for Second Option within an AAS Degree

1. The college recognizes that students may wish to pursue more than one option in degree programs that offer more than one option within their degree.
2. The course stipulations for the second option, including necessary prerequisites as defined by the department & the Director of Enrollment Management, must be met.
3. The student must notify in writing the Enrollment Services Office and head of the academic department of his or her intent to pursue a second option within his or her degree. This must be done at least one semester prior to scheduled completion of the degree/options.

Policy for a Second Certificate of Applied Science

1. The college recognizes the first certificate as having met the college's skill requirements at the certificate level.
2. The course stipulations for the second certificate, including necessary prerequisites, as defined by the department and the Director of Enrollment Management must be met.
3. A person who earned his or her first certificate at Montana Tech must take a minimum of 12 semester hours in residence. A person who earned his or her first certificate elsewhere must earn at least 25% of the credits toward the Montana Tech certificate at Montana Tech.
4. The student must notify the Office of Enrollment Service and heads of the respective academic departments in writing of his or her intent to pursue a second certificate at least one semester prior to scheduled completion of the certificate(s).

Certificate and Advanced Certificate of Completion

Completion of specific course work in certain programs will result in the student earning a Certificate or Advanced Certificate of Completion. These credentials are available in the following programs:

Preapprentice Line Program (Certificate of Completion)
Practical Nursing (Certificate available at 50 credit exit point. See nursing section of this catalog)
Diagnostic Medical Sonography (Advanced Certificate of Completion)

Graduation with Honor or High Honor

- Honor: 3.25 - 3.74 cumulative GPA
- High Honor: 3.75 - 4.00 cumulative GPA

Transfer credit and transfer grades are not considered in determining honor/high honor. Only MT Tech course work is considered. A combined cumulative GPA will be used for students in combined B.S. & A.A.S. programs (i.e., HCI). No honor/high honor is designated for Graduate Students.

Minimum Earned Credit Hours for Honor or High Honor Designation:

Student must earn a minimum of 51% of his or her credits at Montana Tech in order to graduate with honor or high honor, and only Montana Tech courses will count toward the designation.

For the Commencement ceremony, graduation honors for students completing their degree requirements in spring semester are based on the cumulative GPA from **fall semester**. Honors are indicated on the commencement program, and graduates receive an honors cord to be worn during commencement exercises.

Valedictorian

The designated Valedictorian of the graduating class is a student who was admitted as a first-time freshman; has earned **ALL** of his or her credits at Montana Tech, excluding AP Credit and early admit credit (which is factored into the overall GPA for determination of the award); and graduates with the highest grade point average.

Diplomas

Degrees are conferred at the end of summer, fall, and spring terms. Commencement is usually the first or second Saturday in May. Diplomas and Certificates of Completion are mailed to students approximately eight to ten weeks following commencement. Transcripts indicating completion of a degree or certificate are generally available three weeks following the end of a semester.

Academic Minor

Baccalaureate *degree-seeking* students may elect to complete one or more minors in fields outside their major. Minors may be in fields unrelated to students' majors or they may be complementary or supportive of majors. **A student may not take a minor in the same field of study as his or her major.** The appropriate *Application for a Minor* must be submitted to the Enrollment Services Office along with a student's *Application for Degree*. **Students should work with their advisor early in their academic career if they intend to pursue a minor.**

Minors are available in the following areas: *Biology, Business Administration (Finance or Accounting), Chemistry, Computer Science, Extractive Metallurgy,*

Geoscience, Geophysics, Hydrogeology, Liberal Studies, Mathematics, Mineral Processing Engineering, Occupational Safety & Health, Physics, and Professional & Technical Communication. Courses completed to satisfy the requirements of a minor also may be applied toward the General Education Requirements if they appear on the list of approved courses at the time they are taken.

Credits and GPA Required for a Minor
Students must earn the number of credits required for an approved minor as listed in this catalog **while completing or after having completed a baccalaureate degree from Montana Tech.** *A minimum of six of the credits required for a specific minor must be earned at Montana Tech (individual departments may have more stringent requirements), and a "C" average (2.0) or better is required for the course work taken to earn the minor. If a course is failed then the minor will not be granted.*
Any course work over six years old used to meet requirements for a minor is subject to approval by the department offering the minor.
See more information regarding minors in the reference section.

Master's Degree
For information on Master's Degree requirements, see the *"Graduate School"* section.

Transcript of Academic Record
A permanent record of academic information is termed a "transcript." The Director of Enrollment Management is responsible for the maintenance of accurate and readily available student academic records, and for the use and release of information from these records. Transcripts of a student's permanent academic record are issued by the College only upon the written request or consent (letter or fax with student's signature) of the student for personal use or to be sent to designated persons.

Transcripts and honorable dismissal (including release of diploma) will be given only to students who have met all financial obligations to the Institution. All official transcripts are issued at $3.00 each. An additional $3.00 is charged to fax a transcript. See our web site at www.mtech.edu/registrar for information regarding ordering a transcript by using the internet. Student information will be released only as authorized by state and federal laws, or by the individual (see next section)

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA)

Definitions
For the purposes of this policy, Montana Tech uses the following definitions of terms:
Student - any person who attends or has attended Montana Tech
Education records - any record (in handwriting, print, tapes, film, or other medium) maintained by Montana Tech or an agent of the university which is directly related to a student, **except**:

1. A personal record kept by a staff member if it is kept in the sole possession of the maker of the record and is not accessible or revealed to any other person except a temporary substitute for the maker of the record.
2. An employment record of an individual whose employment is not contingent on the fact that he or she is a student, provided the record is used only in relation to the individual's employment.
3. Records maintained by the Office of The Commissioner of Higher Education if the record is maintained solely for law enforcement purposes, is revealed only to law enforcement agencies of the same jurisdiction, and the Unit does not have access to education records maintained by the institution.
4. Records maintained by the Student Health Center if the records are used only for treatment of a student and made available only to those persons providing the treatment.
5. Alumni records which contain information about a student after he or she is no longer in attendance at the institution, and which do not relate to the person as a student.

Locations of Education Records
Following is a list of the types, locations and custodians of education records maintained by Montana Tech.
1. Cumulative **academic records and academic progress records**: Enrollment Services Office (MG 207). Custodian: Director of Enrollment Management.
2. **Financial Aid records:** Enrollment Processing (MG 111). Custodian: Dir. Financial Aid.
3. **Financial records** (charges, payments, etc.): Business Office (MG 205). Custodian: Controller.
4. **Health records:** Health Center (SUB 111). Custodian: Nurse.
5. **Career Services records:** Eng. 102A. Custodian: Dir. Career Services.

Procedure to Inspect Education Records
Students may inspect and review their education records upon request to the appropriate record custodian. Students should submit to the record custodian a written request identifying as precisely as possible the record or records he or she wishes to inspect.

The record custodian will make the needed arrangements for access as promptly as possible and notify the student of the time and place where the records may be inspected. Access will be given within 45 days of the receipt of the request. When a record contains information about more than one student, the student may inspect and review only the records that relate to him or her.

Right of the Institution to Refuse Access
Montana Tech reserves the right to refuse to permit a student to inspect the following records:
1. The financial statement of the student's parents.
2. Letters and statements of recommendation for which the student has waived right of access, or which were placed in file before January 1, 1975.
3. Records connected with an application to attend Montana Tech or a component unit of Montana Tech if that application was denied.
4. Those records, which are excluded from the FERPA definition of education records.

Refusal to Provide Copies
Montana Tech reserves the right to deny transcripts or copies of records not required to be made available by the FERPA in either of the following situations:

1. The student has an unpaid financial obligation to the Institution.
2. There is an unresolved disciplinary action against the student.

Fees for Copies of Records
The fee for copies of educational records other than transcripts is $0.50 per page. **The fee for a transcript is $3.00**.

Record of Requests for Disclosure
Montana Tech will maintain a record of all requests for and/ or disclosure of information from a student's education records. The record will indicate the name of the party making the request, any additional party to whom it may be re-disclosed, and the legitimate interest of the party in requesting or obtaining the information. The record may be reviewed by the eligible student only.

Directory Information
Montana Tech has designated the following items as Directory Information: student name, address (including campus e-mail address), telephone number, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, most recent previous school attended, and photograph. Except as noted in item 1. below, class rosters for electronically mediated (Blackboard) classes will NOT be released, except to students enrolled in that specific class. Students may request that their name be blocked from the electronic class roster in the "personal information" settings in Blackboard. **The Institution may disclose any of those items without prior written consent, unless notified in writing to the contrary by the end of the second week of a semester.** A non-disclosure of information form for this purpose is available from the Enrollment Services Office. **Directory information will then be withheld indefinitely until the Enrollment Services Office receives in writing a revocation of the request for non-disclosure.**

Disclosure of Education Records
Montana Tech will disclose information from a student's education records only with the written consent of the student, except:

1. To school officials who have a legitimate educational interest in the records. A school official is: a person employed by the institution in an administrative, supervisory, academic or research, or support staff position; a person elected to the board of trustees; or a person employed by or under contract to the

Institution to perform a special task, such as an attorney or auditor. A school official has a legitimate educational interest if the official is: Performing a task that is specified in his or her position description or by a contract agreement; performing a task related to a student's education; or performing a task related to the discipline of a student.

2. To officials of another school, upon request, in which a student seeks or intends to enroll.
3. To certain officials or representatives of the U.S. Attorney General's Office, U.S. Department of Education, the Comptroller General, Veteran's Administration Officials, and State and local educational authorities, in connection with certain state or federally supported education programs.
4. In connection with a student's request for or receipt of financial aid, as necessary to determine the eligibility, amount or conditions of the financial aid, or to enforce the terms and conditions of the aid.
5. If required by a State law requiring disclosure that was adopted before November 19, 1974.
6. To organizations conducting certain studies for or on behalf of the university.
7. To accrediting organizations to carry out their functions.
8. To parents of an eligible student who claim the student as a dependent for income tax purposes. Note that Montana Law supersedes FERPA, and that student information WILL NOT be given to a parent without the student's written permission.
9. To comply with a judicial order or a lawfully issued subpoena.
10. To appropriate parties in a health or safety emergency.
11. To a victim of an alleged perpetrator of a crime of violence or non-forcible sex offense, and the public, in connection with the final results of an institutional disciplinary proceeding.
12. To parents regarding the student's violation of any federal, state, or local law, or of any institutional policy or rule governing the use of alcohol or a controlled substance if 1) the institution has determined that the student has committed a disciplinary violation with respect to that use or possession; and 2) the student is under the age if 21 at the time of the disclosure to the present. This item does not supersede any state law that prohibits an institution from disclosing this information.

Correction of Education Records

Students have the right to ask to have records corrected that they believe are inaccurate, misleading, or in violation of their privacy rights. Following are the procedures for the correction of records:

1. A student must ask the office responsible for the record to amend a record. In so doing, the student should identify the part of the record he/ she believes is inaccurate, misleading or in violation of his or her privacy or other rights.
2. The institution may comply with the request or it may decide not to comply. If it decides not to comply, the custodian of the record will notify the student of the decision and advise him/her of the student's right to a hearing to challenge the information believed to be inaccurate, misleading, or in violation of the student's rights.
3. Upon request, Montana Tech will arrange for a hearing, and notify the student, reasonably in advance, of the date, place, and time of hearing.
4. A hearing officer who is a disinterested party will conduct the hearing; however, the hearing officer may be an official of the institution. The student shall be afforded a full and fair opportunity to present evidence relevant to the issues raised in the original request to amend the student's education records. One or more individuals may assist the student, including an attorney.
5. Montana Tech will prepare a written decision based solely on the evidence presented at the hearing. The decision will include a summary of the evidence presented and the reasons for the decision.
6. If the institution decides that the challenged information is not inaccurate, misleading, or in violation of the student's right of privacy, it will notify the student that he or she has a right to place in the record a statement commenting on the challenged information and/or a statement setting forth reasons for disagreeing with the decision.
7. The statement will be maintained as part of the student's education records as long as the contested portion is maintained. If Montana Tech discloses the contested portion of the record, it must also disclose the statement.
8. If the institution decides that the information is inaccurate, misleading, or in violation of the student's right of privacy, it will amend the record and notify the student in writing that the record has been amended.

The necessity for keeping abreast of rapid changes in engineering, science, technology, education and other broad academic areas frequently demands adjustments in curricular requirements. When this occurs, every effort will be made to apply reasonable flexibility to avoid imposing undue hardship on students.

Procedure to Authorize Disclosure of Non-Directory Information to a Third Party

A student who wishes to disclose to a third party information normally considered "restricted" may do so by obtaining from, completing and returning the proper form to the Enrollment Services Office.

Undergraduate Academic Programs

GENERAL EDUCATION REQUIREMENTS (A.S., B.A.S., and B.S. Degrees)

Educational Objectives

The associate and baccalaureate degree programs offered by Montana Tech focus on technical and career-oriented education. Nevertheless, each student's education should include certain common qualities. The general education core curriculum at Montana Tech familiarizes students with the diverse knowledge embraced by the Humanities, Mathematics, Physical & Life Sciences, and Social Sciences. In addition to these general areas of knowledge, a Communications requirement ensures that students acquire effective written and oral communication skills.

Expected Outcomes of the General Education Objective:

- Ability to express oneself both in written form and orally
- Proficient critical thinking skills
- Global and multi-cultural awareness
- Appreciation for diversity
- Understanding of scientific methods
- Ability to function adequately at an algebraic level
- An appreciation for life-long learning

Assessment:

As part of a comprehensive assessment of the General Education program, each student seeking a baccalaureate degree will be required to complete an assessment exam prior to the start of the semester following the term they complete 75 credit hours. The nationally normed exam will be administered on a schedule determined by the Vice-Chancellor for Academic Affairs. At the appropriate time, students will be notified regarding date, time, and location of thesis requiring examination.

Montana Tech General Education Requirements (GER)

Communications	(6 hours)
Humanities	(6 hours)
Mathematical Sciences	(6 hours)
Physical & Life Sciences	(6-7 hours) 1 course w/ lab required.
Social Sciences	(6 hours)

As a General Education Requirement, in addition to the 6 credits of communications courses, all baccalaureate degree-seeking students must also successfully complete one designated writing course at the 3000 or 4000 level. The 4000 level course should be a capstone course in the student's major.

The writing component of a course generally takes one of two forms: 1. The course requires at least three (3), three to five (3 - 5) page papers, and students must write a substantial revision of at least one of these papers; OR 2. The course requires one major paper of 15 to 20 pages, and students must produce an early draft of this paper for feedback from the instructor, then make subsequent revisions.

The 30-31-credit general education core is required of all students seeking an Associate of Science or Baccalaureate Degree. Students planning to transfer from Montana Tech to another institution should consult with that institution before enrolling in GER courses above the 2000 level (Exception ASRN).

Transfer of Core Curriculum within the MT University System

A student should request that "core completion" be noted on his or her transcript prior to the student's transfer to another institution. If completed, core completion will be noted on the student's Montana Tech transcript.

Board of Regents General Education Transfer (Policy 301.10)

A. The Montana University System (MUS) is committed to facilitating the ease of undergraduate student transfer to its campuses, particularly in the area of general education. Therefore, all campuses of the MUS will recognize the integrity of general education programs and courses offered by units of the MUS, Montana's three publicly supported community colleges, the seven tribal colleges and regionally accredited independent colleges in the State of Montana. All campuses in the MUS shall also recognize the integrity and transferability of the MUS transferable core.

B. To ensure adequate student preparation for transfer, campuses will exclude any courses from their general education program that are remedial or developmental in nature. Examples would include introductory or intermediate algebra, reading improvement, vocabulary building, and so on.

C. The Montana Board of Regents has adopted four (4) important procedures to implement the intent of this policy. Those procedures are set out below, in sections II. A., B., C., and D.

II. Procedures:

A. Campus general education programs.

An undergraduate student who has completed the lower division course work in an approved general education program at one of the institutions noted above, and who transfers to another of those institutions, cannot be required to take additional general education coursework at the lower division level.

The student may be required to take additional coursework at the upper division level that is part of an approved general education program at the new campus.

The approved general education program at each of the campuses can be found at this link: http://mus.edu/transfer/genedbycampus.asp.

B. The MUS transferable core.

An undergraduate student who has completed courses identified as part of the (MUS) transferable core, hereafter referred to as the MUS core, will be governed by the follwing rules:

1. If the student has completed the entire 30-credit MUS core, following the operating rules approved by the Montana board of regents, and transfers to another unit in the MUS that student cannot be required to take additional general education courses at the lower division level.
2. If the student has completed fewer than 20 MUS core credits, that student will be required to complete the approved general education program at the campus to which he or she transfers. All general education transfer credits that are part of the MUS core will be reviewed for possible application in the approved general education program at the campus.
3. If that student has completed 20 or more MUS core credits, that student may choose to complete either the MUS core of the approved general education program at the campus to which he or she transfers. The student should make the decision in consultation with a faculty advisor.
4. The student may be required to take additional coursework at the upper division level that is part of an approved general education program at the new campus.

C. Other "General Education" Course work.

An undergraduate student, in the following situations, will have his or her classes analyzed on a course-by-course basis to determine how those classes might satisfy the general education program requirements of the student's new campus:

1. A student who completes postsecondary course work outside of the Montana University System;
2. A student who completes postsecondary course work in the Montana University System that does not fall within the MUS Core described in paragraph II.B of this policy.

The guarantees set out in sections II A. and B. of this policy do not apply to students in these situations. The institutions that make up the Montana University System are encouraged to assist those students as much as possible, however, so the intent of this policy applies to as many students and as many courses as possible.

D. Associate of Arts and Associate of Science Degrees.

A student who has completed an Associate of Arts or an Associate of Science degree with an approved general education component package at another unit of the Montana University System, as defined under Board Policy 301.12, and

transfers to another unit, cannot be required to take additional general education coursework at the lower division level.

The student may be required to take additional course work at the upper division level that is part of an approved general education program at the new campus.

NOTE: Students should be aware that Associate of Arts or Associate of Science degrees ordinarily do not have a designated field of study in their title. If they do, they may not satisfy the requirements of this policy. See Board Policy 301.12., paragraph I.B.2.

E. Before the new institution will accept the courses, a student will have to earn a grade of "C-" or better in each of the classes described in the preceding sections.

F. The Montana University System will establish a General Education Council to oversee the provisions of this policy. The Council will have 12 members. A minimum of four (4) members will be selected from nominations submitted by the faculty governance councils on the campuses. Its responsibilities shall include:

1. Periodically review and recommend possible revision of the Montana University System Core to the Board of Regents;

2. Approve by January of each year a list of general education courses, from each of the institutions described in the first paragraph of this policy, that satisfy the Montana University System Core criteria on that campus;

3. Periodically assess and recommend revision of this policy;

4. Perform other responsibilities, as assigned by the Montana Board of Regents or the Commissioner of Higher Education.

G. Each campus of the Montana University System and the publicly supported community colleges will provide the Office of the Commissioner of Higher Education its approved general education program and update that information whenever changes are made. The Commissioner of Higher Education will make this information available to all campuses of the Montana University System.

H. The tribal colleges and regionally accredited independent colleges in the State of Montana may elect to participate in this reciprocal recognition of general education integrity on the same terms as the campuses of the Montana University System. Those electing to do so will provide the appropriate information to the Office of the Commissioner of Higher Education.

GENERAL EDUCATION REQUIREMENTS (Certificate And Associate of Applied Science Degrees)

Programs of study for which Certificates or Associate of Applied Science degrees are granted include a course in 1) communication, 2) computation, and 3) human relations. Related courses are identified as those numbered below 100 and are not considered as a general education transfer course. The required general education/related instruction varies for each program with a minimum of 12 credits required for the Associate of Applied Science Degree.

Lab Safety Training & Exam Requirement
All students enrolling in a laboratory course must complete the on-line lab safety course PRIOR to participating in a lab. Students are automatically enrolled in the appropriate on-line lab safety training when registering for the lab. After you pre-register for classes, you may retrieve your username and password by clicking the MYMTECH link on the main Montana Tech web page (www.mtech.edu). You can then sign into the course by logging in to MYMTECH, click the course link, click Lab Safety Tool Button, and then follow the posted directions. You must pass the lab safety exam before you can participate in the laboratory.

Honors Program

Mission Statement
To complement the missions of Montana Tech and the participating colleges and departments, broadening and deepening the educational experience of involved students and faculty, by providing an enhanced learning environment for exceptional students.

Required Courses:

Honors Seminar - Fall and Spring Semesters – 1 credit each (minimum 4 of 6 remaining semesters).

Undergraduate Research – 3 credits minimum (A higher minimum number of credits may be established by accrediting agency for a particular degree program.)

Thesis – 1 credit (Topic will be agreed upon by student, department head from student's major and the Honors Committee). Thesis could be a corequisite requirement with a particular department; however, the student could not receive credit twice for the same thesis.
Total credits from required courses, up to 10 credits beyond major requirements.

Honors Seminar Series:
The following is the structure for the seminar series. The series consists of 8 one-credit classes offered throughout the Honors Program. Courses are designed and timed to integrate with the natural progression of learning objectives and needs which occur during a normal undergraduate career.

Goals- Develop and enhance the following: critical thinking and problem solving, independent learning, a strong and professional ability to communicate, community connectedness, cultural fluency, ethics, quantitative skills, research, and leadership. Additionally the series will prepare the student for the transition out of college into his or her career of choice.

Format- Each semester or year will be uniquely designed around a theme. Depending on the theme, the course will use a combination of the following in an effort to ensure the most complete exploration of the theme: seminar/panel discussions by topical experts, student work-groups assigned tasks and reporting back on the theme (or sub-topic), group and/or individual presentations or reports. The presentations will be peer critiqued.

Benefits of an Honors Program:

- An opportunity to broaden and deepen one's educational experience.
- Enhance one's personal, social, and intellectual development recognition for extra work done, on and off campus.
- Integration of knowledge, concepts, and ideas from a variety of disciplines.
- Belong to a community of students with similar educational goals.
- Enhance one's appreciation for life-long learning and social responsibility.

Approved Courses Meeting Montana Tech's Undergraduate General Education Requirements

Communications Core:

WRIT	101	College Writing I
COMM	1216	Principles of Speaking
COMM	1226	Public Speaking
COMM	2016	Presenting Technical Information
JOUR	2706	Reporting
JOUR	3156W	Audio/Visual Presentations
JOUR	3176W	Producing Media Messages
PTC	1146	Publications Design
PTC	2886	Digital Imaging
PTC	4126W	Advanced Writing
WRIT	201	College Writing II
WRIT	321	Advanced Technical Writing
WRIT	325	Writing in the Sciences
WRIT	322	Advanced Business Writing
WRIT	350	Technical Writing

Humanities Core:

BUS	3636	Business Ethics
LIT	126/112	Intro. to Poetry, Drama, & Fiction
FRCH	101/102	Elementary French I & II
GRMN	101/102	Elementary German I & II
SPNS	101/102	Elementary Spanish I & II
HSTR	101/102	Western Civilization I & II
HUMN	2076	Ethics
LIT	223/224	British Literature I & II
HSTA	101/102	American History I & II
LIT	210/211	American Literature I & II
LIT	231/232	Ancient & Modern World Lit
HUMN	2396	Introduction to Philosophy
HSTR	201/202	The 20th Century World I & II
HUMN	3016W	Professional Ethics
HUMN	3116/3126	Shakespeare I & II
HSTA	350	History of Indians of the Northwest
FRCH	401/402	French Literature I & II
HUMN	3476	History of Philosophy

Upper Division Writing Courses:

BIOL	4996W	Senior Thesis
BUS	3316W	Marketing
BUS	3446W	Entrep. & Small Business Mgmt.
BUS	3616W	Management
BUS	3656W	Organizational Behavior
BUS	4896W	Strategy & Planning
CHMY	450	Demonstrations
CHMY	494	Chemistry Seminar
CHMY	491	Special Topics
COMM	3246W	Business & Professional Comm.
COMM	3276W	Interpersonal Communications
E.E./ENGR	4920/4930W	Engineering Design
WRIT	321	Advanced Technical Writing
ENVE	4400W	Pollution Prevention
ENVE	4810W	Environmental Design
GEOE	499W	Geological Engr. Design Project
GEOP	475	Geophysical Engineering Design
HUMN	3016W	Professional Ethics
FRCH	401/402	French Literature I&II
HSTA	322	American History: WWII to Present
HUMN	4456W	History of Fascism
HUMN	4486W	Literature of the Fantastic
HSTR	462	Holocaust in Nazi Occupied Europe
M	435/436	Advanced Calculus I & II
METE	4930W	Senior Design II
METE	4940W	Senior Seminar
MIN	4700W	Mine Design Project
MIN	4920W	Engr. Research, Development or Design
NURS	4306W	Nursing Management & Leadership
OSH	4896W	OSH Senior Project
WRIT	325	Writing in the Sciences
PTC	3406W	New Media Design I
PTC	3416W	Usability Testing
PTC	3476W	Introduction to Desktop Publishing
PTC	3616W	Introduction to African Studies
WRIT	322	Advanced Business Writing
WRIT	350	Technical Editing
PTC	4126W	Advanced Writing
WRIT	415	Writing Winning Proposals
PTC	4416W	Rhetorical Theories & Prof. Comm.
PTC	4426W	History, Technology, & Communication
PTC	4996W	Senior Thesis
S.E.	3250W	Software Engineering I
S.E.	4920W	Senior Design Project

Physical & Life Science Core:

BIOL	1016	Biology & Man **or**
BIOL	1026	Biology & Man w/Lab (L)
BIOL	1086	Introduction to Ecology (L)
BIOL	1096	Introduction to Biodiversity (L)
BIOL	1116	Cell Biology(L)
BIOL	1826	Environmental Issues
BIOL	2016	Anatomy & Physiology I (L)
BIOL	2026	Anatomy & Physiology II (L)
BIOL	2106	Microbiology (L)
BIOL	2746	Evolution of Man
BIOL	3216	General Botany (L)
BIOL	3326	General Zoology (L)
CHMY	121	Intro.. to General Chemistry
CHMY	123	Intro. to Organic & Biochemistry
CHMY	141	College Chemistry I
CHMY	143	College Chemistry II
CHMY	122	Intro. to General Chemistry Lab (L)
CHMY	142	College Chemistry Lab I (L)
CHMY	144	College Chemistry Lab II (L)
GEO	101	Introduction to Physical Geology (L)
GEO	209	Introduction to Field Geology (L)
PHYS	1026	College Physics
PHYS	1036	College Physics
PHYS	1046	General Physics-Mechanics
PHYS	2076	General Physics-H, S, & O

Social Science Core:

ECNS	202	Principles of Macroeconomics
ECNS	201	Principles of Microeconomics
ECNS	203	Principles of Economics
PSYX	100	Intro. to Psychology
PSYX	230	Developmental Psychology
PSYX	272	Educational Psychology
PSYX	340	Abnormal Psychology
PSYX	360	Social Psychology
PTC	3106	Gender & Communication
PTC	3506	Intercultural Communication
SOCI	101	Introduction to Sociology
PCSI	101	Introduction to Political Science
GPHY	121	Principles of Geography
SOCS	2486	General Anthropology
SOCI	201	Social Problems
PSCI	210	Intro. to American Government
PSCI	260	Intro. to State & Local Gov.
STS	1396	Introduction to Logic
STS	2016	Technology & Society
STS	3596W	Politics of Technical Decisions

Mathematics Core:

M	121	College Algebra
MATH	1066	College Trigonometry
M	141	Math for Bus & Social Science I
M	142	Math for Bus & Social Science II
STAT	131	Intro. to Biostatistics
STAT	216	Intro. to Stats
MATH	1516	Calculus I w/ Algebra Enhancement
M	171	Calculus I
M	172	Calculus II

College of Letters, Sciences & Professional Studies

Biological Sciences
Business and Information Technology
Chemistry and Geochemistry
Computer Science
Software Engineering
General Science
Health Care Informatics
Liberal Studies
Mathematical Sciences
Network Technology
Nursing
Professional and Technical Communication

Dean: Dr. Douglas A. Coe
(406) 496-4207
dcoe@mtech.edu
Office: MUS 305

Administrative Associate: Wilma Immonen
(406) 496-4182
wimmonen@mtech.edu
Office: CBB 224
FAX: (406) 496-4135

College Mission:

The College of Letters, Sciences, and Professional Studies prepares students for successful and rewarding careers in business, industry, government, service, education, and professional fields. The college strives to educate informed critical thinkers who have effective analytic and communication skills. The college's accomplished caring faculty seeks to develop leaders and life-long learners who will make a difference in their chosen fields.

Departments and Programs:

Biological Sciences
- B.S. in Biological Sciences
  - Options:
    - Cellular Biology
    - Organismal Biology
    - B.S. in Biological Sciences with Teaching Option
- B.A.S. in Biology
- Minor in Biology

Business & Information Technology
- B.S. in Business & Information Technology
  - Options:
    - Accounting
    - Management
    - Information Technology
- B.A.S. in Business
  - Options:
    - Accounting Track
    - Management Track
- B.S. in Business & Information Technology (***UM-Helena***)
  - Options:
    - Accounting
    - Management
    - Information Technology
- B.A.S. in Business (***UM-Helena***)
  - Options:
    - Accounting Track
    - Management Track
- Minor in Business
  - Options:

Accounting
Management

Chemistry & Geochemistry
B.S. in Chemistry
Options:
Biochemistry
Environmental Chemistry
Geology-Geochemistry
Professional
Minor in Chemistry
M.S. in Geochemistry

Computer Science
B.S. in Computer Science
Options:
Business Applications
Electronic Control Systems
Engineering Applications
Statistics Applications
Technical Communications
Minor in Computer Science
B.S. in Software Engineering
Options:
Business Applications
Electronic Control Systems
Engineering Applications
Statistics Applications
Technical Communications

General Science
B.S. in General Science
B.S. in General Science with Teaching Option

Health Care Informatics
B.S. in Health Care Informatics
A.A.S. in Health Care Informatics Technology
Minor in HCI
Options:
Business
Nursing

Liberal Studies
B.S. in Liberal Studies
Minor in Liberal Studies
Minor in Addiction Treatment Services (with UN-Reno)

Mathematical Sciences
B.S. in Mathematical Sciences
Options:
Math
Statistics
Minor in Mathematics

Network Technology
B.S. in Network Technology
A.A.S. in Network Technology
Minor in Network Technology

Nursing
B.S. in Nursing
A.S. in Nursing

Professional & Technical Communication
B.S. in Professional & Technical Communication
Minor in Professional and Technical Communication
Post-Baccalaureate Certificate in the Practice of Tech. Comm.
M.S. in Technical Communication

BIOLOGICAL SCIENCES

Department Head: Dr. Richard J. Douglass
(406) 496-4450
CBB 220

Administrative Assistant: Wilma Immonen
(406) 496-4182
CBB 224

Fax: (406) 496-4135

Mission and Goals:
The mission of the Biological Sciences program is to provide a quality education in biological sciences through close student-faculty interaction and by providing students with research opportunities. Although the field of biology is expansive, and everything it encompasses cannot be taught, students will learn the process of seeking knowledge from traditional and innovative classroom techniques, ample laboratory and research experience, and appropriate advising.

The Biological Sciences Department also endeavors to carry out its service responsibilities with high quality, up-to-date biology courses from which credits can be transferred both within and outside of the University of Montana and the Montana University System. In addition to its general service functions, the department specifically services the Environmental Engineering, Nursing program, and Occupational Safety and Health (OSH) programs on the North Campus and the College of Technology's Health programs.

The Department of Biological Sciences administers two degree programs, a Bachelor of Science degree in Biological Sciences and the Bachelor of Applied Science (BAS) degree in Biology. The BS degree is offered in two tracks and prepares students for graduate and professional schools. The BAS allows students with an Associate of Applied Science degree to earn a four-year degree with a minimum of additional college work. With either degree, students may be employed as professionals in various biological science disciplines.

Montana Tech graduates with a B.S. in Biological Sciences will:

- •have a general working knowledge of biology including Evolution, Ecology, Genetics, Cellular and Molecular Biology,
- •be proficient in using basic biological equipment and techniques in both laboratory and field settings,
- •be able to apply their knowledge to a variety of biological problems,
- •have effective oral and written communication skills,
- •be able to use scientific literature,
- •be able to conduct research independently and with others.

Outcomes will be assessed by:

- •normal course work and exams,
- •success in completing a senior thesis,
- •success in exams such as the GRE, MCAT, and job and professional school placement.

BIOLOGICAL SCIENCES

Freshman		**Fall Semester**	
BIOL	1086	Intro.. to Ecology	2
BIOL	1096	Intro.. to Biodiversity	2
BIOL	1946	Freshman Seminar	1
CHMY	141	College Chemistry I	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
M	171	Calculus I	3
		Total 15	

Freshman		**Spring Semester**	
BIOL	1116	Cell Biology	4
CHMY	143	College Chemistry II	3
CHMY	144	College Chemistry Lab II	1
COMM	1216	Principles of Speaking	
		- OR -	
COMM	1226	Public Speaking	3
BIOL/STATS		ELECTIVE	3
		Total 13	

Junior		**Fall Semester**	
BIOL	3946	Junior Seminar	1
STAT	441	Experimental Design	3
PHYS	1026	College Physics	4
BIOL	xxxx	Cellular/Organismal Track	3/4
CHMY	xxxx	Cellular/Organismal Track	3
		Total 14/15	

Junior		**Spring Semester**	
BIOL	3016	Genetics	4
BIOL	xxxx	Biology Elective	3
WRIT	322	Advanced Business Writing	
		- OR -	
WRIT	321	Advanced Technical Writing	3
PHYS	1036	College Physics	4
		Total 14	

Minimum credits for a B.S. degree in Biological Sciences 120

If additional preparatory math is needed prior to Calculus I, M 121 will satisfy free elective requirements toward the Biological Science Degree. M 095 will NOT count towards graduation requirements.

Courses required for one curricular track can serve as biology electives for the other track.

BIOLOGY ELECTIVES

BIOL 1236 Southwestern MT Flora, BIOL 1826 Environmental Issues, BIOL 2136 Nat, Hist. of Vertebrates, BIOL 2586 Basic Nutrition, BIOL 2706 Bioethics, BIOL 2746 Evolution of Man, BIOL 2956 Special Topics, BIOL 3026 Microbiology of Wine Making, BIOL 3036 Identification of Algae, BIOL 3116 Plant Ecology, BIOL 3126 Animal Ecology, BIOL 3136 Plant Physiology, BIOL 3216 General Botany, BIOL 3326 General Zoology, BIOL 3546 Industrial Toxicology, BIOL 3976 Special Problems, BIOL 4156 Alpine Ecology, BIOL 4196 Winter Ecology, BIOL 4206 Environmental Microbiology, BIOL 4600 Medical Physiology, BIOL 4706 Micro for Health Professionals, BIOL 4956 Special Topics

Sophomore		**Fall Semester**	
BIOL	2516	Anatomy & Physiology I	4
CAPP	156	MS Excel	
		- OR -	
CAPP	158	MS Access	3
HUMN	xxxx	Humanities Elective	3
STAT	216	Introduction to Statistics	
		-OR-	
STAT	332	Statistics for Scientists & Engineers	3
	xxxx	Cellular/Organismal Track	5/3
		Total 18/16	

Sophomore		**Spring Semester**	
BIOL	2526	Anatomy & Physiology II	4
BIOL	2106	Microbiology	4
BIOL	2946	Sophomore Seminar	1
	xxxx	Cellular/Organismal Track	4
	xxxx	Organismal Track	3
		Total 13/16	

Senior		**Fall Semester**	
BIOL	4106	Basics of Evolution	2
HUMN	xxxx	Humanities Elective	3
	xxxx	Biology Elective	3
	xxxx	Cellular/Organismal Track	5/6
	xxxx	Cellular Track	3
		Total 17/15	

Senior		**Spring Semester**	
BIOL	4996W	Senior Thesis	3
BIOL	xxxx	Biology Elective	3
BIOL	xxxx	Biology Elective	3
	xxxx	Cellular/Organismal Track	3/4
	xxxx	Social Science Elective	3
		Total 15/16	

BIOLOGICAL SCIENCES - Options (Choose one)

Track Cellular

Sophomore			
BIOL	2516/2526	Anatomy & Physiology I & II	8
CHMY	321	Organic Chem I	3
CHMY	322	Organic Chem Lab I	2
CHMY	323	Organic Chem II	3
CHMY	324	Organic Chem Lab II	2
Junior			
CHEM	4216	Biochemistry	3
Senior			
BIOL	4246	Molecular Biology	3
BIOL	4266	Molecular Biology Lab	2
	xxxx	Social Science Elective	3
BIOL	4366	Immunology	3

Track Organismal

Sophomore			
BIOL	3216	Botany	4
BIOL	3056	Nat. Hist. of Vertebrates	4
CHMY	210	Survey of Organic Chemistry	3
Junior			
BIOL	2516	Anatomy & Physiology I & II	8
Senior			
BIOL	3116	Plant Ecology	4
BIOL	xxxx	Biology Elective	2
BIOL	3126	Animal Ecology	4

BIOLOGY - BACHELOR OF APPLIED SCIENCE

The Biology - B.A.S. Degree is primarily designed for students who have earned an associate of applied science degree at a two-year institution who wish to move into baccalaureate program. If, while completing an A.A.S. degree, a student completes any undergraduate level or articulated technology level courses required within a Montana Tech B.A.S. degree program, those credits, plus the block transfer credits, will be applied to the B.A.S. degree requirements. A maximum of 60 credits of course work from the A.A.S. degree can be applied to the B.A.S. degree requirements. Students should see their advisor to select additional courses to complete their degree. (A minimum of 39 credits needs to be 3000-4999 level classes, upper division in order to successfully meet graduation requirements). A minimum of 120 credits is required for a BAS degree.

Block Transfer			**38 credits**
General Education Core			**30 credits**
plus 2 credits for Chem labs			
WRIT	101	College Writing I	3
WRIT	321	Advanced Technical Writing	or
WRIT	322	Advanced Business Writing	3
Humanities Elective			3
Humanities Elective (**UPPER DIV Only**)			3
Social Science Elective (**UPPER DIV Only**)			3
Social Science Elective			3
M	121	College Algebra	3
STAT	216	Introduction to Statistics	3
CHMY	141/142	College Chemistry I w/lab	4
CHMY	143/144	College Chemistry II w/lab	4

Required Biology courses			**26 credits**
BIOL	1116	Cell Biology	4
BIOL	2106	Microbiology	4
BIOL	3016	Genetics	3
BIOL	3116	Plant Ecology	4
BIOL	3126	Animal Ecology	4
BIOL	4106	Evolution	3
BIOL	4946	Seminar	1
BIOL	4996 W	Senior Thesis	3

Other required courses			
CAPP	131	Basic MS Office	3
COMM 1216 or 1226 Prin.of Speaking/Public Speaking			3

Minimum Credits for a B.A.S. in Biology: 120

Minor in Biology, please refer to reference section “MINORS”.

BAS OPTIONS (Choose 1 Track)

Track One			**(18 credits)**
CHMY	321	Organic Chem I	3
CHMY	323	Organic Chem II	3
CHMY	322	Organic Chem Lab I	2
CHMY	324	Organic Chem Lab II	2
CHEM	4216	Biochemistry	3
UPPER Division Elective (3000/4000 Level)			3
UPPER Division Elective (3000/4000 Level)			2

Track Two			**(18 credits)**
CHMY	210	Survey of Organic Chemistry	3
BIOL	4246	Molecular Biology	3
BIOL	4366	Immunology	3
UPPER Division Elective (3000/4000 Level)			3
UPPER Division Elective (3000/4000 Level)			3
UPPER Division Elective (3000/4000 Level)			1

Track Three			**(19 credits)**
CHEM	210	Survey of Organic Chemistry	3
BIOL	3216	General Botany or	
BIOL	3326	General Zoology	4
BIOL	3206	Environmental Microbiology	4
UPPER Division Elective (3000/4000 Level)			3
UPPER Division Elective (3000/4000 Level)			3
UPPER Division Elective (3000/4000 Level)			2

Business and Information Technology

Department Head: Dr. Tim Kober
(406) 496-4457
ELC 319

Administrative Assistant: Theresa O'Leary
(406) 496-4401
ELC 301

Department FAX: (406) 496-4704

Mission

The Business and Information Technology Department is committed to providing a baccalaureate education that enables its graduates to provide a life-long contribution to society by combining a firm interdisciplinary business curriculum with current information technology in a manner responsive to changing market demands.

In support of this mission, the BIT department is committed to the following:

Departmental Objectives

Prepare students for an ever-evolving business climate by offering a dynamic and emergent curriculum.
Emphasize both practical and conceptual models to produce a manager capable of insightful, comprehensive, critical and applied thinking.
Enable students to understand and apply a wide range of business analytical tools.
Connect the theory of management and leadership to the practical challenges of the workplace to be an effective problem solver.
Deliver a student with an in-depth appreciation of group dynamics and team work.
Provide an educational program of study integrating business and technology.

Program Outcomes

Graduates will be able to implement contemporary management practices.
Graduates will understand and be able to implement the strategic management process.
Graduates will be prepared to implement the business decision making process in decision analysis.
Graduates will communicate effectively using written, oral, and multimedia venues.
Graduates will be able to interpret and analyze financial statements.
Graduates will be able to work effectively on projects in either a team environment or an individual basis.
Graduates will be prepared to be life-long learners. Upon graduation, graduates will be well equipped to pursue post-baccalaureate studies.
Graduates will be ready for the technological challenges of the twenty-first century workplace.

Overview

What will strike the student entering this program is its dynamic balance between traditional business course work and information technology requirements. The curriculum integrates business and computer applications in much the same way as today's most successful, innovative businesses. Graduates work at the interface of business and information technology, enabling them to pursue a variety of career paths. Preparation from the course curriculum encourages and supports the need for continuing education of working professionals. The recommendation of sitting for a professional examination of the student's choosing reinforces this. Graduates from the business program will be instilled to understand and honor the concepts of ethics and diversity in the workplace. The curriculum includes all of the pre-professional courses required for admission into most Master of Business Administrations (MBA) programs.

The BIT degree offers students three educational options:

Accounting: Students concentrate on accounting and have the opportunity, through Tech course work, to prepare for the Certified Public Accountant and Certified Management Accountant exams. Students preparing to take the Certified Public Accountant exam should be aware that a minimum of 150 college credit hours are required prior to obtaining certification in Montana. Students are encouraged to discuss options for meeting this requirement with their advisors.

Management: The management option at Montana Tech gives students the flexibility to pursue additional management course work beyond the business core in areas of marketing, human resources, or cost management. Students completing this option are prepared to enter any number of managerial based careers or continue into graduate school.

Information Technology: This option allows students to complement general business knowledge and skills with an emphasis in information technology and in particular the management of information technology systems. Students completing this option are prepared to enter information technology management positions or continue into graduate school.

The Bachelor of Applied Science Degree in Business is also available through the department. This customized degree provides an opportunity for individuals having an Associate of Applied Science degree to apply a larger block of credit to a baccalaureate degree.

Students not enrolled in the BIT program can choose to obtain one of two minors in Business Administrations: Accounting or Management. A minor in Business Administration is a valuable addition to an engineering or other technical degree. Students should check with an academic advisor to determine if the electives within a particular discipline can be fulfilled with business courses.

Students in the Helena area can enroll in upper division courses taught by Montana Tech at The University of Montana – Helena College of Technology. Montana Tech's "Helena Program" enables students to obtain a Baccalaureate business degree while working full-time.

BUSINESS AND INFORMATION TECHNOLOGY - Accounting Option

Freshman		**Fall and Spring Semester**	
BUS	1016	Introduction to Business	3
WRIT	101	College Writing I	3
COMM	1216	Principles of Speaking	3
CAPP	156	MS Excel	3
M	141	Math for Bus. & Soc. Sci	3
M	142	Math for Bus. & Soc. Sci	3
		Physical & Life Sci. Elective	3
		Physical & Life Sci. Elect. w/ lab	3-4
		Social Science Elective	3
		Free Electives	2-3
		Total 29-31 Credits	

Sophomore		**Fall Semester**	
ACTG	201	Principles of Financial Acct.	3
ECNS	201	Principles of Microeconomics	3
C.S.	2126	Applications Programming	3
CAPP	158	MS Access	3
		Humanities Elective	3
		Total 15 Credits	

Sophomore		**Spring Semester**	
ACTG	202	Principles of Managerial Acct.	3
ECNS	202	Principles of Macroeconomics.	3
STAT	216	Intro. to Statistics	3
		CS/IT/HCI/PTC Elective	3
		Social Science Elective	3
		Total 15 Credits	

Junior		**Fall Semester**	
BUS	3636	Business Ethics (Humn Core)	3
BUS	3416	Business Law I	3
BUS	3516	Business Finance	3
ACTG	410	Cost/MGMT Acct. I	3
ACTG	301	Intermediate Accounting I	3
		Total 15 Credits	

Junior		**Spring Semester**	
BUS	3316W	Marketing	3
BUS	3666	Oper.& Production Mgmt.	3
ACTG	302	Intermediate Accounting II	3
ACTG	321	Acct. Information Systems	3
		CS/IT/HCI/PTC Elective	3
		Total 15 Credits	

Senior		**Fall Semester**	
BUS	3616W	Management	3
C.S.	4516	Data Comm. Sys. /Networks	3
ACTG	401	Principles of Fed. Taxation	3
ACTG	411	Auditing I	3
C.S.	4616	Systems Design	3
		Total 15 Credits	

Senior		**Spring Semester**	
BUS	4936	Strategic Management	3
WRIT	322	Advanced Business Writing	3
BUS	4566	Financial Markets & Institutions	3
		Free Electives	3
		Concentration Electives	3
		Total 15 Credits	

Minimum Credits for a B.S. degree in Business and Information Technology: 120

* CS/IT/HCI/PTC and concentration electives must have department approval.
** BUS 4936W Strategic Management is the department's capstone course and can only be taken within the final two semesters of study.

BUSINESS AND INFORMATION TECHNOLOGY - Management Option

Freshman		**Fall and Spring Semester**	
BUS	1016	Introduction to Business	3
WRIT	101	College Writing I	3
COMM	1216	Principles of Speaking	3
CAPP	156	MS Excel	3
M	141	Math for Bus. & Soc. Sci	3
M	142	Math for Bus. & Soc. Sci	3
		Physical & Life Sci. Elective	3
		Physical & Life Science Elect. w/lab	3-4
		Social Science Elective	3
		Free Electives	2-3
		Total 29-31 Credits	

Sophomore		**Fall Semester**	
ACTG	201	Principles of Financial Acct.	3
ECNS	201	Principles of Microeconomics	3
CAPP	158	MS Access	3
C.S.	2126	Applications Programming	3
		Humanities Elective	3
		Total 15 Credits	

Sophomore		**Spring Semester**	
ACTG	202	Principles of Managerial Acct.	3
ECNS	202	Principles of Macroeconomics	3
STAT	216	Introduction to Statistics	3
		CS/IT/HCI/PTC Elective	3
		Social Science Elective	3
		Total 15 Credits	

Junior		**Fall Semester**	
BUS	3636	Business Ethics (Humanities Core)	3
BUS	3416	Business Law I	3
BUS	3616W	Management	3
WRIT	322	Advanced Business Writing	3
C.S.	2126	Applications Programming	3
		Total 15 Credits	

Junior		**Spring Semester**	
BUS	3316W	Marketing	3
ACTG	321	Acct. Information Systems	3
BUS	3646	Human Resource Management	3
		CS/IT/HCI/PTC Elective	3
		Concentration Elective	3
		Total 15 Credits	

Senior		**Fall Semester**	
BUS	3656	Organizational Behavior	3
BUS	4516	International Business	3
C.S.	4616	Systems Design	3
BUS	3516	Business Finance	3
		Concentration Elective	3
		Total 15 Credits	

Senior		**Spring Semester**	
BUS	4936	Strategic Management	3
BUS	4566	Financial Markets & Institutions	3
BUS	3666	Operations & Production Management	3
		Concentration Elective	3
		Concentration Elective	3
		Total 15 Credits	

Minimum Credits for a B.S. degree in Business and Information Technology: 120

* CS/IT/HCI/PTC and concentration electives must have department approval

** BUS 4936W Strategic Management is the department's capstone course and can only be taken in the final two semesters of study.

BUSINESS AND INFORMATION TECHNOLOGY - Information Technology

Freshman		**Fall and Spring Semester**	
BUS	1016	Introduction to Business	3
WRIT	101	College Writing I	3
COMM	1216	Principles of Speaking	3
CAPP	156	MS Excel	3
M	141	Math for Bus. & Soc. Sci	3
M	142	Math for Bus. & Soc. Sci	3
		Physical & Life Sci. Elective	3
		Physical & Life Sci. Elect. w/lab	3-4
		Social Science	3
		Free Electives	2-3
		Total 29-31 Credits	

Sophomore		**Fall Semester**	
ACTG	201	Principles of Accounting	3
ECNS	201	Principles of Microeconomics	3
C.S.	2126	Applications Programming	3
CAPP	158	MS Access	3
		Humanities Elective	3
		Total 15	

Sophomore		**Spring Semester**	
ACTG	202	Principles of Accounting	3
ECNS	202	Principles of Macroeconomics	3
STAT	216	Introduction to Statistics	3
C.S.	2126	Applications Programming	3
		Social Science Elective	3
		Total 15 Credits	

Junior		**Fall Semester**	
BUS	3416	Business Law I	3
BUS	3636	Business Ethics (Humanities Core)	3
BUS	3616W	Management	3
WRIT	322	Advanced Business Writing	3
IT	3416	Advanced Spreadsheets	3
		Total 15 Credits	

Junior		**Spring Semester**	
BUS	3316W	Marketing	3
BUS	3666	Oper.& Production Mgmt.	3
ACTG	321	Acct. Information Systems	3
IT	3426	Advanced Database	3
		CS/IT/HCI/PTC Elective	3
		Total 15 Credits	

Senior		**Fall Semester**	
BUS	4516	International Business	3
C.S.	4616	Systems Design	3
BUS	3516	Business Finance	3
IT	4206	Information Technology Management	3
		Concentration Elective	3
		Total 15 Credits	

Senior		**Spring Semester**	
BUS	4936W	Strategic Management	3
BUS	4566	Financial Markets & Institutions	3
IT	4936	Proprietory Software	3
		Concentration Elective	3
		Concentration Elective	3
		Total 15 Credits	

* CS/IT/HCI/PTC and concentration electives must have department approval.
** BUS 4936W Strategic Management is the department's capstone course and can only be taken within the final two semesters of study.

BACHELOR OF APPLIED SCIENCE - BUSINESS

The Business - BAS degree is primarily designed for students who have earned an associate of applied science degree at a two-year institution who wish to move into a baccalaureate program. If, while completing an AAS degree, a student completes any undergraduate level or articulated technology level courses required within a Montana Tech BAS degree program, those credits, plus the block transfer credits, will be applied to the BAS degree requirements. A maximum of 60 credits of course work from the AAS degree can be applied to the BAS degree requirements. Students should see their advisor to select additional courses to complete their degree. (A minimum of 39 credits needs to be 3000-4999 level classes, (upper division) in order to successfully meet graduation requirements.)

Block Transfer (54 cr..)

General Education Core (30 cr..)

Communications			**6 cr..**
WRIT	101	College Writing I	3
WRIT	322	Adv. Business Writing	3
Humanities			**6 cr..**
Humanities Elective			3
BUS	3636	Business Ethics	3
Social Sciences			**6 cr..**
*Social Science Elective			3
ECNS	203	Principles of Economics	3
Mathematics			**6cr.**
M	141	Math for Bus. and Social Science I	3 cr..
M	142	Math for Bus. and Social Science II	3 cr..
Physical & Life Science			**6-7 cr..**
Physical & Life Science			3
Physical & Life Science w/lab Elective			3-4
Business Core			**24 cr..**
ACTG	201	Principles of Financial Acct.	3
ACTG	202	Principles of Managerial Acct.	3
ACTG	321	Accounting Information Systems	3
BUS	3316W	Marketing	3
BUS	3416	Business Law I	3
BUS	3516	Business Finance	3
BUS	3616W	Management	3
BUS	4936	Strategic Management	3

Accounting Track (12 credits)

Required			
ACTG	410	Cost / Mgmt. Acct. I	3
ACTG	301	Intermediate Accounting I	3
ACTG	302	Intermediate Accounting II	3
Concentration Elective - Pick one of the following			
ACTG	420	Cost / Mgmt. Acct. II	3
ACTG	401	Princ. of Fed Taxation	3
ACTG	411	Auditing I	3
ACTG	436	Advanced Accounting	3
ACTG	435	Governmental Accounting	3
ACTG	436	Advanced Accounting	3
ACTG	415	Gov. & Not-for-Profit Acct. I	3

Management Track (12 credits)

Required			
BUS	3646	Human Resource Management	3
Concentration Elective - Pick three of the following			
ACTG	410	Cost / Mgmt. Acct. I	3
ACTG	420	Cost / Mgmt. Acct. II	3
BUS	3126	Risk and Insurance	3
BUS	3426	Business Law II	3
BUS	3626	Labor Relations	3
BUS	3656	Organizational Behavior	3
BUS	3666	Production Management	3
BUS	4326	Marketing Research	3
BUS	4516	International Business	3
BUS	4566	Financial Markets and Institutions	3
BUS	3446	Entrepreneurship	3
BUS	3xxx/4xxx	Special Topics/Internships**	3

***Special Topics/Internship must have department approval**

****BUS 4936W Strategic Management is the department's capstone course and can only be taken within the final two semesters of study.**

* Bachelor of Science - Business & Information Technology - UM-Helena

Contact: Ms. Barbara Yahvah
UM-Helena
Helena, MT 59601
(406) 444-6822
yahvahb@umhelena.edu

MONTANA TECH COURSE				UM-H TRANSFER COURSE	
			FRESHMAN YEAR		
WRIT	101	College Writing I	3	A) WRIT 101	3
C.S.	4616	Systems Design	3	A)	3
M	141	Math for Bus. & Soc. Sci.	3	A) M 141	3
		Humanities Elective*	3	A) HIST, LITERATURE, LANGUAGE	3
		Physical & Life Sci. Core*	3	A) Any SCI course	3
BUS	1016	Introduction to Business	3	A) BUS 105	3
COMM	1216	Principles of Speaking	3	A) ENG 111T	3
C.S.	xxxx	Computer Science Elective.	3	A) Any approved I.T. course	3
M	142	Math for Bus. & Soc. Sci.	3	A) M 142	3
		Physical & Life Sci. Lab Core*	3-4	A) Any SCI course w/LAB	3/4
			SOPHOMORE YEAR		
ACTG	201	Principles of Financial Acct.	3	A) ACTG 201	3
C.S.	2126	Applications Programming	3	A) CT 131	3
ECNS	202	Principles of Macroeconomics (Social Sci Elect)	3	A) ECNS 202	3
CAPP	156	MS Excel	3	A) CT 137, 237	4
		Concentration and/or Electives	3	See Below	
ACTG	202	Principles of Managerial Acct.	3	A) ACTG 202	3
ECNS	201	Principles of Microeconomics (Social Sci Elect)	3	A) ECNS 201	3
CAPP	158	MS Access	3	A) CAPP 158	4
STAT	216	Introduction to Statistics	3	A) STAT 216	3
		Humanities Electives*	3	A) HIST, LITERATURE, LANGUAGE	3
			JUNIOR YEAR		
BUS	3416	Business Law I	3	A) BUS 246	3
BUS	3516	Finance	3	A) BUS 265	3
BUS	3616W	Management	3	A) BUS 260 (Does not count as "W")	3
		Concentration and/or Electives**	6	See Below	
BUS	3316W	Marketing	3	A) BUS 210 (Does not count as "W")	3
BUS	3666	Operations and Production Management	3	Course taught at UM-Helena	
BUS	3136	Small Business Accounting Systems	**OR**	Course taught at UM-Helena	
ACTG	321	Accounting Information System	3	Course taught at UM-Helena	
WRIT	322	Advanced Business Writing	3	Course taught on-line	
		Concentration and/or Electives**	3	See Below	
			SENIOR YEAR		
C.S.	4516	Data Comm. Systems & Networks	3	Course taught at UM-Helena	
C.S.	4616	System Design Process	3	Course taught at UM-Helena	
		Concentration and/or Electives**	9	See Below	
BUS	4566	Financial Markets & Institutes	3	Course taught at UM-Helena	
BUS	4936W	Strategic Management	3	Course taught at UM-Helena	
		Concentration and/or Electives**	9	See Below	

*Choose electives so that the General Education Core Requirements are satisfied. Refer to the general education core requirements in previous section.
Concentration and/or elective credits must be selected from the lists, which follow, in accordance with the **option the student has chosen.

MANAGEMENT OPTION

Concentration Electives (Communication) (9 Credits Required)

BUS	3656	Organization Behavior	3	Course taught at UM-Helena
COMM	1226	Public Speaking	3	A) ENG 131
WRIT	201	College Writing II	3	A) WRIT 201

Concentration Electives (Management) (12 credits required)

BUS	3126	Risk and Insurance	3	Course taught at UM-Helena
BUS	3426	Business Law II	3	Course taught at UM-Helena
BUS	3626	Labor Rel. and the Coll. Barg. Proc	3	Course taught at UM-Helena
BUS	3636	Business Ethics	3	Course taught at UM-Helena
BUS	3646	Human Resource Management	3	Course taught at UM-Helena
PLUS				
		Upper Division Electives	6	A) See advisor
F.E.	XXXX	Free Electives	2 credits	A) See advisor

Minimum Credits for B.S. degree in Business Information Technology 127

Bachelor of Applied Science – Business UM - Helena

Contact: Ms. Barbara Yahvah
113 Reeders Alley
Helena, MT 59601
(406) 444-6822
yahvahb@umhelena.edu

This articulation agreement applies for the following degrees: (1) All AAS degrees; (2) AA in Accounting or Business; (3) AS in Accounting Technology, Business Technology or Computer Technology. Students should see their advisor to plan their transfer into BAS.

Any specific UM-Helena course will only be transferred in one of the following categories: (1) Block transfer; (2) General Education Core; or (3) Business concentration. Classes cannot be counted in more than one category. Please see your advisor to maximize the transferability of your classes.

BLOCK TRANSFER UM-Helena (51 cr..)

General Education Core **(30 cr..)**

Communications			**6 cr..**	
WRIT 101	College Writing (College Writing I)		3 cr..	UM-H
WRIT 322	Advanced Business Writing		3 cr..	**TECH**
Humanities			**6 cr..**	
Humanities Elective		HIST, LITERATURE, LANGUAGE	3 cr..	UM-H
BUS 3636 Business Ethics			3 cr..	**TECH**
Social Sciences			**6 cr..**	
ECNS 202	Principles of Macroeconomics		3 cr..	UM-H
ECNS 201	Principles of Microeconomics		3 cr..	UM-H
Mathematics			**6cr.**	
MA 110	Probability and linear Math		3 cr..	UM-H
M 171 OR STAT 216	Calculus or Statistics		3 cr..	UM-H
Physical & Life Science			**6-7 cr..**	
Physical & Life Science Elective		BIOL, CHEM, GEOL, PHYS, SCI	3 cr..	UM-H
Physical & Life Science Elective w/LAB		BIOL, GEOL, PHYS, SCI	4 cr..	UM-H
Business Concentration Required:			**27 cr..**	
ACCT 201	Principles of Financial Accounting		3 cr..	UM-H
ACCT 202	Principles of Managerial Accounting		3 cr..	UM-H
BUS 210	Marketing **(BUS 3316W)**		3 +	UM-H **(TECH)**
BUS 246	Business Law I **(BUS 3416)**		3 +	UM-H **(TECH)**
BUS 260	Management **(BUS 3616W)**		3 +	UM-H **(TECH)**
ACTG 321	Accounting Information Systems		3 +	**TECH**
BUS 3516	Business Finance		3 +	**TECH**
BUS 3646	Human Resource Management		3 +	**TECH**
BUS 4936W	Strategic Management		3 +	**TECH**
Business Concentration Electives (choose 4 courses)			**12 cr..**	
BUS 3426	Business Law II		3 +	**TECH**
BUS 3446W	Entrepreneur. & Tech Enterprise Dev. I		3 +	**TECH**
BUS 3626	Labor Relations		3 +	**TECH**
BUS 3656W	Organizational Behavior		3 +	**TECH**
BUS 3666	Operations & Production Management		3 +	**TECH**
BUS 3126	Risk & Insurance		3 +	**TECH**
BUS 4516	International Business		3 +	**TECH**
BUS 4566	Financial Markets & Institutions		3 +	**TECH**
BUS 4326	Marketing Research		3+	**TECH**

Any courses that are remedial in nature, such as math courses below College Algebra will not be counted in the block transfer credits.

+Meets the upper division requirements for a B.A.S. (minimum 39 credits).

Students must complete at least 30 credits through Montana Tech of The University of Montana.

Some courses may have prerequisites or require specific test scores for enrollment. Prerequisite courses not listed on this agreement may not count towards a students transfer into the bachelor's degree program.

Minimum Credits for BAS degree in Business 120

CHEMISTRY

Department Head: Dr. Douglas Cameron
(406) 496-4247
CBB 215

Administrative Assistant: Wilma Immonen
(406) 496-4182
CBB 224

Fax: (406) 496-4135

The Department of Chemistry and Geochemistry offers a B.S. degree in Chemistry and a M.S. degree in Geochemistry. The undergraduate degree is certified by the American Chemical Society and a student who fulfills the requirements described under the Professional option will be certified by ACS. The undergraduate curriculum allows sufficient electives for students to tailor their program to match career objectives.

Several areas of specialization are available at the undergraduate level. Each is designed to enhance knowledge in the special area while maintaining a strong chemical orientation. Areas of specialization include, Biochemistry, Environmental Chemistry (ACS certified), Geology-Geochemistry, and Professional (ACS certified). Internship opportunities are also available for students who wish to incorporate practical work experience with their academic studies.

Mission of the Department of Chemistry & Geochemistry:
The mission of the Department of Chemistry and Geochemistry is to pursue a better understanding of the world through scholarship involving faculty working with undergraduate and graduate students and to communicate that understanding to students and the public through exemplary teaching and outreach.

Objective of the Department of Chemistry & Geochemistry:
The objective of the Montana Tech Department of Chemistry and Geochemistry is to broadly educate its majors in the field of chemistry and to provide these students with the knowledge and tools to succeed in pursuing careers in industry, education, government, or professional fields.

Montana Tech graduates with a B.S. in Chemistry will:

- Have a general working knowledge of inorganic, organic, analytical, physical, and optionally biochemistry;
- Be able to effectively apply mathematics through calculus and introductory physics to understanding chemistry;
- Be proficient in basic and safe chemical laboratory skills;
- Understand the principles and applications of modern instrumentation, computation, experimental design, and data analysis;
- Be able to apply, adapt, and extend their knowledge to solve a wide variety of chemical and technical problems;
- Have effective oral and written communication skills;
- Be able to access, read, understand, and use the scientific literature;
- Be able to work with others to solve chemical problems as a team;
- Compete successfully for careers in industry, government, education, or health care.

These outcomes will assessed by:

- Taking and passing the specific courses that constitute the B. S. Chemistry curriculum;
- By national standardized exam scores;
- The successful completion of capstone experiences in undergraduate research and/or chemistry seminar;
- Surveys of our undergraduates at the end of the sophomore and at senior years;
- Placement rates.

Faculty members in chemistry are actively involved in many areas of both fundamental and applied research with a primary focus in the area of environmental geochemistry , material science, and energy. Areas of research include remediation of mine waste and other environmental problems, isolation and structural elucidation of compounds from microorganisms for use in biofuels, chemical applications of graph theory, computer modeling of clay surfaces, inorganic and organometallic synthesis, and chemical education. Participation by undergraduate students in faculty research is strongly encouraged and required for the Professional option. A number of undergraduate research and teaching assistantships are available in the department to facilitate student participation.

The Chemistry degree offers students four educational options:

Biochemistry Option: This option is for students interested in pursuing careers in research and/or professional practice in biomedicine and health care, including careers in biotechnology, medicine, medical technology, pharmacy, dentistry, etc. The Biochemistry Option is designed to produce graduates whose educational preparation should be well suited for entering graduate or professional schools in biomedicine or for seeking employment with biotechnological companies. This objective is accomplished in the proposed Biochemistry Option by including several appropriate courses in biology and by increasing the emphasis on biological processes in the chemistry curriculum. The full curriculum in the option is described in detail in the following pages.

Environmental Chemistry (ACS certified): This option is for chemistry majors who also desire a strong background in the environmental sciences. In addition to completing all of the requirements for an ACS certified chemistry degree (see the Professional option listed below), students pursuing this option will take courses in biology, geology, and environmental engineering designed to provide the fundamental understanding necessary to work in the environmental field. Additional courses required under this option are Biol. 1116, BIOL 3106, CHMY 442, CHMY. 430, ENVE 2040, ENVE 1180, GEO 101, GEOE 420, and (STAT 332 or STAT 441). In addition the undergraduate research required for ACS certification must be directed toward an environmental topic.

Geology-Geochemistry: This option is designed particularly for those wanting a strong background in geology. A student considering entry into the Master's program in Geochemistry offered by the department is strongly urged to follow this option. With the completion of the courses required for the option, a student would be able to enter directly into the Geochemistry Master's program. The Geology-Geochemistry option includes the following courses: GEO 101, 204, GEOE 403, 420; CHMY. 442, and 430.

Professional (ACS certified): This option is designed for majors anticipating graduate study or research-oriented positions in chemistry. Several of the courses that are optional under the basic program are required under this plan. A minimum of 3 credits of senior research and a paper on this research is required. The Professional option requires the following courses: CHMY. 401, 403, Chem 4216, and CHMY 435.

CHEMISTRY

Freshman		**Fall Semester**	
CHMY	141	College Chemistry I	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
M	171	Calculus I	3
		Electives	3 or 6
		Total 13-16	

Sophomore		**Fall Semester**	
CHMY	321	Organic Chemistry I	3
CHMY	322	Organic Chemistry I Lab	2
C.S.	2xx6**	Computer Programming	3
M	273	Calculus III	4
PHYS	2076	General Physics	3
PHYS	2096	Physics Laboratory	1
		Total 16	

Freshman		**Spring Semester**	
CHMY	143	College Chemistry II	3
CHMY	144	College Chemistry Lab II	1
M	172	Calculus II	3
PHYS	1046	General Physics-Mechanics	3
		Electives	6
		Total 16	

Sophomore		**Spring Semester**	
CHMY	323	Organic Chemistry II	3
CHMY	324	Organic Chemistry II Lab	2
M	274	Differential Equations	3
PHYS	2086	General Physics	3
PHYS	2106	Physics Laboratory	1
		Electives	3
		Total 15	

Junior		**Fall Semester**	
CHMY	311	Analytical Chem Quantitative Anlys	4
CHMY	302	Chem. Literature & Science Writ.	2
CHMY	371	Phys Chm.- Quantum Chem & Spect.	3
CHMY	372	Physical Chemistry I Lab	1
M	xxx	***300 or higher Elective	3
		Electives	3
		Total 16	

Senior		**Fall Semester**	
CHMY	494	Chemistry Seminar	1
CHMY	4xxx	4000 level Chem Elective	3
CHMY	4xxx	4000 level Chem Elective	3
WRIT	321	Advanced Technical Writing	
		Or	
WRIT	322	Advanced Business Writing	3
		Electives	3
		Total 13	

Junior		**Spring Semester**	
CHMY	421	Adv. Instrumental Analysis	4
CHMY	373	Phys.Chm - Kinetics & Thermo.	3
CHMY	374	Physical Chemistry II Lab	2
		Electives	6
		Total 15	

Senior		**Spring Semester**	
CHMY	494	Chemistry Seminar	1
CHMY	4xxx	4000 level Chem Elective	3
CHMY	4xxx	4000 level Chem Elective	3
		Electives	8
		Total 15	

Minimum credits for a B.S. degree in Chemistry 120

12 credits of Chemistry electives to be chosen from the following courses and to be distributed among at least two divisions, i.e., Organic, Physical, Inorganic or Analytical:

Organic:	CHEM. 4216, 4226, CHMY 411
Inorganic:	CHMY 401, 403
Physical:	CHMY. 442, 4430
Analytical:	CHMY. 465
Biochemistry	*See curriculum on next page*

** C.S. 2106, 2126, 2136, or C.S. 2146.

***Math xxx elective must be chosen from M 333, 405, 410, or STAT 322, 411.

For information regarding Secondary Education Certification in conjunction with The University of Montana - Western, please refer to the pre-professional section.

Minor in Chemistry, please refer to reference section “MINORS”. Also Pre-Pharmacy is referred to in the same reference section under “Pre-Professional Programs”.

CHEMISTRY (Biochemistry Option)

Freshman		**Fall Semester**	
CHMY	141	College Chemistry I	3
CHMY	142	College Chemistry Lab	1
WRIT	101	College Writing I	3
STAT	131	Intro. to Biostatistics	3
PPH	1006	Pre-Professional Health Seminar	1
		Electives	3
		Total 14	

Freshman		**Spring Semester**	
BIOL	1116	Cell Biology	4
BIOL	2706	Bioethics	3
CHMY	143	College Chemistry II	3
CHMY	144	College Chemistry Lab II	1
		Electives	3
		Total 14	

Junior		**Fall Semester**	
BIOL	2516	Anatomy & Physiology I	4
CHMY	311	Analytical Chm. - Quantitative analys.	4
CHMY	302	Chm.Literature & Science Writing	2
CHMY	371	Phys. Chm - Quantum chm & Spect.	3
CHEM	4216	Biochemistry I	3
		Total 16	

Junior		**Spring Semester**	
BIOL	3106	Genetics	4
CHEM	4226	Biochemistry II	3
CHEM	4236	Biochemistry Lab	1
CHEM	4986	Undergraduate Research	1
		Electives	6
		Total 15	

Sophomore		**Fall Semester**	
*C.S.	2xx6	Computer Programming Elective	3
CHMY	321	Organic Chemistry I	3
CHMY	322	Organic Chemistry I Lab	2
M	171	Calculus I	3
PHYS	1026	College Physics	4
PHYS	2096	Physics Laboratory	1
		Total 16	

Sophomore		**Spring Semester**	
BIOL	2106	Microbiology	4
CHMY	323	Organic Chemistry II	3
CHMY	324	Organic Chemistry II Lab	2
M	172	Calculus II	3
PHYS	1036	College Physics	4
PHYS	2106	Physics Laboratory	1
		Total 17	

Senior		**Fall Semester**	
BIOL	4226	Molecular Biology Lab	1
BIOL	4246	Molecular Biology	3
CHMY	401	Adv. Inorganic Chem I	3
CHMY	494	Chemistry Seminar	1
CHMY	490	Undergraduate Research	1
WRIT	321	Advanced Technical Writing	**OR**
WRIT	322	Advanced Business Writing	3
STAT	441	Experimental Design	3
		Total 15	

Senior		**Spring Semester**	
BIOL	4306	Immunology	3
CHMY	494	Chemistry Seminar	1
CHMY	490	Undergraduate Research	1
STAT	432	Regress. & Model Building	3
		Electives	5
		Total 13	

Minimum credits for a B.S. degree in Chemistry with an option in Biochemistry 120

*C.S. 2106, 2126, 2136, or 2146.

COMPUTER SCIENCE

Department Head: Dr. Michele Van Dyne
(406) 496-4855
MUS 208

Administrative Assistant: Tami Windham
(406) 496-4366
MUS 201

Department FAX: (406) 496-4756

The Computer Science program is accredited by the Accreditation Board for Engineering and Technology/ Computing Accreditation Commission (ABET/CAC). It is housed in the Computer Science department which provides instruction and laboratory experience to students of most other majors on campus. The program maintains a balance of theory and practical experience, made possible by low class sizes and a low student to faculty ratio. There are several computing labs across campus that are open to students of all majors. The Computer Science department laboratory is centrally located between faculty offices, enabling significant student-faculty interaction. This lab contains computers running MS Windows and Linux.

(Note: If you are interested in a career in software development, also see the *Software Engineering* program description in this catalog.)

Program Mission: Our program prepares students to solve problems using computers. Our graduates positively influence how computer technology affects the world and carry on our institution's tradition of excellence. Our graduates have excellent skills, a "can do" attitude, and meet industry expectations right out of college.

During the first three to five years after graduation our CS graduates will have:

1. Adapted, thrived, and contributed in an industry setting or completed a graduate program
2. Improved the software development process or computing environment of the workplace using their broad theoretical and practical knowledge of computation
3. Demonstrated an ongoing commitment to professional development.

At the time of graduation, all Computer Science students will have demonstrated the ability to:

CS/SE1	Understand professional and ethical responsibilities
CS/SE2	Work with clients and co-workers, have tact, and see things from other perspectives
CS/SE3	Identify and evaluate technical alternatives
CS/SE4	Identify and evaluate non-technical alternatives
CS/SE5	Apply oral and written skills effectively
CS6	Use the techniques and tools of modern computing and software development
CS/SE7	Work effectively in multidisciplinary teams
CS/SE8	Understand the need for professional development and historical perspective
CS/SE9	Learn new technologies independently
CS/SE10	See a multistage project/task through to completion
CS/SE11	See the essence of the problem and design a solution
CS/SE12	Stay current with respect to societal issues relating to computer technology
CS/SE13	Apply quantitative methods to software development
CS14	Apply skills gained in math, science and logic
CS/SE15	Be technically proficient and able to perform all phases of software development
CS/SE16	Work effectively in a wide variety of domains
CS17	Observe, use, reflect on, and refine software development processes and computing infrastructure

This section refers to the curriculum on the next page:
*Science electives must include a two-semester sequence of laboratory science and a minimum of 12 credits total: Either (1) BIOL 1086, 1096, and 1116 plus 4 more science credits; (2) CHMY 141 w. lab 142, CHMY 143 w. lab 144 plus 4 more science credits; (3) GEO 101, plus 5 more science credits; (4) PHYS 1046, 2076 w. lab 2096, and PHYS 2086 w. lab 2106 plus 1 more science credit (take the physics sequence for the Electronic Control Systems option).

**COMM 1216 Princ of Speaking or COMM 1226 Public Speaking can replace COMM 2016. C.S. 4606 Senior Design Project can replace C.S. 4916 Internship. Students in the Business Applications, Electronic Control Systems, Engineering Applications, and Statistics Applications options may replace WRIT 321 Advanced & Technical Writing with WRIT 325 Writing in the Sciences or WRIT 322 Advanced Business Writing.

Minor in Computer Science, please refer to reference section "MINORS".

COMPUTER SCIENCE

Freshman		Fall Semester	
C.S.	1006	CS/SE Freshman Seminar	1
C.S.	2106	Intro. to Computer Sci. I	3
WRIT	101	College Writing I	3
M	171	Calculus I**	3
HUMN	xxxx	Humanities Elective	3
		Social Science Elective	3
		Total 16	

Freshman		Spring Semester	
C.S.	2116	Intro. to Computer Sci. II	3
COMM	2016	Presenting Technical Information**	3
M	172	Calculus II	3
		Social Science Elective	3
		Science Elective*	3
		Total 15	

Junior		Fall Semester	
S.E.	3250W	Software Engineering I	3
STAT	332	Stats for Scientists & Engineers	3
WRIT	321	Advanced Technical Writing	3
		Science Elective*	3
		Professional Elective	3
		Total 15	

Junior		Spring Semester	
C.S.	3356	Programming Language	3
C.S.	4406	Computer Architecture	3
		Humanities Elective	3
S.E.	3260	Software Engineering II	2
		Professional Elective	3
		Total 14	

Sophomore		Fall Semester	
C.S.	2156	Embedded Systems Developmt	3
C.S.	3166	Discrete Structures	3
M	273	Multivariable Calculus	4
C.S.	3316	Data Struct & Algor. I	3
		Science Elective*	3
		Total 16	

Sophomore		Spring Semester	
C.S.	2656	Database Management	3
M	333	Linear Algebra	3
C.S.	3326	Data Struct & Algor. I I	3
M	274	Intro. to Differential Equations	3
		Science Elective*	3
		Total 15	

Senior		Fall Semester	
C.S.	3406	Operating Systems	3
C.S.	4386	Theory of Comuptation	3
C.S.	4916	Internship**	2
		Professional Elective	3
C.S.	4526	Networking Principles	3
		Total 14	

Senior		Spring Semester	
C.S.	4356	Web Science	3
C.S.	4556	Artificial Intelligence	3
C.S.	4916	Internship**	2
C.S.	4946	Senior Seminar	1
M	410	Numerical Compt. for Sci. & Eng.	3
		Professional Elective	3
		Total 15	

Minimum Credits for a B.S. in Computer Science 120

Professional Electives – Junior & Senior Years

BUSINESS APPLICATIONS OPTION (12 Credits)

Junior			Fall	Spring
ACTG	201	Princ. of Financial Acct.	3	
ACTG	202	Princ. of Managerial Acct.		3

Senior		Fall	Spring
*BUS3316W	Marketing		3
*BUS3416	Business Law I	3	
*BUS3516	Business Finance	3	
*BUS3616W	Management		3

*Select 2 courses out of 4

ELECTRONIC CONTROL SYSTEMS OPTION (12 Credits)

Junior			Fall	Spring
PHYS	3036	Electronics	3	
***E.E.	2530	Intro. to Electric Circuits		3

Electronic Circuits Sequence

**E.E.	2550	Intro. to Electric Circuits Lab		1
*E.E.	3270	Digital Circuit Design	3	
E.E.	3550	Electric Circuits II		4
*E.E.	3570	Electronic Design		3
*GEOP	446	Applied Linear Systems	3	

Electronic Control Sequence

**E.E.	2550	Intro. to Electric Circuits Lab		1
E.E.	4450	Process Instrum. & Control	3	
**E.E.	4460	Process Instrum. & Cont. Lab	1	
E.E.	3270	Digital Circuit Design		3

Microprocessor Sequence

**E.E.	2550	Intro. to Electric Circuits Lab		1
E.E.	3270	Digital Circuit Design		3
E.E.	4280	Intro. to Microprocessors	3	

*Select 1 course of 3;
**Take at least one to reach 13 credits of professional electives if short 1 credit of science;
***Microprocessor Sequence students take E.E. 2530 & 2550 in their Senior year.

ENGINEERING APPLICATIONS OPTION (12 Credits)

Junior			Fall	Spring
ENGR	1050	Introduction to General Engr.	1	
ENGR	2050	Statics	3	
ENGR	2060	Dynamics		3
ENGR	2150	Engineering Computer Graphics		3

Senior			Fall	Spring
ENGR	3350	Mechanics of Materials	3	
ENGR	3360	Mechanics of Materials Lab	1	
ENGR	3150	Intro. Engr Computer Applications		2
ENGR	4150	Engineering Computer Appl.		3

*Select 2 or more to reach minimum 12 credits within the option.

STATISTICS APPLICATIONS OPTION (12 Credits)

Students in the Statics option need to take MATH 3316 before beginning the courses in the option.

Junior			Fall	Spring
*STAT	441	Experimental Design	3	
*STAT	432	Regression & Model Building		3

Senior			Fall	Spring
STAT	421	Probability Theory	3	
*STAT	442	Mathematical Statistics		3
*STAT	435	Statistical Computing & Exp Data Ana		3

*Select 3 courses out of 4

TECHNICAL COMMUNICATION OPTION (12 Credits)

PTC	3406	New Media Design I	3	
*WRIT	321	Advanced Technical Writing		3
*WRIT	322	Advanced Business Writing		3
*WRIT	325	Writing in the Sciences	3	
*WRIT	350	Technical Editing		3
*PTC	4406	New Media Design II		3
*PTC	4126W	Advanced Writing		3
*PTC	4426W	History, Technology, & Comm.		3

*Select 3 courses out of 8

GENERAL SCIENCE

Program Head: Dr. Richard J. Douglass
(406) 496-4450
CBB 220

Administrative Assistant: Wilma Immonen
(406) 496-4182
CBB 224

Department FAX: (406) 496-4135

The general science curriculum allows students to design programs with more breadth than traditional science programs. Many modern fields of inquiry (medicine, neuroscience, biophysical science) and K-12 science education encompass several scientific disciplines. The General Science degree provides students interested in graduate work, careers in health sciences, science related business or science education the appropriate broad background in science.

The General Science Program allows pre-health students preparing for careers in medicine, dentistry or related fields to meet professional school admissions requirements while completing a Bachelor of Science degree. General Science, when combined with a second major can work well for students planning careers in science-related business, public relations, and human services. General Science combined with a Master's degree in education provides excellent training for science education.

Montana Tech graduates with a B.S. in General Sciences will:

- Have a general working knowledge of science in general and a deeper understanding in at least two fields,
- Be proficient in using basic science techniques in solving problems,
- Have effective oral and written communication skills,
- Be able to use scientific literature,

Outcomes will be assessed by:

- Normal course work and exams,
- Success in profession exams such as the GRE and MCAT,
- Acceptance into graduate and professional schools,
- Placement as elementary and high school teachers.

GENERAL SCIENCE

Freshman		**Fall Semester**	
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
GEO	101	Intro. to Physical Geology	3
CAPP	131	Basic MS Office	3
M	151	Precalculus	4
		Total 17	

Freshman		**Spring Semester**	
BIOL	1116	Cell Biology	4
CHMY	143	College Chemistry II	3
CHMY	144	College Chemistry Lab II	1
SOCS	2486	General Anthropology	3
CAPP	156	MS Excel	3
xxxx		xxxx Free Electives	2
		Total 16	

Junior		**Fall Semester**	
ENVE	2040	Environmental process Engineering	3
MATH	4316	Experimental Design	3
STS	2016	Technology & Society	3
	xxxx	Minor Electives	3
	xxxx	Minor Electives	3
		Total 15	

Junior		**Spring Semester**	
BIOL	3116	Plant Ecology or	
BIOL	3126	Animal Ecology	4
	xxxx	Minor Electives	6
	xxxx	Minor Electives	3
		Total 13	

Sophomore		**Fall Semester**	
BIOL	2746	Evolution of Man	3
GEOE	2020	Historical Geology	3
M	171	Calculus I	3
PHYS	1026	College Physics	4
	xxxx	Minor Electives	3
		Total 16	

Sophomore		**Spring Semester**	
ECNS	203	Principles of Economics	3
M	172	Calculus II	3
STAT	216	Intro. to Stats	OR
STAT	332	or Stats for Sci. & Engineers	3
PHYS	1036	College Physics	4
	xxxx	Minor Electives	3
		Total 16	

Senior		**Fall Semester**	
WRIT	322	Advanced Business Writing	-OR-
WRIT	321	Advanced Technical Writing	3
STAT	432	Regression & Model Building	3
	xxxx	Minor Electives	3
	xxxx	Minor Electives	3
	xxxx	Humanities Elective	3
		Total 15	

Senior		**Spring Semester**	
	xxxx	Humanities Elective	3
	xxxx	Minor Electives	3
	xxxx	Minor Electives	6
	xxxx	Seminar	1
		Total 13	

Minimum Credits for a B.S. in General Science: 120

For a student whose first Mathematics course at Montana Tech is calculus, these additional courses would most likely be M 273 and M 274. In addition, the B.S. in General Science requires that the student complete the requirements for a minor in two of the following areas: Biology; Chemistry; Computer Science; Geosciences; Mathematics; Professional & Technical Communication. Seminar must be taken in one of the two areas in which the student is obtaining a minor.

A Bachelor of Science degree in General Science with Honors is available. Students with a GPA of 3.50 (a minimum of 30 credits must have been earned at Montana Tech) or higher must apply for admission to the General Science Steering Committee in the 4th semester of the General Science program. Honors students must complete and orally defend a formally written undergraduate thesis (of at least 3 and preferably 6 credits) based on research or a special project. Honors students must present the work on which the thesis is based at an approved forum.

HEALTH CARE INFORMATICS

Program Coordinator: Mr. Gary Mannix
(406) 496-4345
MUS 105

Administrative Assistant: Wilma Immonen
(406) 496-4182
CBB 224

Department FAX: (406) 496-4135

Mission

The mission of the Health Care Informatics Program is to give our students an educational experience that provides them with the knowledge, skills and tools needed to be effective members and/or leaders in multidisciplinary groups responsible for the design and development, implementation, evaluation and management of health care information systems.

Educational Objectives & Outcomes

- have a general working knowledge of computer science, health care systems, health care organization and delivery, information systems, and telecommunications.
- understand the principles and applications of information systems in data management and information processing at a level that enables the graduate to work in the health care system, health software development industry, pharmaceutical industry or consulting organizations.
- develop skills to analyze and describe the workflow for software application development, design of new applications or improve the work process in the organization.
- be able to work in an interdisciplinary team with physicians, nurses and other professionals in different settings such as hospitals, ambulatory settings, long term health care agencies, insurance and managed care organizations, government agencies and vendor firms to select, implement, manage and/or evaluate information system solutions that address problems in the delivery of health care.
- be an effective member of an interdisciplinary team who is able to work with others to develop plans, achieve goals, and solve problems as a project manager.
- have effective oral and written communication skills
- have effective presentation skills and make effective use of presentation software.
- be able to access, read, understand, and make a critical analysis of health care informatics literature to be life-long learners.
- be able to compete successfully for careers in health care delivery sector, health care financing sector, health care information systems vendors, pharmaceutical industry, health services research, government, or education.

These outcomes will be assessed by:

- achievement of the specific objectives in the courses constituting the B. S. in HCI.
- successfully completing the internship and practicum experiences in health care informatics.
- satisfaction surveys given to preceptors of the internships and practicums.
- satisfaction surveys given to employers of HCI students.
- placement rates.

Health Care Informatics

Freshman		**Fall Semester**	
CHMY	121	Intro. to General Chemistry	3
HCI	1016	Into to Health Care Informatics	3
CAPP	131	Basic MS Office	3
M	121	College Algebra	3
PSYX	100	Intro. Psychology	3
		Total 15	

Sophomore		**Fall Semester**	
BIOL	2016	Anatomy & Physiology	4
BUS	1016	Intro. to Business	3
HCI	2156	Health Care Facilities Procedures	3
HCI	2256	Data, Info. & Knowledge	2
C.S.	2126	Applications Programming	3
		Total 15	

		Spring Semester	
CHMY	123	Intro. to Organic and Biochemistry	3
CHMY	122	Intro. to General Chem Lab	1
WRIT	101	College Writing I	3
HCI	1206	Medical Data and Terminologies	3
SOCI	101	Intro. to Sociology	3
CAPP	158	MS Access	3
		Total 16	

		Spring Semester	
BIOL	2026	Anatomy & Physiology	4
*BUS/C.S.3XXX		Business or Computer Science Elective	3
CAPP	156	MS Excel	3
HCI	2306	Overview of HCI Systems	4
COMM	2016	Presenting Technical Info & Lab	2
		Total 16	

Optional Exit point with Associate of Applied Science in Health Care Information Technology 62 Credits

Junior		**Fall Semester**	
HUMN	xxxx	Humanities Elective	3
HCI	3106	HC Delivery in the US I	3
WRIT	322	Advanced Writing	3
STAT	131	Intro. to Biostatistics	3
HCI	3406	EHR for Med Practice	3
		Total 15	

Senior		**Fall Semester**	
*BUS/C.S.3XXX		Business or Computer Science Elective	3
C.S.	4616	Systems Design Process	3
C.S.	4206	Decision Support Systems	3
HCI	4106	Proj & Sys Management	4
HCI	4206	Public Health Informatics	3
		Total 16	

		Spring Semester	
*BUS/C.S.XXXX		Business or Computer Science Elective	3
HCI	3126	HC Delivery in the US II	3
COMM	3276	Interpersonal Communication	3
HCI	2106	Health Care Ethics and Regulations	3
STAT	435	Stat. Comp & Expl Data	3
		Total 15	

		Spring Semester	
HCI	4306	HC Informatics Practicum	6
HCI	4916	HC Informatics Internship	6
		Total 12	

Minimum credits for a B.S. degree in Health Care Informatics 120 credits.

*For the B.S. degree, students may focus in either Computer Science or Business:

In the Computer Science focus, students need:

- C.S. 3126 Advanced Applications Programming
- C.S. 4516 Data Communication Systems and Networks
- Either BUS 3616W Management or
- BUS 3656W Organizational Behavior.

In the Business focus, students need:

- BUS 3616W Management 3616W Management
- BUS 3656W Organizational Behavior
- Either C.S. 3126 Advanced Applications Programming or
- C.S. 4516 Data Communication Systems and Networks.

Computer Science Minor Option available

Business Minor Option Available

Minor Requirements

HCI Core Classes (all students must complete)

HCI	**1016**	**Intro. To Health Care Informatics**
HCI	**3106**	**Health Care Delivery in the US I**
HCI	**3406**	**EHR in Medical Practice**

HCI Optional Classes (students must complete a minimum of 9 credits from the optional classes listed below.)

Business (Suggested)		
HCI	2106	Health Care Ethics and Regulations
HCI	4106	Projects and Systems Management
HCI	2256	Data, Information, and Knowledge
HCI	3206	Information Systems Security
HCI	3126	Health Care Delivery in the US II

Nursing (Suggested)		
HCI	2106	Health Care Ethics and Regulations
HCI	4106	Projects and Systems Management
HCI	4206	Public Health Informatics
HCI	4946	Health Care Seminar

Liberal Studies

Department Head: Dr. Jack Crowley
(406) 496-4462
MAIN 105A

Administrative Assistant: Evelyn Merkle
(406) 496-4275
MAIN 104

Department FAX: (406) 496-4510

The Liberal Studies Program continues a Montana Tech tradition of offering quality courses in the Humanities and Social Sciences The program stresses self-expression, self-definition, and self-fulfillment. Students are encouraged to develop their intellectual capacities as well as the ability to think analytically, creatively, and critically. Personal advising attention, abundant electives, and systematic career planning help prepare LS students for rewarding careers.

Mission

The mission of the Liberal Studies Program is to provide students with a broad-based, quality education in the Humanities and Social Sciences, leading to a Bachelor of Science degree with a strong career focus.

Educational Objectives

The educational objectives of the Liberal Studies Program include the following:

1. Graduates will be prepared to pursue a successful career in a field consistent with their interests and abilities.
2. Graduates will demonstrate a set of valuable theoretical and practical skills.
3. Graduates will understand the interaction of people within societies and their ethical obligations as members of society.

Educational Outcomes

The educational outcomes of the Liberal Studies Program include the following:

1. The ability to communicate effectively in both oral and written form.
2. The ability to demonstrate a capacity for critical thinking.
3. The ability to work cooperatively with others in groups and teams.
4. An awareness of human diversity and exposure to a variety of cultures.
5. An understanding of human history and social interaction.
6. An appreciation for the role of philosophy, the arts, and literature in society.
7. A commitment to life-long learning.

Assessment

The Liberal Studies Program is committed to an assessment process that extends through the undergraduate years and beyond graduation, to ensure consistent quality and to facilitate improvements to the Liberal Studies curriculum.

LIBERAL STUDIES

Communications & Literature 27 Credits

WRIT	101	College Writing I	3
WRIT	201	College Writing II	3
LIT	126/1126	Intro. to Poetry, Drama, Fiction	3

Select any 18 credits in this group

LIT	223, 224	British Literature I &II	3, 3
LIT	210, 211	American Literature I & II	3, 3
LIT	231, 232	Modern & Ancient World Lit.	3, 3
FRCH	401, 402	French Literature	3, 3
HUMN	4xxxW	Special Topics	3

May substitute 10 credits of Foreign Language

History - 18 Credits

Select any two 6-credit sequences for 12 credits

HSTR	101, 102	Western Civilization I & II	3, 3
HSTA	101, 102	American History I &II	3, 3
HSTR	201, 202	The 20th Century World	3, 3

Plus

HUMN	4956	Special Topics	6

Speech Communications - 12 credits required

COMM	1216	Principles of Speaking	3
COMM	1226	Public Speaking	3

Select any 6 credits

COMM	3226	Group Dynamics	3
COMM	3246W	Business & Prof. Communication	3
COMM	3276W	Interpersonal Communication	3
COMM	4216	Public Rel. Practice & Mgmt	3
COMM	4296	Communication Theory	3

Humanities & Social Science - 18 Credits

Select only 12 credits from this group- 12 credits

PSYX	100	Intro. to Psychology	3
SOCI	101	Introduction to Sociology	3
SOCI	201	Social Problems	3
HUMN	2396	Introduction to Philosophy	3
HUMN	1086	Art & Music	3
SOCS	2486	General Anthropology	3
GPHY	121	Human Geography	3
ECNS	203	Principles of Economics	3
PSCI	101	Introduction to Poli. Sci.	3
PSCI	210	Intro. to American Gov't	3
PSCI	260	Intro. to State & Local Gov't	3
PSYX	230	Developmental Psychology	3

Plus 6 credits upper division from the following:

PSCI	341	Pol. Parties & Elections	3
PSCI	456	Public Administration & Policy	3
PSCI	341	Pol. Parties & Elections	3
PSCI	438	International Relations	3
PSYX	340	Abnormal Psychology	3

Math and Science - 12 Credits (1000 level or higher)

M	xxxx	Math Electives	6
XXXX	xxxx	Science Electives**	7

Career/Life Planning

L.S.	1006	Career/Life Planning	2

***Electives - 31 credits: Must* be taken in **upper division** course work.

*Must be 1000 level or higher.

**Students must complete one science elective with Lab as part of General Education requirement.

****As a General Education Requirement, in addition to College Writing I, all baccalaureate degree-seeking students must successfully complete two designated writing courses (W*) at the 3000 or 4000 level**. The 4000 level course must be a capstone course in the student's major. Such courses are indicated in the catalog with a "W" appended to the course number (e.g., PTC 3896W).

Minimum Credits for a B.S. degree in Liberal Studies: 120

Minor in Liberal Studies, please refer to reference section "MINORS".

HUMAN AND COMMUNITY SCIENCES (HCS)

MINOR AND CERTIFICATE PROGRAMS

Meri L. Shadley, Ph.D., MFT, LADC
UNR – CASAT – Mail Stop 279
775-784-6265 e-mail: mshadley@casat.org

Center for the Application of Substance Abuse Technologies
800 Haskell St. 1st Floor ~ Reno, NV 89509
Phone: 775.784.6265 ~ Toll Free: 1.866. 617.2816 ~ Fax: 775.784.1840
http://casat.unr.edu

A minor in addiction services is available through the Center for the Application of Substance Abuse Technologies (CASAT). All students are introduced to the field of addiction services via the overview courses of HCS 1540 and HCS 2550. The treatment minor is especially suited to students majoring in psychology, social work, criminal justice, and nursing. There is also an undergraduate treatment services certificate available for students who already have a bachelor's degree or do not wish to pursue a degree but seek addiction information for their chosen careers. Formal acceptance into a minor or certificate program is required in order for students to take course work at the 3000 or 4000 level. An additional application process is required for acceptance into the internship, HCS 4916. Applications for the minor are due by April 1 for the fall semester and November 15 for the spring semester. All applications are available through the CASAT office at 800 Haskell or online at http://casat.unr.edu/mwattc/unr.php.

Addiction Treatment Services Minor from UN-Reno —18 credits

HCS 3006—Problems of Substance Abuse and Addiction.....3
HCS 3016—Bio/Psycho/Social Factors in Addiction.....3
HCS 3026—Substance Abuse Prevention 3
HCS 3540—Addiction Treatment I 3
HCS 3550—Individual and Group Treatment of Addiction.....3
HCS 4540—Addiction Treatment II.....3

Addiction Treatment Services Certificate—21 credits

All of the courses listed for the minor 18
Plus (For students who wish to become Certified)
HCS 4916—Internship in Addiction Treatment & Prevention.....3

Bachelor of Applied Science - General Studies

Department Head: Dr. Jack Crowley
(406) 496-4462
MAIN 105A

Administrative Assistant: Evelyn Merkle
(406) 496-4275
MAIN 104

Department FAX: (406) 496-4510

BLOCK TRANSFER ***54 CREDITS*** _____ _____

If, while completing an AAS degree, a student completes any undergraduate level or articulated technology level courses required within a Montana Tech BAS degree program, those credits, plus the block transfer credits, will be applied to the BAS degree requirements. A maximum of 60 credits of course work from the AAS degree can be applied to the BAS degree requirements. Students should see their advisor to select additional courses to complete their degree.

General Education Core **(31 cr..)**

Communications	*6 cr.*.	
WRIT 101	College Writing I	3 cr..
COMM 3246W	**Business and Communications**	**3 cr..**
Humanities	*6 cr.*.	
LIT 126/112	Intro. to Poetry, Drama, & Fiction	3 cr..
Humanities Elective (UPPER DIV Only)		**3 cr..**
Social Sciences	*6 cr.*.	
Social Science Elective		3 cr..
Social Science Elective (UPPER DIV Only)		**3 cr..**
Mathematics	*6cr.*	
Math 1XXX	Math Elective	3 cr..
Math 1XXX	Math Elective	3 cr..
Physical & Life Science	*7 cr.*.	
Physical & Life Science Elective		3 cr..
Physical & Life Science Elective w/lab		4 cr..

UPPER DIVISION ELECTIVES in BUS, COMM, HCS, HUMN, L.S., SOCS **(3000/4000 Level)** ***(36 CR.)***

XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxx	Upper Div Elective	3
XXX xxxxW	Upper Div Elective	3

Recommended sequence of Mathematics course for students who have not completed the equivalent of Intermediate Algebra:

M 095	INTERMEDIATE ALGEBRA
M 121	COLLEGE ALGEBRA
STAT 216	INTRODUCTION TO STATISTICS

See advisor to select appropriate math course work.

MATHEMATICAL SCIENCES

Department Head: Dr. Richard J. Rossi
(406) 496-4356
MUS 109

Administrative Assistant: Tami Windham
(406) 496-4366
MUS 201

Department FAX: (406) 496-4756

Mission

The mission of the Mathematical Sciences program is to provide a quality education that blends theory and practice to produce a mathematician who can enter and pursue a successful career in one of the many mathematical fields or pursue an advanced degree in a mathematical science. Our mathematics graduates will be prepared to meet the demands of the growing number of quantitative and data-based sciences.

Educational Objectives

1. Provide solid background in the mathematics that is needed to solve real-world mathematical and quantitative problems.
2. Train students to understand and apply a wide range of mathematical methods to solve problems of a quantitative nature.
3. Prepare students to adapt to an ever changing world and its demands for data analysis, quantitative, and analytical skills.

Outcomes

1. Graduates will be prepared to assume positions as mathematicians in education, industry, or government upon graduation.
2. Graduates will be able to select appropriate mathematical methods to solve quantitative problems.
3. Graduates entering industry will be able to recognize the need for quantitative information and apply it to problem solving and data analysis in real world situations.
4. Graduates entering graduate programs in mathematics and statistics will be well trained in the fundamentals and theory of modern mathematics.

Assessment

The Mathematical Sciences program believes that the quality of an academic program is ultimately defined by the long-term success of its graduates. We believe that if our graduates meet our goals, they will be well prepared for a career in a mathematical field and be very successful in their career. The outcomes listed above are constantly assessed through course evaluations, graduate exit surveys, student satisfaction surveys, placement rates, and department discussions of the mathematics curriculum. Thus, the goal of our assessment program is to insure we maintain our mission and continuously improve our curriculum in order that the graduates of our program achieve the goals of the program.

The mathematician makes definitions and hypotheses, then traces out their logical consequences. This "mathematical method" can be applied to any object of thought, including thought itself. The mathematics student will learn to use this method for solving problems in science and technology, as well as in mathematics. The rise in automation and computing has contributed to an increase in the importance of mathematics in society. Those who combine sound mathematical training with a well-rounded education are in demand. Professional opportunities, both in secondary school teaching and industrial and government positions, are open to college graduates with bachelor's degrees in mathematics. Professional advancement in these positions usually requires graduate study or on-the-job training. Many industries provide for such efforts.

Industry – The primary function of a mathematician in industry is as a consultant. In this capacity, the consultant cooperates with engineers, scientists and management, and must be able to discuss problems with them in their language.

Statistics – Statistics involves the study of problems that arise in scientific research, in social and economic investigations, in business and industry, and in government work. A statistician deals with the design of data collection methods and the interpretation of the resulting data. He or she designs efficient experiments and sampling plans for obtaining data to be used in hypothesis tests and the estimation of unknown quantities. An applied statistician often works with scientists in the fields of agriculture, biology, wildlife management, medicine, economics, psychology, sociology, or industrial quality control.

Teaching – Students wishing to earn a teaching certificate may earn a bachelor's degree at Montana Tech but must continue on at another college to complete their certification requirements.

MATHEMATICAL SCIENCES

Freshman		**Fall Semester**	
WRIT	101	College Writing I	3
STAT	216	Intro. to Stats	3
M	171	Calculus I	3
M	194	Freshman Seminar	1
***	xxxx	General Elective	3
***	xxxx	General Elective	2
		Total 15	

Sophomore		**Fall Semester**	
M	242	Methods of Proof	3
M	273	Multivariable Calculus	4
M	333	Linear Algebra	3
***	xxxx	General Electives	3
***	xxxx	General Electives	2
		Total 15	

Freshman		**Spring Semester**	
COMM	1216/1226	Principles of Speaking/Public Speaking	3
M	172	Calculus II	3
**	xxxx	Science Elective	4
***	xxxx	General Electives	5
		Total 15	

Sophomore		**Spring Semester**	
C.S.	2136	Matlab for Engineers & Scientists **OR**	
C.S.	2146	C Programming for Engr & Scientists	3
M	274	Intro. to Differential Equations	3
M	323	Methods of Proof II	3
STAT	332	Stats for Sci. & Engineers	3
	xxxx	General Elective	3
		Total 15	

Junior		**Fall Semester**	
M	xxxx	3000/4000 ELECTIVE	3
	xxxx	OPTION ELECTIVE	3
	xxxx	OPTION ELECTIVE	3
***	xxxx	General Electives	6
		Total 15	

Senior		**Fall Semester**	
M	494	SENIOR SEMINAR	1
	xxxx	OPTION ELECTIVE	3
	xxxx	OPTION ELECTIVE	6
	xxxx	General Electives	6
		Total 16	

Junior		**Spring Semester**	
	xxxx	OPTION ELECTIVE	3
	xxxx	OPTION ELECTIVE	3
	xxxx	OPTION ELECTIVE	3
	xxxx	General Electives	6
		Total 15	

Senior		**Spring Semester**	
	xxxx	OPTION ELECTIVE	3
	xxxx	OPTION ELECTIVE	6
	xxxx	General Electives	5
		Total 14	

Minimum credits for a B.S. degree in Mathematics 120

OPTION 1: MATH

Junior			**Fall**	**Spring**
M	330	History of Mathematics	3	
M	351	Algebraic Structures I	3	
M	329	Modern Geometry		3
M	352	Algebraic Structures II		3
M	xxxx	3000/4000 Elective		3

Senior			**Fall**	**Spring**
M	435	Advanced Calculus I	3	
M	4xxx	Approved Senior Elective	3	
M	xxxx	3000/4000 Elective	3	
M	436	Advanced Calculus II		3
MATH	4xxx	Approved Senior Elective		3
MATH	xxxx	3000/4000 Elective		3

OPTION 2: STATISTICS

Junior			**Fall**	**Spring**
M	435	Advanced Calculus I	3	
STAT	421	Probability Theory	3	
M	410	Numerical Compt. for Engineers		3
M	436	Advanced Calculus II		3
STAT	422	Mathematical Stats		3

Senior			**Fall**	**Spring**
STAT	441	Experimental Design	3	
M	xxxx	3000/4000 Elective	3	
	xxxx	General Electives	3	
STAT	432	Regr. & Model Building		3
STAT	435	Stat. Comp. & Explor Data		3
	xxxx	General Electives		3

**Science Electives must include at least one semester of laboratory science, either, (1) BIOL 1026, 1116, 1236, or 2016; (2) CHMY 141 with lab 142; (3) GEO 101 with lab GEOE 104 or GEO 209; or (4) PHYS 1046 and PHYS 2076 with lab 2096.

***Electives must be chosen so that the General Education Requirements in the Humanities Core and Social Sciences Core are met.

The sequences M 405-406, STAT 421-422 are offered on alternate year basis.

M 330 does not count as an approved M 3000/4000 elective.

M 329 only counts as an approved M 3000/4000 elective for those students seeking Secondary Education Certification.

Minor in Mathematical Sciences, please refer to reference section “MINORS”.

Network Technology

Department Head: Ed Metesh
(406) 496-3735
COT 124 Office A

Administrative Assistant: Marilyn Patrick
(406) 496-3711
COT 100 C

Department FAX: (406) 496-3710

The mission of the undergraduate Network Technology degree program is to provide a quality education that develops skills necessary to design, develop, administer, secure, and support computer networks. An education that stays abreast of new and innovative technologies that enables graduates to provide solutions for business and industry.

The Network Technology degree prepares students for employment in the Information Technology arena. The degree places particular emphasis on current and emerging network technologies. Many courses required in this curriculum prepare students for a wide variety of industry recognized certification exams. The course work is rich in laboratory experiences with state-of-the-industry hardware and software. Students study in a learning environment that stresses practical, hands-on experiences and internships.

Graduates of the program will find career opportunities as PC Support Specialists, Network Technicians, Network Analysts, and Network Administrators. Other possibilities include Data Communications Analysts and Security Administrators.

Mission and Goals

The mission of the undergraduate Network Technology degree program is to provide a quality education that develops skills necessary to design, develop, administer, secure, and support computer networks. An education that stays abreast of new and innovative technologies that enables graduates to provide solutions for business and industry.

Program Educational Objectives

Students will demonstrate competencies in computer maintenance and support.
Students will demonstrate competencies in network device configurations and design principles and be receptive to new technologies.
Students will demonstrate competencies in appropriate network operating systems.
Students will demonstrate the ability to communicate effectively and work as part of a team.

Program Outcomes

Graduates will demonstrate sufficient knowledge to pass the Comp/TIA A+, Net+, and Security+ exams.
Graduates will demonstrate sufficient knowledge to pass the Cisco CCNA exams.
Graduates will demonstrate sufficient knowledge to pass the Cisco CCNP exams.
Graduates will demonstrate sufficient knowledge to pass the Novell CNA exams.
Graduates will demonstrate sufficient knowledge to pass the Microsoft MCSA Core exams.
Graduates will demonstrate sufficient knowledge to design, develop, administer, secure, and support small to medium computer networks and effectively communicate those processes.

Program Assessment

Industry Advisory boards
Graduate/Placement Survey
Internship Student/Supervisor Evaluations
Instructional Diagnosis tools
Student evaluations
Student peer evaluations

NETWORK TECHNOLOGY

Freshman		**Fall Semester**	
WRIT	101	College Writing I	3
I.T.	0110	Intro. to Operating Systems (MCSA I)	3
M	121	College Algebra	3
I.T.	0260	Voice and Data Cabling	3
I.T.	0247	Introduction to Programming	3
		Total	15

Sophomore		**Fall Semester**	
PSYX	1000	Intro. to Psychology	3
PTC	2506	Web Page Design	3
I.T.	0195	IT Essentials	4
I.T.	0126	Networking Fundamentals (CCNA 1)	4
I.T.	0130	Intro. to Windows Server (MCSA 2)	3
		Total	17

Freshman		**Spring Semester**	
I.T.	0272	Fundamentals of Wireless LANs	3
I.T.	0154	Introduction to Unix	3
I.T.	0176	Intro. to Routers (CCNA 2)	4
I.T.	0115	Interm Windows Server (MCSA 4)	3
I.T.	0210	Intro. to Novell Netware	3
		Total	16

Sophomore		**Spring Semester**	
I.T.	3546	Advanced Linux	3
I.T.	0226	Routing & Switching (CCNA 3)	4
I.T.	0276	WAN Technologies (CCNA 4)	4
I.T.	XXXX	Approved I.T./C.S. Elective	3
COMM	2016	Presenting Technical Info	3
		-OR-	
COMM	1216	Principles of Speaking	3
		Total	17

Optional Exit point with Associate of Applied Science in Network Technology 65 Credits

Junior		**Fall Semester**	
STAT	216	Intro. to Stats.	3
I.T.	3116	Advanced Windows Server	3
I.T.	3016	Advanced Routing (CCNP 1)	4
	XXXX	Humanities Elective	3
	XXXX	Physical or Life Science Elective	3
		Total	16

Senior		**Fall Semester**	
I.T.	3036	Advanced Novell Administration	3
I.T.	3026	Remote Access Networks (CCNP 2)	4
	XXXX	Social Science Elective	3
I.T.	4916	Internship	3
		Total	13

Junior		**Spring Semester**	
I.T.	3056	Web Server Administration	3
HUMN	3016W	Professional Ethics	3
	3XXX	Business Elective	3
I.T.	4016	Multi-Layer Switching (CCNP 3)	4
		Total	13

Senior		**Spring Semester**	
I.T.	0255	Web Scripting/Programming	3
	XXXX	Physical/Life Science Elective	3-4
I.T.	4026W	Network Troubleshooting (CCNP 4)	4
I.T.	3046	Network Security	3
		Total	13

Minimum Credits for a B.S. degree in Network Technology: 120

Minor in Network Technology, please refer to reference section “MINORS”.

NURSING (ASN, BSN)

Director of Nursing: Karen VanDaveer
(406) 496-3726
South Campus

LOCATION: 25 Basin Creek Road
(Approximately 7 miles south of Main Campus)

Administrative Assistant: Wilene Lester
(406) 496-3722
South Campus

Department FAX: (406) 496-3715

Accreditation

MT Tech Associate Registered Nursing program is accredited by:
National League for Nursing Accrediting Commission
61 Broadway
33rd Floor
New York, NY 10006
Phone: (800) 669-1656
Website: www.nlnac.org

and fully approved by:
Montana State Board of Nursing
301 South Park
PO Box 200513
Helena, MT 59620-0513
Phone: (406) 841-2340
Website: http://mt.gov/dli/bsd/license/bsd_boards/nur_board/board_page.asp

The nursing faculty at Montana Tech of The University of Montana appreciates your interest in nursing education and hopes this information will answer your questions about the profession of nursing in general and Montana Tech's nursing programs in particular. After you review this material, you may still have questions or need more information. Any of the nursing faculty would be happy to visit with you personally. Please refer to the above for contact information to schedule an appointment. If you are interested in nursing education at Montana Tech, it is essential to work with a nursing faculty advisor for selection and sequencing of appropriate courses.

Mission

Montana Tech of the University of Montana Nursing Department is dedicated to preparing generalist nurses by exposing them to a diverse array of nursing roles through a variety of community settings.

The Nursing Department stresses the importance of being an intellectual leader and role model in the profession of nursing.

Montana Tech Nursing Department Guiding Principles

We believe:

- Nursing and nursing education are essential for the promotion, maintenance and restoration of health, along with the prevention of illness.
- Individuals who wish to enter nursing should be free to choose from a number of educational alternatives.
- Nursing and nursing education will become more complex as health care evolves. This continually changing health care environment mandates the role, function and educational preparation of the nurse.
- The profession of nursing is best served through highly educated members who continually strive to broaden their knowledge and expertise to meet the increasing demands of the health care environment.
- In a holistic approach to nursing education, including sensitivity to the physical, psychological, spiritual and sociocultural needs of the individual, family and community.
- In a continually evolving curriculum that reflects best practice.
- Acquisition of nursing knowledge and skill is best achieved through a combination of class room requirements and clinical experience in both simulated and actual care environment.

Core Concepts of Conceptual Framework:

The following concepts are considered to be the foundation for the nursing program's conceptual framework and will be threaded throughout the ASN, and BSN curricula. The concepts of caring, communication and professionalism are introduced throughout all levels of nursing, where as critical thinking and clinical judgment are more specific to ASN and BSN nursing. The faculty at Montana Tech believes that critical thinking and clinical judgment are initially introduced at the ASN level but are not fully integrated until acquiring BSN education.

Caring

Caring is a human response to needs that is articulated through commitment, knowledge, experience, and therapeutic use of self Caring occurs when the nurse/client interaction transcends physical care and reflects respect for the client and his or her unique circumstances and health beliefs.

Communication

Communication is an interactive process that involves the nurse, the client, and health care team members. Communication consists of both verbal and non-verbal exchanges that encourage the expression of needs, support coping behaviors, and facilitate decision making.

Professionalism

Professionalism is a set of behaviors that all nurses are expected to exhibit as members of the nursing profession. These behaviors foster the nurse-client relationship while supporting the integrity of the profession. Expected behaviors include, but are not limited to, unconditional positive regard, efficiency, responsibility, accountability, fairness, trustworthiness, honesty, confidence, and competence.

Critical Thinking

Critical thinking is an active, purposeful reasoning process that is used to continually modify and improve individual nursing practice. It is an evidence-based process that involves ongoing reflective analysis of data accumulated through assessment, planning, implementation, and evaluation of nurse/client interactions.

Clinical Judgment

Clinical judgment is an autonomous problem-solving process that is derived through inquiry, critical thinking, and decision making, while responding to clients as unique individuals who have the right to self-determination.

Therapeutic Use of Self

Therapeutic Use of Self is defined as every client interaction must have a purposeful therapeutic intent.

Brief History

Montana Tech began offering a degree in professional nursing in 2000, with its first group of 17 students graduating in May 2001 with an Associate of Science in Nursing (ASN) degree. This first group completed a "bridge" program designed for currently licensed LPN's who wanted to become a Registered Nurse.

After the first year, the vast majority of students seeking nursing education at Montana Tech were new to nursing and wanted to become a Registered Nurse. In

response, Montana Tech's Nursing Department replaced its "bridge" program with a "direct entry" Associate of Science in Nursing degree and added a Bachelor of Science in Nursing (BSN) completion degree component to the program in 2003.

The curriculum adopted by the state wide nursing work group, to satisfy the mandates of the Legislative Audit Committee and the Board of Regents, is utilized by at least 22 other states. It includes pre-nursing course work that is appropriate for a RN credential with two years of additional nursing coursework, after which students can take the RN licensure examination.

Available Nursing Programs

•Bachelors (BSN) degree in professional nursing
[Completion program for currently licensed RN's]
•Associate (ASN) degree in professional nursing

Registered Nursing Program (ASN)

Montana Tech's College of Letters, Sciences, & Professional Studies offers two degrees in professional nursing—a Bachelor of Science in Nursing (BSN) completion degree and an Associate of Science in Nursing (ASN) degree. Students pursuing the BSN degree must first earn the ASN degree and pass the *National Council Licensure Examination for Registered Nurses (NCLEX-RN)* in order to continue into the BSN curriculum. Students must meet minimum program requirements and complete a formal acceptance application to be accepted into the professional nursing program.

Students who initially do not demonstrate academic readiness will need to complete "developmental" courses to be adequately prepared for the required nursing and non-nursing classes in the curriculum.

Academic readiness for the required prerequisite courses for acceptance into the Professional Nursing Program can be demonstrated in any of the following ways:

- ACT® score or;
- SAT® score or;
- Compass test scores or;
- Prior completion of M 121 and WRIT 101 (or their equivalents).

Students in the professional nursing program are eligible to take the *National Council Licensure Examination for Registered Nurses (NCLEX-RN)** after completing the Associate of Science in Nursing Degree graduation requirements.

***Graduates of United States nursing programs must pass the national NCLEX exam in order to gain licensure to practice as a registered nurse.**

Program Description (RN)

Education

• The focus of Montana Tech's professional nursing curriculum is to provide education leading to substantial specialized knowledge of the biological, physical, behavioral, psychological, and sociological sciences and of nursing theory as a basis for the nursing process. The nursing process is the assessment, nursing diagnosis, planning, nursing intervention, and evaluation in the promotion and maintenance of health; the prevention, case finding, and management of illness, injury, or infirmity; and the restoration of optimum function. The term also includes administration, teaching, counseling, supervision, delegation, and evaluation of nursing practice. The professional nurse is directly accountable and responsible to the consumer for the quality of nursing care rendered.

• The ***role of the registered nurse*** is to provide nursing care to clients—individuals or groups. The nursing curriculum prepares the graduate to function in the three recognized roles of the professional nurse—provider of care, manager of care and member of the discipline of nursing.

• As a provider of care, the registered nurse demonstrates critical thinking, accountability, clinical decision-making through use of the nursing process, effective communication with clients, families and health team members, teaching and collaboration with the client and family, collaboration with members of the health care team, and sensitivity to individual and cultural diversity.

• As a manager of care, the registered nurse demonstrates management of care for a group of clients using collaboration and consultation, organizes and delegates nursing care, client advocacy, and evaluation of health care delivery using client-centered outcomes.

• As a member of the discipline of nursing the registered nurse demonstrates knowledge of self-assessment and development and continuous learning, ethical-legal framework for nursing practice, advancement of nursing practice through professional activities, political, economic and societal forces affecting nursing practice and health care delivery, and health care change and nursing research.

• In addition to all of the roles and responsibilities of the associate degree nurse, the baccalaureate degree nurse is prepared to plan, deliver, and coordinate care for clients including individuals, families and communities in a variety of structured and unstructured settings with an emphasis on care management, complex care situations, and clients with unpredictable outcomes. The baccalaureate degree nurse functions as a change agent in the health care system and utilizes nursing research findings in the delivery of care.

Expected Outcomes

The ASN curriculum is designed to provide nursing education that will enable a professional nurse to:

1. Demonstrate substantial specialized knowledge of life sciences, behavioral sciences, and of nursing practice and theory. Demonstrates fundamental information management and computer literacy skills.
2. Demonstrate competence in basic through advanced nursing procedures that require theoretical knowledge and psychomotor capability, within the scope of professional nursing practice.
3. Perform in the role of the associate degree professional nurse, with emphasis on caring, communication, professionalism thinking and clinical judgment.
4. Perform in the role of the associate degree professional nurse related to caring through presence, knowledge of self, and understanding the meaning of the client's lived experience.
5. Select the utilizing professional, therapeutic, and interpersonal techniques in a variety of settings.
6. Demonstrate through professionalism client advocacy, leadership, supervision, delegation, collaboration, participation in professional organizations, and continued life-long learning while maintaining accountability for practice and quality of nursing care.
7. Integrate critical thinking and clinical judgement which involves evidence based process, autonomous problem solving and decision making.

Additionally, the BSN curriculum provides nursing education that will enable the baccalaureate-prepared nurse to:

8. Utilize community based settings as well as caring for a community as a whole through the health wellness/illness continuum.
9. Utilize the nursing process to provide care for vulnerable populations.
10. Apply research principals and current nursing research and theory to practice.
11. Understanding of health care policies and health care finance allegation of resources.
12. Assume a leadership role in professional and practice settings.

13. Demonstrate commitment of advancement of the profession of nursing through participation in nursing activities outside the employment setting.

Admission to Montana Tech does not guarantee acceptance into the ASN program. **Students entering Montana Tech with the intent to become a registered nurse may declare a major in pre-nursing upon admission to Tech, but are not accepted into the nursing Program until after a formal application and selection process occurs.**

Students must meet the minimum Nursing Department requirements to be eligible for application to the Nursing Program. Acceptance into the Nursing program is competitive and based on: a selective grade point average (GPA) calculated from grades received for the required prerequisite courses below, and a standardized test (Test of Essential Academic Skills (TEAS)). The cost of the exam is approximately $30. Review materials for this exam are available at www.atitesting.com. The selection will be made based on 60% GPA and 40% TEAS score. Minimum selective GPA for application to the nursing program is 3.0 (out of a 4.0 scale). The selection process will take place twice yearly. There is a fall application with entry occurring in the spring and a spring application with entry occurring in the fall.

The Nursing Department fact sheet, which both the student and advisor sign, outlines requirements for acceptance into and progression through the Professional Nursing Program. Since the Professional Nursing Program is continually evolving, information in the Advising Fact Sheet is updated from semester to semester. It is the student's responsibility to make sure he or she is familiar with the most current Nursing Department policies. Information contained within the current Advising Fact Sheet is summarized below.

- A grade of "C+" or higher is required for all nursing **AND** a "C-" or higher is required for all non-nursing courses within the Nursing Program curriculum. After a student is accepted into the nursing program, courses can only be attempted once and must be passed with a grade of at least a "C+" for nursing courses and at least a "C-" for non-nursing courses for the student to progress through the program. If any course grades is less than a "C+" the student must withdraw from the Nursing Program, but may petition for re-entry.

- Montana Tech's Nursing Department uses a mastery approach to evaluate student academic progress throughout the ASN program, meaning that students must achieve a passing score (78% [77.5%]) on every exam in every nursing class in order to progress through the program. For regular exams and computerized assessment test, students who do not initially achieve a passing score can take an additional test covering the same content. If the student achieves a passing score on the second exam, the grade will be recorded as 77.5% and the student will continue course work. If the student fails the second attempt, he or she will not be allowed to continue in the course and will receive a failing grade.

- Many Nursing Department standards and requirements (such as behavioral standards, grading scale, attendance, course repetition, graduation requirements, etc.) are more rigorous and strict than general Montana Tech requirements.

- Completion of a degree in nursing is costly. In addition to tuition and fees, nursing students should be aware that required nursing textbooks/reference materials are expensive and that many courses require several texts. The student should also plan for a number of out-of-pocket expenses related to clinical supplies and course/program requirements. Once accepted into the nursing program,both ASN and BSN students are assessed a program fee each semester ($550.00 per semester for 2009-2010).

- To assure progression through the program, the student must meet the total academic and clinical requirements. The student must demonstrate a continuing ability to assure patient/client safety and welfare. Satisfactory classroom academic performance does not, in and of itself, assure progression through the program. The student must continually adhere to the Nursing Department's Code of Conduct and must be able to adhere to clinical agency policies.

- Students are required to successfully complete program assessment tests, including an end-of-program assessment in order to progress through and graduate from the program. The purpose of the program assessment is to improve the graduate's ability to pass the NCLEX-RN examination.

- Many courses are only offered once a year. Many courses have prerequisites. Many courses must be taken in sequence. It is essential to meet with a nursing advisor prior to enrolling in or dropping any courses. Failure to work directly with a nursing advisor may have a significant impact on the student's ability to progress through the nursing program in a timely manner.

- Once a student is admitted to the nursing program he or she will be provided with a copy of the *Montana Tech Nursing Student Handbook.* This document outlines specific Nursing Department policies and procedures which the student is required to adhere to while completing nursing program requirements at Montana Tech. An agreement to adhere to the Nursing Student Handbook is required to be signed yearly (or when changes occur).

- All Nursing Department announcements and essential communication are communicated via e-mail (MT Tech account). Once accepted into the program, each student will be assigned a mailbox to retrieve corrected assignments, test score sheets, etc.

- It is the student's responsibility to obtain written documentation from the MT Tech Office of Enrollment Services regarding approval of transfer and/or course substitutions. Students must have PRIOR written approval from the Office of Enrollment Services that a course taken at another campus is equivalent to a MT Tech course.

- Students who retake a course should be aware that Montana Tech's policy is that the last grade received is the grade that will be used when calculating GPA.

Nursing Department Application Requirements

Students must complete with a grade of "C+" or higher for all nursing courses (and be currently enrolled in and complete with a grade of "C-" or higher) in the following prerequisite courses prior to formal application to the Nursing Program.

BIOL 2016	Anatomy & Physiology I
BIOL 2026	Anatomy & Physiology II
WRIT 101	College Writing I
CHMY 121	Intro. to General Chemistry
CHMY 122	Intro. to General Chemistry Lab
M 121	College Algebra
BIOL 2586	Basic Nutrition
PSYX 100	Intro. to Psychology
NURS 1016	Intro. to Nursing (not used in GPA calculation for selection)

Nursing Department requirements for acceptance into the ASN program are:

- Completion of the required prerequisite courses listed above.
- Minimum selective GPA of 3.0 in BIOL 2016, WRIT 101, M 121, BIOL 2586, BIOL 2026, CHMY 121, CHMY 122. and PSYX 100.
- Completion of the TEAS exam.
- Proof of measles, mumps, and rubella vaccination or immunity.
- Evidence of Hepatitis B seroimmunity (demonstrated with a

positive titer result).
- Evidence of freedom from tuberculosis (TB skin test or chest x-ray).
- CPR -- evidence of current completion of an approved CPR course (American Heart Association Health Care Provider or American Red Cross Professional Rescuer).

Fulfillment of the minimum requirements does not guarantee acceptance into the Nursing Program. All candidates who meet application requirements will be considered for acceptance. The number of students accepted into the Nursing Program is limited. If the number of qualified applicants exceeds available spaces, not all qualified applicants will be accepted and GPA & TEAS will be used as selection criteria.

Background Check:

Clinical practice is a mandatory part of Montana Tech of The University of Montana Nursing Program. To ensure the safety and well being of all patients, many employing institutions in health care have increasingly stringent requirements and background checks as conditions for providing patient care by students. Therefore, it is required that all students within the nursing program **complete a background check upon being selected for admission**. The involved clinical affiliate receives and reviews the background check to determine if each student may complete clinical hours within the agency. Since clinical practice is actual (not simulated) health care settings is a mandatory component of Montana Tech's nursing curriculum, students who are denied access to a clinical affiliate are generally unable to meet course and curriculum objectives and therefore are unable to progress through the program.

Complete instructions on how to complete the background check can be found on Verified Credentials, Inc. website at www.myvci.com/mtech. The cost for the background check is approximately $62. The student is responsible for saving the results and turning in the cover page as proof of completion. This cover page must be turned in prior to the first day of the semester. The background check results are to be given to the requesting clinical affiliate(s). Montana Tech faculty or staff do not have access to background check results, so questions about clinical affiliate decisions must be directed to the involved clinical affiliate.

Application Procedure:

Practical Nurse:

- Submit formal application. (Contact Nursing Department for application dates) 496-3722.
- Meet all Montana Tech general admission requirements.
- Selection is based on nursing department general education courses in Semester 1 & 2 GPA.

Licensed Practical Nurse:

- Submit formal application. (Contact Nursing Department for application dates) 496-3722.
- Meet all Montana Tech general admission requirements.
- If your initial licensure is older than 3 years, you need to take the (GAP test), a standardized test to assess your nursing knowledge. Call the Nursing Department for details.

Associate of Science Registered Nursing Curriculum

Freshman		Fall Semester		Freshman		Spring Semester	
BIOL	2016	Anatomy & Physiology I	4	BIOL	2026	Anatomy & Physiology II	4
BIOL	2586	Basic Nutrition	2	CHMY	121	Intro. to General Chemistry	3
WRIT	101	College Writing I	3	CHMY	122	Intro. to General Chem. Lab	1
M	121	College Algebra	3	*NURS	1016	Introduction to Nursing	1
		Total	12	PSYX	100	Introduction Psychology	3
						Total	12

NOTE: Acceptance to Nursing Program required before taking Semester Three (Sophomore year) course work.

Sophomore		Fall Semester (3rd)		Sophomore		Spring Semester (4th)	
NURS	1456	Pharmacology	3	NURS	1566	Core Concepts of Adult Nursing	7
NURS	1506	Fundamentals of Nursing	7	NURS	1576	Core Concepts of Maternal/Child Nur	3
NURS	1556	Gerontology	2	NURS	1586	Core Concepts of Mental Hlth Nursing	2
		Total	12			Total	12

Junior		Fall Semester (5th)		Junior		Spring Semester (6th)	
BIOL	2126	Microbiology for Nursing & Allied Hlth	4	NURS	2476	Complex Care of Maternal/Child Nur	3
NURS	2006	Pathophysiology	3	NURS	2486	Complex Care of Mental Hlth Nursing	2
NURS	2466	Complex Care Needs-Adult Client	4	NURS	2806	Managing Client Care	4
NURS	2506	Advanced Clinical Skills	1	SOCI	101	Introduction to Sociology	3
		Total	12			Total	12

BSN Completion Program Curriculum

Junior		Fall Semester		Junior		Spring Semester	
STAT	131	Intro. to Biostatistics	3	HUMN	3016W	Professional Ethics	3
NURS	3076	Advanced Pathophysiology	3	NURS	3036	Community Health Nursing	4
NURS	3126	Advanced Health Assessment	3	NURS	3116	Trend & Issues in Professional Nursing	2
NURS	4106	Nursing Theory	3		xxxx	Humanities Elective	3
		Total	12			Total	12

Senior		Fall Semester		Senior		Spring Semester	
NURS	3096	Care of the Aging Client	3	AHS	4606	Electrocardiography	3
NURS	3136	Family Nursing	3	NURS	4046	Nursing Across Hlth Care Continuum	3
NURS	4206	Nursing Research	3	NURS	4306W	Nursing Leadership and Management	6
WRIT	322	Advanced Business Writing	3			Total	12
		Total	12				

Minimum credits for a B.S. degree in Registered Nursing 120 credits

*Online Course

Online Anatomy & Physiology course is not applicable for nursing students.

Admission to Bachelor of Science Completion Program:

- The BSN completion program is open to all Registered Nurses with an active licensure to practice nursing in Montana.
- The BSN completion program generally takes four academic semesters to complete.
- Students desiring to complete the BSN program in two academic semesters must successfully complete all non-nursing courses within the curriculum prior to beginning BSN nursing courses.

Professional and Technical Communication

Department Head: Dr. Henrietta Shirk
(406) 496-4297
ENGR 212

Administrative Assistant: Evelyn Merkle
(406) 496-4782
ENGR 209

Department FAX: (406) 496-4758 OR (406) 496-4510

Mission

The Professional and Technical Communication (PTC) program provides a formal, practical course of study that prepares students to understand and communicate the relationship between individuals and their technologically oriented society.

Departmental Objectives

To prepare students with the knowledge, skills, and professional behaviors required to succeed in a technical communication work environment, as evidenced by at 95-percent placement rate of PTC graduates.

To prepare students to accept the challenge of successfully completing professional and technical communication tasks in any field of work or study, and for any audience, as PTC graduates are hired in a broad range of positions.

To provide instruction in current-generation technologies that apply principles of effective design, including a variety of print and digital media in which students demonstrate mastery of at least one medium.

To enable student to function ethically and professionally on multidisciplinary teams through completion of community-based service learning projects, internships, peer reviews, and a capstone course in which they complete a project for an actual client.

Degrees / Certifications Offered

Bachelor of Science in Professional and Technical Communication
Minor in Professional and Technical Communication
Post-baccalaureate Certificate in Technical Communication
Master of Science in Technical Communication (including five-year B.S.-M.S. plan)

Faculty

Program faculty model the professional behaviors they expect of their students, including engagement with leading-edge technologies, involvement in academic, professional, and industrial organizations, application of communication theory to social and industrial needs, and awareness and appreciation of multiculturalism.

Teaching Facilities

The department's new-media studio features state-of-the-art interactive non-linear digital video editing, media compression, web authoring, and interactive DVD authoring systems. Our graphic production studio is designed for digital imaging, new media development, and desktop publishing on PC or Macintosh platforms using current-generation software. Additionally, we provide a usability testing laboratory with state-of-the art software and hardware testing facilities.

Career Path Options

Professional and Technical Communication (PTC) program graduates and interns are writers, editors, and purveyors of complex information in such fields as engineering, medicine, the environment, and a wide range of sciences. Some are document designers who incorporate graphics, photography, artwork, and scanned data into documents. Some are marketing and public information staff who prepare and produce flyers, correspondence, videos, displays, and electronic presentations. Others are teachers or trainers, software documenters, grant-proposal writers, usability testing specialists, Web-page producers, or producers of CDs and DVDs.

With each graduating class, the demands of new technologies and new business enterprises add challenging and rewarding career options to a rapidly growing list.

Program Outcomes

Graduates will demonstrate the ability to:

- Collaborate effectively with subject-matter experts and coworkers.
- Provide clear writing for a specific audience directed by clearly defined purposes.
- Analyze the needs of users (through applying audience analysis techniques for the design and writing of documents).
- Assess and learn new technology and reach new audiences with new technology.
- Critique one's own work and the work of other professional communicators.
- Employ word-processing, document-design, graphics, drawing, desktop publishing, and presentation software.
- Establish an effective tone and style in technical and professional documentation.
- Achieve a set of expectations and values by observing ethical and legal considerations when communicating.
- Develop production-quality documents, online information, and websites.
- Conduct informational and problem-solving interviews.
- Write and design memos, letters, email, websites, and other practical communication.
- Address communication conflicts in small groups arising from participant diversity.
- Comprehensively edit a document (using levels of edit concepts, usability testing, field-testing, etc.)
- Conduct contextual inquiry (on-site interviews and observations for users and task analysis).
- Use online environments for the learning of content information in both educational and professional contexts.

[Note: The above program outcomes are adapted from recently published research by the Society for Technical Communication. These research results are based on reported competencies from the ten largest technical communication undergraduate programs in the United States and from 67 technical communication managers. Source: K.T. Rainey, R.K. Turner, and D. Dayton, "Core Competencies for Technical Communicators," *Technical Communication* (August 2005), Vol. 52, No. 3, pages 323-352]

Program Assessment

Industry Advisory Board
Internship Student/Supervisor Evaluations
Instructional Diagnostic Tools
Student Evaluations
Student Peer Evaluations
Capstone Project/Thesis
Program Exit Surveys/Interviews
Graduate Placement Survey

PROFESSIONAL & TECHNICAL COMMUNICATION

Program Description

The Professional and Technical Communication (PTC) program at Montana Tech prepares students to enter the exciting and dynamic world of technical communication. Our program provides students with a rich understanding of the very latest media technology and the theoretical framework necessary for effective communication. The excellent faculty, combined with state-of-the-art facilities, give our students a competitive edge in the global job market.

Freshman		Fall Semester	
WRIT	101	College Writing I	3
PTC	1946	Freshman Seminar	1
	xxxx	Physical/ Life Science Elective*	3
M	121	College Algebra	3
HUMN	xxxx	Humanities or Foreign Language	3
CAPP	156	MS Excel	3
		Total 16	

Freshman		Spring Semester	
PTC	1146	Visual Communication	2
PTC	1946	Freshman Seminar	1
	xxxx	Physical Life/Science Elective*	3
M	xxxx	Elect (Preferably MATH 1326)	3
FE	xxxx	Free Elective	3
CAPP	158	MS Access	3
		Total 15	

Junior		Fall Semester	
WRIT	322	Advance Business Writing	3
PTC	3406W	New Media Design I	3
STS	3596	Politics of Technical Decisions	3
PTC	3156	Digital Video Production	3
PTC	x916	Internship (total hours may vary 1-6)	3
		Total 15	

Junior		Spring Semester	
PTC	3476W	Desktop Publishing	3
PTC	4406W	New Media Design II	3
BUS	3316W	Marketing	3
PTC	3216W	Scientific & Tech. Writing	3
PSYX	360	Social Psychology	3
		Total 15	

Sophomore		Fall Semester	
PTC	2886	Digital Imaging	3
STS	2016	Technology & Society	3
BUS	1016	Introduction to Business	3
PSYX	100	General Psychology	3
PTC	2446	Prof Comm Consulting	1
FE	xxxx	Lower Division Free Elective	3
		Total 16	

Sophomore		Spring Semester	
COMM	2016	Presenting Tech. Info.	2
JOUR	2706	Reporting	3
WRIT	201	College Writing II	3
C.S.	2126	Applications Programming	3
PTC	2506	Web Page Design	3
		Total 14	

Senior		Fall Semester	
WRIT	325	Writing in the Sciences	3
HUMN	3016W	Professional Ethics	3
FE	xxxx	Upper Division Elective	3
PTC	4416W	Rhetor Theories & ProComm.	3
PTC	4996W	Senior Thesis/Project	2
		Total 14	

Senior		Spring Semester	
PTC	4056W	Technical Editing	3
PTC	4126W	Advanced Writing	3
HUMN	xxxx	Literature	3
PTC	4426W	Technology, Comm. Culture	3
PTC	4996W	Senior Thesis/Project	2
		Total 14	

Minimum Credits for a B.S. degree in Professional and Technical Communication: 120

*Must complete one science course with a lab.
All electives must be 1000 or higher and **Upper Division** electives must be 3000 or higher. **The 4000 level course must be a capstone course in the student's major. Such courses are indicated in the catalog with a "W" appended to the course number (e.g., PTC 3896W).**

Minor in Professional & Technical Communication, please refer to reference section "MINORS". Also Post-Baccalaureate Certificate in the Practice of Technical Communication is referred to in the same reference section.

SOFTWARE ENGINEERING

Department Head: Dr. Michele Van Dyne
(406) 496-4855
MUS 208

Administrative Assistant: Tami Windham
(406) 496-4366
MUS 201

Department FAX: (406) 496-4756

The Software Engineering program is housed in the Computer Science department which provides instruction and laboratory experience to students from most other majors on campus. Software engineers specialize in designing, building, testing, and maintaining software systems. They are responsible for the usability, safety, and reliability of their products.

Students in the program enjoy low class sizes and a low student-to-faculty ratio. There are several computing labs across campus that are open to students of all majors. The Computer Science department laboratory is centrally located between faculty offices, enabling significant student-faculty interaction. This lab contains computers running MS Windows and Linux.

(Note: If you are interested in a broad-field career in computing science outside of pure software development, also see the *Computer Science* program description in this catalog.)

Program Mission: Our program prepares students to develop quality software systems using proven software engineering methodologies. Our graduates positively influence how computer technology affects the world and carry on our institution's tradition of excellence. Our graduates have excellent skills, a "can do" attitude, and meet industry expectations right out of college.

During the first three to five years after graduation our SE graduates will have:

1. Adapted, thrived, and contributed in an industry setting or completed a graduate program
2. Improved software quality and the state of the art by promoting the adoption of best practices and supporting those best practices that are already being used
3. Demonstrated an ongoing commitment to professional development.

At the time of graduation, all Software Engineering students will have demonstrated the ability to:

CS/SE1	Understand professional and ethical responsibilities
CS/SE2	Work with clients and co-workers, have tact, and see things from other perspectives
CS/SE3	Identify and evaluate technical alternatives
CS/SE4	Identify and evaluate non-technical alternatives
CS/SE5	Apply oral and written skills effectively
SE6	Use the techniques and tools of modern software engineering practice
CS/SE7	Work effectively in multidisciplinary teams
CS/SE8	Understand the need for professional development and historical perspective
CS/SE9	Learn new technologies independently
CS/SE10	See a multistage project/task through to completion
CS/SE11	See the essence of the problem and design a solution
CS/SE12	Stay current with respect to societal issues relating to computer technology
CS/SE13	Apply quantitative methods to software development
SE14	Apply skills gained in math, science, engineering, and business
CS/SE15	Be technically proficient and able to perform all phases of software development
CS/SE16	Work effectively in a wide variety of domains
SE17	Observe, use, reflect on, and refine software development and business processes

This section refers to the curriculum on the next page:
*BIOL 1026, Biology and Man with Lab, or GEO 101, Physical Geology, may be substituted for CHMY 141/142. COMM 1216 Princ of Speaking or COMM 1226 Public Speaking can replace COMM 2016.

**Students in the Business Applications, Electronic Control Systems, Engineering Applications, and Statistics Applications options may replace WRIT 321 Advanced Technical Writing with WRIT 325 Writing in the Sciences or WRIT 322 Advanced Business Writing.

Freshman		**Fall Semester**	
S.E.	1000	CS/SE Freshman Seminar	1
C.S.	2106	Intro. to Computer Sci. I	3
CHMY	141	College Chemistry I*	3
CHMY	142	College Chemistry I Lab*	1
WRIT	101	College Writing I	3
M	171	Calculus I*	3
HUMN	xxxx	Humanities Elective	3
		Total	17

Freshman		**Spring Semester**	
C.S.	2116	Intro. to Computer Sci. II	3
COMM	2016	Presenting Technical Commun*	3
M	172	Calculus II	3
3			
PHYS	1046	Gen Phys-Mechanics	3
HUMN	xxxx	Humanities Elective	3
		Social Science Elective	3
		Total	18

Junior		**Fall Semester**	
WRIT	321	Advanced Technical Writing	3
STAT	332	Stats for Sci. & Engineers	3
S.E.	3250W	Software Engineering I	3
M.EC	3630	Engineering Economy	3
		Professional Elective	3
		Total	15

Junior		**Spring Semester**	
C.S.	4406	Computer Architecture	3
S.E.	3300	User-interface Design	3
S.E.	3260	Software Engineering II	2
S.E.	3280	Software Require & Specification	3
		Professional Elective	3
		Total	14

Sophomore		**Fall Semester**	
C.S.	2156	Embedded Systems Development	3
C.S.	3166	Discrete Structures	3
C.S.	3316	Data Struct. & Algor. I	3
M	273	Multivariable Calculus	4
PHYS	2076	Gen Phys.-H, S, & O	3
PHYS	2096	Gen Phys.-H, S, & O Lab	1
		Total	17

Sophomore		**Spring Semester**	
C.S.	2656	Database Management	3
C.S.	3326	Data Struct & Algor. II	3
ECNS	203	Principles of Economics	3
M	274	Intro. to Differential Equations	
PHYS	2086	Gen. Phys.-Elect, Mag, & Wave	3
PHYS	2106	Gen. Phys.-Elect, Mag, & W Lab	1
		Total	16

Senior		**Fall Semester**	
C.S.	3406	Operating Systems	3
C.S.	4526	Networking Principles	3
S.E.	4270	Principal Software Arch & Design	3
S.E.	4920W	Senior Design I	3
		Professional Elective	3
		Total	15

Senior		**Spring Semester**	
BUS	3666	Operations & Production MGMT	3
C.S.	3356	Programming Lang.	3
C.S.	4356	Web Science	3
S.E.	4920W	Senior Design II	3
S.E.	4940	Senior Seminar	1
		Professional Elective	3
		Total	16

Minimum credits for a B.S. degree in Software Engineering 128

Professional Electives – Junior & Senior Years

BUSINESS APPLICATIONS OPTION **(12 Credits)**

Junior			**Fall**	**Spring**
ACTG	201	Princ. of Financial Acct.	3	
ACTG	202	Princ. of Managerial Acct.		3
Senior			-	
*BUS3316W		Marketing		3
*BUS3416		Business Law I	3	
*BUS3516		Business Finance	3	
*BUS3616W		Management		3

*Select 2 courses out of 4

ELECTRONIC CONTROL SYSTEMS OPTION **(12 Credits)**

Junior				
PHYS	3036	Electronics	3	
***E.E.	2530	Intro. to Electric Circuits		3
Electronic Circuits Sequence				
**E.E.	2550	Intro. to Electric Circuits Lab		1
*E.E.	3270	Digital Circuit Design	3	
E.E.	3550	Electric Circuits II		4
*E.E.	3570	Electronic Design		3
*GEOP	446	Applied Linear Systems	3	
Electronic Control Sequence				
**E.E.	2550	Intro. to Electric Circuits Lab		1
E.E.	4450	Process Instrum & Control	3	
**E.E.	4460	Process Instrum & Cont Lab	1	
E.E.	3270	Digital Circuit Design		3
Microprocessor Sequence				
**E.E.	2550	Intro. to Electric Circuits Lab		1
E.E.	3270	Digital Circuit Design		3
E.E.	4280	Embedded Systems Design	3	

*Select 1 course of 3;
**Take at least one to reach 13 credits of professional electives if short 1 credit of science;
***Microprocessor Sequence students take E.E. 2530 & 2550 in their Senior year.

ENGINEERING APPLICATIONS OPTION **(12 Credits)**

Junior			**Fall**	**Spring**
ENGR	1050	Introduction to General Engr.	1	
ENGR	2050	Statics	3	
ENGR	2060	Dynamics		3
ENGR	2150	Engineering Computer Graphics		2
Senior				
ENGR	3350	Mechanics of Materials	3	
ENGR	3360	Mechanics of Materials Lab	1	
ENGR	3150	Intro. Engr Computer Applications		2
ENGR	4150	Engineering Computer Appl.		3

*Select 2 or more to reach minimum 12 credits within the option.

STATISTICS APPLICATIONS OPTION **(12 Credits)**

Students in the Statics option need to take MATH 3316 before beginning the courses in the option.

Junior				
*STAT	441	Experimental Design	3	
*STAT	432	Regression & Model Building		3
Senior				
STAT	421	Probability Theory	3	
*STAT	422	Mathematical Statistics		3
*STAT	435	Statistical Computing & Exp Data Ana		3

*Select 3 courses out of 4

TECHNICAL COMMUNICATION OPTION **(12 Credits)**

PTC	3406	New Media Design I	3	
*WRIT	321	Advanced Technical Writing		3
*WRIT	322	Advanced Business Writing	3	
*WRIT	325	Writing in the Sciences	3	
*WRIT	350	Technical Editing		3
*PTC	4406	New Media Design II		3
*PTC	4126W	Advanced Writing		3
*PTC	4426W	History, Technology, & Comm		3

*Select 3 courses out of 8

College of Technology

LOCATION: 25 Basin Creek RD. (Approximately 7 miles south of Main Campus)
(Refer to Map in back of catalog:
LOCATIONS OF MONTANA TECH CAMPUSES)
(406) 496-3707

Business Technology
Health
Information Technology
Trades and Technical

Dean: Dr. John M. Garic
(406) 496-3714
Office: COT 100 A

Associate Dean: Steve Luft
(406) 496-3740
Office COT 119B

Administrative Associate: Marilyn Patrick
(406) 496-3711
Office: COT 100C
FAX:(406) 496-3710

Departments:	**Programs:**
Business Technology	**Certificate of Applied Science in Bookkeeping** AAS in Accounting Technology Options: Health Service Human Resource **Certificate of Applied Science in Medical Receptionist** AAS in Business Technology Options: Administrative Computer Specialist Medical Office Specialist **Certificate of Applied Science in Computer Assistant**
Health	**Certificate in Nurse Assistant** (CNA) - Completion of program & passage of NA exam student awarded certification through the Department of Public Health & Human Services (DPHHS) AAS in Medical Assistant AAS in Radiologic Technology
UM-Missoula COT (external degree)	AAS in Surgical Technology
Information Technology	**Certificate of Applied Science in Network Technician** AAS in Network Technology AAS in Web Development and Administration
Trades & Technical	**Certificate of Applied Science in Automotive Technology** AAS in Civil Engineering Technology AAS in Construction Technology - Carpentry **Certificate of Applied Science in Drafting Technician** AAS in Drafting Technology AAS in Metals Fabrication Technology Certificate Pre-Apprenticeship Line Program Wind Energy Program

Mission
Montana Tech's College of Technology prepares traditional and non-traditional students for their personal and/or educational goals through the integration of technology, communications, problem solving, and technical skills.

We are committed to expand educational opportunities through:

- Service learning with work-based activities.
- A blend of theory and practice.
- Alternative course delivery.
- Computer literacy.

Institutional Objectives
- Achieve individual employment goals.
- Utilize effective communication and problem solving skills through traditional and technological resources.
- Engage students in a service-learning environment.

Advisory Committees
Special advisory committees composed of representatives of business and industry meet periodically with the College's administration and faculty to advise on the development and improvement of the specific training programs.

Compensatory Education
Students whose English and/or Mathematics preparation are insufficient to demonstrate proficiency on the COMPASS test will be required to pass compensatory English and/or compensatory Mathematics before entry into the required related instruction of their chosen programs.

If a student tests into M 061 or M 090 for these programs: Accounting, Business, Medical Assistant, Radiologic, & Surgical Technology, then the student is highly encouraged to take M 090 or its equivalent during summer school in order to take M 095 for fall semester.

Baccalaureate Prep Program
Students who do not meet the established requirements for entry into a four-year degree program may choose to enter the College of Technology's **Baccalaureate Prep Program (BPP)**. This program allows students an alternative pathway for entry into a four-year degree program. Students in the BPP will take a select set of courses. Upon successful completion of those courses, students will be permitted entry into a four-year degree program. Students in the BPP must understand that these courses will extend the time needed to complete their desired program.

BUSINESS TECHNOLOGY

Department Chair: Linda Granger
(406) 496-3724
COT 108 Office A

Administrative Assistant: Marilyn Patrick
(406) 496-3711
COT 100 C

Department FAX: (406) 496-3710

Mission

It is the mission of the Business Department of the College of Technology to provide students with the communicative, technical, and problem-solving skills necessary to become and stay employable in an ever-changing business environment. The Department realizes the importance of staying abreast of new and innovative technologies.

We encourage life-long learning to instill its importance in all that we teach. The Business Department strives to accommodate non-traditional students as well as students with special disabilities.

We are committed to our students reaching their professional, personal, and educational goals.

ACCOUNTING TECHNOLOGY PROGRAM AAS

The Accounting Technology Program provides students with educational opportunities leading to positions as small-office managers, bookkeepers in health service settings, accounting clerks, accounting technicians, and human resource assistants. Students may also choose to take classes to achieve career advancement goals or to enhance current skills. Strong accounting, human resource, and health curriculums are complemented with general education and extensive computer course work.

Objectives:

- To provide students with an exceptional curriculum that integrates the business areas of accounting, human resource, and health service support with technology necessary to succeed professionally.
- To support students in their pursuit of life-time learning and professional development.

Outcomes:

Graduates of the Accounting Technology Programs will be able to:

- Practice accounting and human resource skills in diverse business environments in a conscientious, precise, and deliberate manner.
- Demonstrate a solid knowledge base conducive to educational mobility.
- Utilize informational literacy in problem solving.
- Utilize interpersonal communication techniques in individual and group settings.
- Demonstrate responsibility and accountability for decisions and actions taken in the work environment.

Assessment:

- Placement Survey
- Graduate Survey
- Employer feedback through advisory boards
- Course assessment through student evaluations
- Educational mobility assessment through monitoring of students' continued educational pursuits

Health Service Option

The primary mission of the Accounting Technology Degree Option in Health Services is to prepare individuals for accounting careers in the health service arena. This degree melds existing course work in the Accounting Technology Program with medical course work to form an integrated option under the Accounting Technology Associate of Applied Science Degree.

Program graduates, possessing an understanding of both accounting and medical concepts and principles, will be able to work in a variety of health service environments. The program of study is drawn from an array of disciplines that include information technology, mathematics, communication, accounting, human resources, and health.

Human Resource Option

This program promotes an understanding of the behavioral requirements of jobs and the determination of human resource needs, recruiting objectives, and interviewing techniques. Equal employment opportunity, labor relations, and federal and state labor laws are presented. Development and implementation of personnel policies and procedures are introduced. This program combines curriculum from both the accounting and human resource areas together with strong computer application course work. In addition to students enrolled on a full-time basis, this program will benefit the full-time employee interested in professional development and training in human resources.

The Accounting Technology programs are designed for fall entry. If a spring entry is desired, it may take longer than two years to complete the program.

ACCOUNTING TECHNOLOGY PROGRAM AAS

		1st Semester				**3rd Semester**	
ACTG	101	Accounting Procedures I	3	*ACTG	180	Payroll Accounting	3
BUS	0120	Keyboarding	3	*ACTG	205	Computerized Accounting	3
BUS	0265	Business Applications	3	*BUS	0267	Electronic Information Manager	2
CAPP	131	Basic MS Office	3	+CAPP	154	MS Word	2
ACTG	211	Income Tax Fundamentals	3	ACTG	202	Principles of Managerial Acct.	3
		Option Requirement	3	ACTG	215	Foundations of Gov't & No-Profit Acct.	3
		Total 15				Total 17	
		2nd Semester				**4th Semester**	
**BUS	0113	Human Resource Issues	2	CAPP	156	MS Excel	3
ACTG	201	Princ. of Financial Acct.	3	CAPP	158	MS Access	3
WRIT	101	College Writing I	3	M.T.	0220	Employment Strategies	2
+COMM	1216	Principles of Speaking	3	ACTG	212	Income Tax Fundamentals II	3
M	095	Intermediate Algebra	3	+		Option Requirement	3
PSYX	100	Intro. to Psychology	3			Option Requirement	3
		Total 17				Total 17	

* Offered only in Fall

** Offered only in Spring

Minimum credits for an AAS degree in Accounting Technology 67

Human Resource Option Requirements:				**Health Service Option Requirements:**			
*BUS	0115	Intro. To Human Resource Mgmt	3	**BUS	0116	Basic Medical Records	3
**BUS	0135	Compensation & Benefits	3	*BUS	0207	Medical Coding & Billing I	3
BUS	0266	E-Commerce	3	*BUS	0230	Medical Office Procedures	3
**BUS	3626	Labor Relations	3	**BUS	0261	Health Service Accounting Soft.	3
**BUS	3646	Personnel Management	3	HLTH	0103	Medical Terminology	3

+Take an option requirement instead of COMM 1216 in the 2nd semester.
+Take COMM 1216 instead of CAPP 154 in the 3rd semester
+Take CAPP 154 instead of an option requirement in the 4th semester.

Completion of the first two semesters may result in the award of a CERTIFICATE OF APPLIED SCIENCE IN BOOKKEEPING. Students must complete a course in each of the following areas: English, Math, and Psychology, and 3 elective credits in the accounting area to receive a certificate.

BUSINESS TECHNOLOGY PROGRAM AAS

Objectives:

- Provide students with the general education and technical skills necessary to become efficient and effective employees within the office technology workforce.
- Provide students with soft skills training that will enhance their general knowledge about interpersonal relationships and the workforce in general.

Outcomes:

Graduates of the Office Technology Programs will be able to:

- Demonstrate problem-solving, critical-thinking, oral, and written communication skills.
- Demonstrate soft skills including professional skills and the ability to work effectively within groups.
- Demonstrate a competent use of a variety of software applications in the area of business technology.

Assessment:

- Model Office Sites/Supervisor Feedback and Grading
- Montana Tech Placement Survey
- Montana Tech Graduate Survey
- Advisory Boards
- Student Evaluations
- Surveys of Local Businesses
- Graduate Survey

Administrative Computer Specialist: The office professional is expected to be versatile and accomplished beyond the routine skills of keyboarding and filing. Needed abilities include the operation of electronic equipment, the effective use of the telephone, and an understanding of human resource management. In addition to office skills, it is essential that an office professional be adept at interpersonal relations and communications.

Medical Office Specialist: The need increases nationally for medical office specialists with above-average abilities. Confidential matters require a person with a high degree of integrity and loyalty to the employer. The work varies with the institution and field in which the medical office specialist works. From the private practitioner, dentist and veterinarian, to the highly specialized practitioners, the medical office specialist is expected to assist patients, to prepare medical and insurance forms, to process accounts, to make appointments, and to transcribe medical records and correspondence—a truly demanding field for a special person. In this ever-changing business environment, the medical office specialist must always be ready for technological advancements.

BUSINESS TECHNOLOGY - AAS (Administrative Computer Specialist option)

		1st Semester				3rd Semester	
BUS	0120	Keyboarding	3	*BUS	0232	Records Management	3
BUS	0265	Business Applications	3	*BUS	0266	E-Commerce	3
*BUS	0267	Electronic Information Manager	2	CAPP	158	MS Access	3
WRIT	101	College Writing I	3	I.T.	0117	Web Site Development	3
*CAPP	141	Basic Internet	3	M	095	Intermediate Algebra	3
CAPP	131	Basic MS Office	3	M.T.	0220	Employment Strategies	2
		Total 17				Total 17	

		2nd Semester				4th Semester	
**BUS	0113	Human Resource Issues	2	BUS	0234	Model Office	1
BUS	0102	Accounting Procedures I	3	**WRIT	122	Intro. to Business Writing	3
COMM	1216	Principles of Speaking	3	HLTH	0102	Soft Skills Training	1
I.T.	0195	IT Essentials	4	CAPP	156	MS Excel	3
CAPP	154	MS Word	3	**I.T.	0274	Intro. to Publications	3
PSYX	100	General Psychology	3	**CAPP	153	MS Power Point	3
		Total 18		PTC	2506	Web Page Design	3
						Total 17	

*Offered Only in Fall **Offered Only in Spring

Minimum credits for an AAS degree in Administrative Assistant 69

This program is designed for fall entry. If a spring entry is desired, it will take longer than two years to complete.

BUSINESS TECHNOLOGY - AAS (Medical Office Specialist option)

		1st Semester				3rd Semester	
BUS	0120	Keyboarding	3	*BUS	0114	Begin Med Transcription	2
*BUS	0232	Records Management	3	*BUS	0207	Med Coding & Billing I	3
*BUS	0265	Business Applications	3	*BUS	0230	Medical Office Procedures	2
WRIT	101	College Writing I	3	BUS	0234	Model Office	1
CAPP	141	Basic Internet	3	CAPP	154	MS Word	3
HLTH	0107	Basic	2	CAPP	158	MS Access	3
		Total 17		M	095	Intermediate Algebra	3
						Total 17	

		2rd Semester				4th Semester	
ACTG	101	Princ of Financial Acct.	3	**BUS	0113	Human Resource Issues	2
**BUS	0116	Basic Medical Records	3	**BUS	0217	Medical Transcription	2
COMM	1216	Principles of Speaking	3	**BUS	0247	Med Coding & Billing II	3
HLTH	0103	Medical Terminology	3	**BUS	0261	Health Services Act. Soft.	3
**HLTH	0104	Medical Ethics	2	**WRIT	122	Intro. to Business Writing	3
CAPP	131	Basic MS Office	3	**CAPP	153	MS Power Point	3
PSYX	100	Intro. to Psychology	3	M.T.	0220	Employment Strategies	2
		Total 20				Total 18	

*Offered Only in Fall **Offered Only in Spring

Completion of the first two semesters may result in the award of a CERTIFICATE OF APPLIED SCIENCE MEDICAL RECEPTIONIST. Students must complete a course in each of the following areas: English, Math, and Psychology to receive the certificate. Note: Model office may be taken for more than one credit if a student desires.

Minimum credits for an AAS degree in Medical Office Specialist 72

This program is designed for fall entry. If a spring entry is desired, it will take longer than two years to complete.

Certificate of Applied Science - Computer Assistant

The Computer Assistant program prepares individuals for operation of software programs and a basic knowledge of managing data and files. Course work is designed to provide a solid foundation for microcomputer operations and to develop essential business and computer skills.

BUS	0265	Business Applications	2	CAPP	154	MS Word	3
*BUS	0266	E-Commerce	3	CAPP	156	MS Excel	3
*BUS	0267	Electronic Information Manager	2	CAPP	158	MS Access	3
WRIT	101	College Writing I	3	**I.T.	0274	Publications	3
*CAPP	141	Basic Internet	3	**CAPP	153	MS Power Point	3
CAPP	131	Basic MS Office	3	PSYX	100	Intro. to Psychology	3
		Total 17				Total 18	

Health

Health Programs Coordinator: Dan Owens
(406) 496-3761
COT 115 E

Administrative Assistant: Julie Brandon
(406) 496-3791
COT 115

Department FAX: (406) 496-3710

Mission

Montana Tech College of Technology's Health Programs prepare students to meet the highest standards necessary to succeed in the health care industry. We strive to assist students with educational preparation through the integration of technology, communications, problem-solving, and technical skills.

The Health Programs blend theory with practice to assure the opportunity for students to gain the skills and knowledge needed to work in specific health care jobs. Work-based learning opportunities through clinical experiences and practicum's are provided with each program.

The Health Programs Department endeavors to assist students to meet their employment goals and to instill a high standard of care and empathy as health care providers. These jobs demand a high level of independent judgment, effective communication and problem-solving skills, and quality customer service. Our students are prepared to enter the health care industry as desirable and capable workers.

Certified Nurse Assistant Program (CNA)

Montana Tech offers a 14/15-credit Certified Nurse Assistant (CNA) Certificate. Students are accepted each Fall, Spring, and Summer semester and complete the program in one semester. Space is limited and qualified students are accepted on a first-come/first-serve basis.

Readiness for the required courses in the NA Program can be demonstrated in either of the following ways:

- Prior completion of COMM 0102 and MATH 0101 (or their equivalents).
- Or proficient in those areas upon admission.

Graduates of the CNA Program are eligible to apply for certification through the Montana Department of Public Health & Human Services after completing the Certified Nurse Assistant graduation requirements.

Montana Tech offers a school to work CNA project. This is a partnership with area high schools and health care facilities.

Program Description (CNA)

Education

•The Certified Nurse Assistant (CNA) program is designed to acquaint the student with basic client care skills.

Objectives

The CNA curriculum is designed to provide nursing education that will enable a Certified Nurse Assistant:

1. Demonstrate knowledge of basic body structure and function.
2. Demonstrate competence in fundamental skills of client care.
3. Describe the role of the nurse assistant related to caring, communication, and professionalism.
4. Describe the role of the nurse assistant related to caring by demonstrating warmth, respect, genuineness and empathy.
5. Describe the role of the nurse assistant related to communication encompassing verbal, nonverbal, and written interaction with the health care team, client, and family.
6. Describe the role of the nurse assistant related to professionalism by maintaining responsibility, accountability and competence.

CNA Information

It is the student's responsibility to make sure he or she is familiar with the most current Health Program Department policies.

- There are no prerequisites or formal application process required for admission into the CNA program, it is on a first-come - first-serve.
- A grade of **C** or higher is required for **ALL** courses, **non-health** and health within the health program curriculum, in order to progress through the NA Program. If **any** course grade is less than a "C," the student must withdraw from the NA Program but may apply for re-entry at a later date.
- To assure progression through the program, the student must meet the total academic and clinical requirements. The student must demonstrate a continuing ability to assure patient/client safety and welfare. Therefore, satisfactory classroom academic performance does not, in and of itself, assure progression through the program.

General Health Programs Department Standards and Requirements

To progress successfully through the NA program, applicants should have:

- Adequate visual acuity, with or without corrective lenses, to read fine print.
- Adequate hearing ability, with or without auditory aids, to be able to hear heart sounds and understand a normal speaking voice.
- Adequate physical ability to perform basic client/patient care.
- Sufficient command of the English language to effectively communicate (verbally and in written form) with clients/patients, families, and staff.

CNA Program Admission Requirements

CNA students are admitted each Fall, Spring and Summer semester. Students must meet minimum academic requirements and comply with the following health-related program requirements.

- Hepatitis B Vaccination (series of three injections). The first two injections must be completed prior to the end of the first clinic placement.
- Proof of freedom from tuberculosis (TB skin test or chest x-ray).

Fulfillment of the minimum requirements does not guarantee admission into the NA Program. The number of students accepted into the NA Program is limited and admission is on a first-come/first-serve basis. If the number of qualified applicants exceeds available spaces, not all qualified applicants will be accepted.

CERTIFIED NURSE ASSISTANT (CNA) PROGRAM

BUS	0103	Basic Computers/Beg. Keyboarding	2
		-OR-	
CAPP	131	Basic MS Office	3
WRIT	095	Developmental Writing	3
HLTH	0107	Basic Anatomy & Physiology	2
HLTH	0110	Nursing Fundamentals I	3
M	090	Introductory Algebra	4
		Total 14/15	

MEDICAL ASSISTANT PROGRAM -AAS

Description of Program

Montana Tech College of Technology Health Programs Department incorporated the Medical Assistant Program in 2005. The first graduates received their AAS degrees in May of 2006. The Medical Assistant Program allows students to explore a medical office career which incorporates both administrative (front office) and clinical (back office) skills. The curriculum for this program was developed using the standards of the two leading national certifying organizations: The American Association of Medical Assistants (AAMA) and the American Medical Technologists (AMT).

In Montana, Medical Assistants work under the supervision of a physician or podiatrist to take health histories, obtain vital signs, administer medication, give immunizations, perform CLIA waived office laboratory procedures, perform EKG'S, etc. Because of their administrative skills training, Medical Assistants also do medical office accounting, records management, coding and billing and transcription. In addition to these skill based competencies, Medical Assistants must also understand the legal and ethical issues facing health care providers.

Clinical experience is available in local and rural medical practices.

Objectives

The objectives of the Associate of Applied Science Degree in Medical Assistant are:

- Provide a quality education blending theory and practice to assist students with meeting their individual employment goals while impacting the ever increasing needs of the health care industry.
- Facilitate effective communication, problem-solving and critical thinking through a variety of traditional and technological resources. Students receive a general education core, targeted administrative and business courses, and clinical skills education.
- Expose students to a variety of work-based learning opportunities to meet personal interests.

Outcomes

Montana Tech grads are eligible to take a national credentialing exam provided by the AMT. Successful candidates must have a firm grasp on the theory and practice associated with doing medical assistant work. Part of the education includes demonstrating competency in a variety of clinical activities generally associated with the scope of practice. The Montana Tech College of Technology MA Program incorporates the necessary procedural clinical practice to assure graduates of opportunities to reach entry level competency.

Assessment

The Health Programs Department believes that the quality of an academic program is defined by the capability of the students to enter and succeed in the workforce. If graduates meet our didactic and clinical requirements, they will be well prepared for a career in the health care industry.

Specific requirements for the clinical internship are: Annual proof of being free of tuberculosis, proof of Hepatitis B immunization and completion of CPR (adult, child, infant) and First Aid training. Students will be required to purchase suitable medical office attire (scrubs) and may want to purchase a personal stethoscope. Lab Fees will be assessed for malpractice insurance and lab supplies.

MEDICAL ASSISTANT - AAS

1st Semester

ACTG	101	Princ of Financial Acct.	3
BUS	0120	Keyboarding I	3
WRIT	101	College Writing I	3
HLTH	0102	Soft Skills	1
M	095	Intermediate Algebra	3
BIOL	2016	Anatomy & Physiology I	4
		Total 17	

2nd Semester

BUS	0116	Basic Medical Records	3
*HLTH	0103	Medical Terminology	3
CAPP	131	Basic MS Office	3
BIOL	2026	Anatomy & Physiology II	4
PSYX	100	Intro. to Psychology	3
		Total 16	

3rd Semester

BUS	0114	Beginning Medical Transcription	2
BUS	0207	Medical Coding & Billing I	3
BUS	0230	Medical Office Procedures	2
COMM	1216	Principles of Speaking	3
*HLTH	0104	Medical Ethics	2
HLTH	0205	Fundamentals of Med Assist I	4
HLTH	0206	Med Asst Practicum I	2
		Total 18	

4th Semester

BUS	0247	Medical Coding & Billing II	3
BUS	0261	Health Services Acctg Soft.	3
HLTH	0207	Fundamentals of Med Asst II	4
HLTH	0208	Med Assist Practicum II	3
*HLTH	0209	Pharmacology	3
M.T.	0220	Employment Strategies	2
		Total 18	

Minimum credits for an AAS degree in Medical Assistant 69

*Courses are only offered online.

RADIOLOGIC TECHNOLOGY PROGRAM - AAS

Description of Program

In the fall of 2004, Montana Tech College of Technology began meeting the needs of Butte and the State of Montana by offering an Associate of Applied Science of Radiologic Technology. To meet these needs, the Health Programs Department is providing students with advanced education to meet the demands of the ever-changing radiologic field. The educational requirements are derived from the standards of several national organizations, including the American Registry of Radiologic Technologists (ARRT), the Joint Review Committee on Education in Radiologic Technology (JCERT), and the American Society of Radiologic Technology (ASRT) to provide an education that will maintain continuity among radiologic professionals. Radiologic Technologists use x-ray equipment to produce images of tissue, organs, bones, and vessels of the body. These medical professionals perform diagnostic imaging examinations and administer radiation therapy treatments. Work settings vary from large hospitals, to suburban outpatient clinics, to rural physician offices.

Program clinical experiences are available in the entire southwestern Montana region and are integrated through each semester. The Radiologic Technology Program employs alternative course delivery modes through web-based courses, evening classes, and varied clinical experiences. Much of the clinical training emphasizes computer based programs and technology, blended lecture and web based courses.

Objectives

The objectives of the Associate of Applied Science Degree in Radiologic Technology are three-fold:

- Provide a quality education that blends theory and practice to assist students with meeting their individual employment goals and help meet the needs of the health care industry.
- Facilitate effective communication and problem-solving skills through a variety of traditional and technological resources. In this regard, students receive a general education core that sets the foundation for effective communication.
- Expose the students to a vast variety of work-based learning opportunities to satisfy the personal interests of the students.

Outcomes

Students must sit for a national certification exam upon completion of the degree in order to enter the workforce. Candidates for this certification are required to meet minimum didactic and clinical competency requirements. As part of this educational program, students must demonstrate competency in a variety of radiologic clinical activities. Graduating students must submit documents to ARRT with faculty approval stating the student performed the procedures independently, consistently, and effectively. Montana Tech College of Technology has the necessary competency requirements as stated by the American Society of Radiologic Technologists.

Assessment

The Health Programs Department believes that the quality of an academic program is defined by the capability of the students to enter the workforce and in the end, their long term success. We believe that if our graduates meet our didactic and clinical competency requirements and goals, they will be prepared for a career in the health care industry. The goals of our assessment program are to assure our students obtain the necessary national certification to enter the workforce, to maintain our mission, and to continuously update and improve our curriculum in order that the graduates achieve the goals of the Radiologic Technology Program.

Radiologic Technologists use x-ray equipment to produce images of the tissue, organs, bones and vessels of the body. Radiology Technologists are medical professionals who perform diagnostic imaging examinations and administer radiation therapy treatments. A career in radiology technology can lead in many directions. There are many specialty areas with specific imaging techniques for radiology technologists to advance into. Demand is strong across the country. Work settings vary from large hospitals, to suburban outpatient clinics, to rural physician offices.

The Radiologic Technology program includes anatomy, biology, radiation safety and physics. Students learn to use computers and electronic equipment. It is one of the fastest growing professions in the country. Radiologic Technologists are vital members of the patient care team.

Students completing the 2 year AAS degree must sit for a national certification test before they may enter the workforce.

How do I get into the Montana Tech RT program?

Admission to Montana Tech does not guarantee acceptance into the Radiologic Technology (RT) Program. Students entering with the intent to become a radiology technologist are accepted into the program through a formal selection process. Students planning to study radiology technology need a strong educational health core and must be competent in computer skills. The plan of study includes 16 credits for the first fall semester. These credits are the basis for selecting students into the program. The minimum selective GPA for consideration into the RT Program is 2.75. Other selection criteria include computer proficiency demonstrated by completion of CAPP 131 Basic MS Office, successful challenge of the course, or prior work experience. A limited number of students are admitted spring semester of each year. If the number of qualified applicants exceeds the available space, not all qualified applicants will be accepted. Students must meet minimum Radiology Department requirements to be eligible for application into the program. Please refer to the checklist for the requirements and point system that will be used for the selection process.

RADIOLOGIC TECHNOLOGY - AAS

1st Semester

BIOL	2016	Anatomy & Physiology I	4
WRIT	101	College Writing I	3
HLTH	0201	Intro. Physical & Biological Science	3
		OR	
CHMY	121	Intro. to General Chemistry	3
M	095	Intermediate Algebra	3
PSYX	100	Introduction Psychology	3
		Total 16	

2nd Semester

BIOL	2026	Anatomy & Physiology II	4
RAD	0110	Introduction to Imaging	3
RAD	0111	Radiographic Procedures I	3
RAD	0121	Radiographic Imaging Physics	4
RAD	0151	Clinical Ed I	4
		Total 18	

Summer Semester (3rd)

RAD	0161	Radiographic Clinical Ed II	10
	Total	10	

4th Semester

RAD	0122	Radiographic Imaging II	3
RAD	0141	Radiation Protection	2
RAD	0211	Radiographic Procedures II	3
RAD	0251	Radiographic Clinical Ed III	8
		Total 16	

5th Semester

HLTH	0104	Medical Ethics	2
RAD	0219	Radiographic Imaging III	2
RAD	0245	Radiographic Analysis	2
RAD	0261	Radiographic Clinical Ed IV	6
		Total 12	

Minimum credits for an AAS degree in Radiologic Technology 72

UM -COLLEGE OF TECHNOLOGY SURGICAL TECHNOLOGY PROGRAM

Description of Program

Montana Tech College of Technology is proud to partner with The University of Montana-College of Technology to offer their Associate of Applied Science Degree in Surgical Technology entirely on the Butte campus. This learning consortium agreement is available to assist the students who cannot relocate and to help meet the needs of the health care industry. Students begin their studies with the educational health core at Montana Tech College of Technology. All students must make admission to UM-COT and will be formally selected into their program. They continue their studies on the Butte campus through a combination of web delivery course work and hospital clinical work. Surgical technologists work closely with surgeons, anesthesiologists, and registered nurses in delivering patient care preoperatively, inoperatively, and postoperatively.

Objectives

Students are able to live in Butte while earning this degree from UM-COT. As MT Tech COT students taking educational health core courses, preparation begins toward the acceptance into the Surgical Technology Program. A broad base of general education courses, as well as specific health related courses set the foundation for students. An on-site advisor assists students with the transition into the surgical courses with UM-COT.

Outcomes

Students will be prepared to enter the specific surgical curriculum when accepted and may remain on the Butte campus.

Assessment

The Health Programs Department believes that preparing students to enter the workforce is the ultimate academic goal. The educational health core students that ultimately enter The University of Montana-COT Surgical Technology Program have the same educational opportunities and clinical experiences that their counterparts in Missoula experience. We continuously work with the faculty and staff in UM-COT to make necessary changes to enhance the education for the students seeking surgical technology.

Surgical Technologists work closely with surgeons, anesthesiologists, and registered nurses in delivering patient care preoperatively, intra-operatively, and postoperatively. They function as a scrub technologist, the sterile member of the surgical team who passes instruments, sutures, and sponges during surgery. They follow strict adherence to aseptic techniques, as well as the care, cleaning, and maintenance of surgical supplies. Their responsibilities include: preparing the operating room, instruments, equipment and supplies as well as positioning and preparing a safe environment for the patient during surgery.

Surgical Technology students' program includes anatomy and physiology, microbiology, introduction to computer use, ethics in health professions, and specific surgical technology courses related to functioning as a vital member of the surgical team.

Surgical Technologists belong to a separate non-nursing profession of highly skilled, credentialed, allied health professionals who possess specialized education and training specifically for working as a member of a surgery team. Surgical Technology students completing the program are encouraged to take a national certification exam toward being a certified professional.

The UM-M Surgical Technology Program is a collaborative program between The University of Montana-Missoula College of Technology and Montana Tech campuses. Students completing this program will graduate with an AAS degree in Surgical Technology from The University of Montana-Missoula.

How do I apply for the Surgical Technology Program?

Formal application process will be accomplished in the Fall semester by November 1st for Spring Entry. Students intending to become a surgical technologist apply to the program through a formal admissions process at the UM-COT campus. Admission to UM-COT and to Montana Tech does not guarantee acceptance into the Surgical Technology Program.

Students planning to study Surgical Technology need a strong educational health core. The plan of study includes approximately 16 credits the first fall semester of attendance. Students admitted and attending Montana Tech must also be admitted to the UM-COT and have identified their intended program as Surgical Technology. A current Montana Tech student may use a photocopy of the MT Tech admission form when seeking admission to UM-COT. Information regarding the selection process and financial aid are available through UM-Missoula. The local advisor at Montana Tech—**Dan Owens**—will assist Montana Tech students with this process.

For Further Information Contact

[1] Montana Tech COT Surgical Technology Advisor: Dan Owens (406) 496-3761 or
[2] UM-Missoula new student admissions: Beverly Zygmond (406) 243-7828 or Bzygmond@mso.umt.edu
[3] UM-COT Surgical Technology Program Administrative Assistant: Diana Reetz-Stacey (406) 243-7871 or Diana.ReetzStacey@mso.umt.edu.

SURGICAL TECHNOLOGY - AAS

		1st Semester				2nd Semester	
*BIOL	2016	Anatomy and Physiology I	4	**SCN	195	Microbiology for the Surgical Tech	3
WRIT	101	College Writing I	3	*BIOL	2026	Anatomy and Physiology II	4
*CAPP	131	Basic MS Office	3	**SUR	101T	Intro. to Safe Patient Care	3
*M	121	College Algebra	3	***SUR	102T	Surgical Procedures Lab I	2
*HLTH	0103	Medical Terminology	3	**SUR	154T	Surgical Pharmacology	3
		Total 16		*PSYX	100	Introduction Psychology	3
						Total 18	

		3rd Semester				4th Semester	
**SUR	200T	Operating Room Techniques	5	**SUR	205T	Surgical Procedures II	5
**SUR	201T	Surgical Procedures I	4	***SUR	206T	Surgical Lab Practicum II	5
***SUR	202T	Surgical Procedures Lab II	2	***SUR	290T	Surgical Internship	5
***SUR	203T	Surgical Lab Practicum I	4			Total 15	
**SUR	204T	Ethical Dimensions in Health Prof.	3				
		Total 18				TOTAL CREDITS - 67	

*Butte Campus **Web-based courses are offered through UM-COT ***Hospital

NETWORK TECHNOLOGY

Department Chair: Ed Metesh
(406) 496-3735
COT 124 Office A

Administrative Assistant: Marilyn Patrick
(406) 496-3711
COT 100 C

Department FAX: (406) 496-3710

NETWORK TECHNOLOGY PROGRAM - AAS

The Network Technology AAS degree prepares students for employment in the Information Technology arena. The degree places particular emphasis on current and emerging network technologies. Many courses required in this curriculum prepare students for a wide variety of industry recognized certification exams. The course work is rich in laboratory experiences with state-of-the-industry hardware and software. Students study in a learning environment that stresses practical, hands-on experiences and internships.

Graduates of the program will find career opportunities as PC Support Specialists, Network Technicians, and related employment opportunities.

Mission and Goals
The mission of the Network Technology AAS degree program is to provide a quality education that develops skills necessary to design, develop, and support computer networks. An education that stays abreast of new and innovative technologies that enables graduates to provide solutions for business and industry.

Program Educational Objectives
Students will demonstrate competencies in computer maintenance and support.
Students will demonstrate competencies in network device configurations and design principles and be receptive to new technologies.
Students will demonstrate competencies in appropriate network operating systems.
Students will demonstrate the ability to work as part of a team to provide practical solutions for industry.

Program Outcomes
Graduates will demonstrate sufficient knowledge to pass the Comp/TIA A+ and Net+ exams.
Graduates will demonstrate sufficient knowledge to pass the Cisco CCNA exams.
Graduates will demonstrate sufficient knowledge to pass select Microsoft MCSA Core exams.
Graduates will demonstrate sufficient knowledge to design, develop, and support small to medium computer networks and effectively communicate those processes.

Program Assessment
Industry Advisory boards
Graduate/Placement Survey
Internship Student/Supervisor Evaluations
Instructional Diagnosis tools
Student evaluations
Student peer evaluations

Network Technology - AAS

Freshman		Fall Semester	
WRIT	101	College Writing I	3
I.T.	0110	Intro. to Operating Systems (MCSA I)	3
M	121	College Algebra	3
I.T.	0260	Voice and Data Cabling	3
I.T.	0247	Introduction to Programming	3
		Total	17

Sophomore		Fall Semester	
PSYX	100	Intro. to Psychology	3
PTC	2506	Web Page Design	3
I.T.	0195	IT Essentials	4
I.T.	0126	Networking Fundamentals (CCNA 1)	4
I.T.	0130	Intro. to Windows Server (MCSA 2)	3
		Total	17

Freshman		Spring Semester	
I.T.	0272	Fundamentals of Wireless LANs	3
I.T.	0154	Introduction to Unix	3
I.T.	0176	Intro. to Routers (CCNA 2)	4
I.T.	0115	Interm Windows Server (MCSA 4)	3
I.T.	0210	Intro. to Novell Netware	3
		Total	16

Sophomore		Spring Semester	
I.T.	3546	Advanced Linux	3
I.T.	0226	Routing & Switching (CCNA 3)	4
I.T.	0276	WAN Technologies (CCNA 4)	4
I.T.	XXXX	Approved I.T./C.S. Elective	3
COMM	2016	Presenting Technical Info	4
	-OR-		
COMM	1216	Principles of Speaking	3
		Total	17

Optional Exit point with Associate of Applied Science in Network Technology 65 Credits

Network Technician Program Certificate of Applied Science

The Network Technician program is designed to prepare the student for certification as a CCNA (Cisco Certified Networking Associate). Courses are designed to prepare a certified wire level technician with knowledge to access the implications of a given network design and to effectively communicate with all involved personnel, from the architect to the end user, in the implementation of that design. All course work is directly transferable to the AAS degree.

Fall and Spring Entry

WRIT	095	Developmental Writing	3
I.T.	0110	Intro. to Operating Systems	3
I.T.	0115	Network Design & Document Tools	3
CAPP	131	Basic MS Office	3
MATH	095	Intermediate Algebra	3
PSYX	100	General Psychology	3
		Total	18

I.T.	0126	Network Fundament (CCNA 1)	4
I.T.	0176	Intro. to Router Tech (CCNA 2)	4
I.T.	0226	Routing & Switching (CCNA 3)	4
I.T.	0276	WAN Technologies (CCNA 4)	4
		Total	16

Minimum credits for a Certificate in Network Technician Program 34

Web Development & Administration - AAS

Fall		**1st Semester**	
WRIT	101	College Writing I	3
I.T.	0110	Intro. to Operating Systems (MSCA 1)	3
M	121	College Algebra	3
I.T.	0247	Intro. to Programming	3
I.T.	0100	Web Page Fundamentals	3
I.T.	0270	Intro. to Oracle	3
		Total	19

Spring		**2nd Semester**	
I.T.	0253	Java	3
I.T.	0154	Introduction to Linux	3
I.T.	0176	Intro. to Routers (CCNA 2)	4
I.T.	0250	Interactive Web Pages	3
PTC	2506	Web Page Design	3
I.T.	3056	Web Server Administration	3
	Total		19

Fall		**3rd Semester**	
PSYX	100	Intro. to Psychology	3
I.T.	0117	Website Development	3
I.T.	0195	IT Essentials	4
I.T.	0126	Networking Fundamentals (CCNA 1)	4
PTC	1146	Publications Design	2
I.T.	0130	Intro. to Windows Server	3
		Total	18

Spring		**4th Semester**	
I.T.	3546	Advanced Linux	3
I.T.	0280	Oracle II	3
I.T.	0254	Integration	3
I.T.	0255	Web Scripting/Programming	3
PTC	xxxx	Approved PTC/COMM Elective	3
		Total	15

Minimum credits for an AAS degree in Web Development & Administration 71

TRADES AND TECHNICAL

Department Chair: Bill Ryan
(406) 496-3753
COT 126

Administrative Assistant: Marilyn Patrick
(406) 496-3711
COT 100 C

Department FAX: (406) 496-3710

Mission

The Trades and Technical Department prepares traditional and non-traditional students for their personal and /or educational goals through the integration of technology, communications, problem solving and technical skills.

AUTOMOTIVE TECHNOLOGY - Certificate of Applied Science

Program Contact: Don Stodden
(406) 496-3752
COT 128

Modern engineering technology and manufacturing have transformed the automobile from a relatively elementary system to a complex mechanical and electronic marvel. This program requires a sound educational background for the technician who must diagnose malfunctions, operate test equipment and correct problems throughout the entire automotive system. Specialization has entered this field and the person who wishes may concentrate on specific areas of interest. The instruction, course of study, facilities and equipment of the institution have been evaluated by the National Automotive Technicians Education Foundation (NATEF) and meet the National Institutes for Automotive Services Excellence (NIASE) standards for training of automotive technicians.

Outcomes

- Demonstrate mechanical and problem solving skills in team and individual learning exercises.
- Develop a sense of pride in the students work and the desire to progress and excel in the automotive field.
- Provide high priority tasks enabling student to demonstrate the use of automotive equipment when using worksheets and live work.
- Promote occupational growth and life-long learning.

Assessment

Priority Performance worksheets
Task completion written tests Noel-Levitz
Student Satisfaction Survey
Student evaluations
Program Survey of seniors
Advisory Board
Updated computer texts

ASE Performance Certificate Test

AUTOMOTIVE TECHNOLOGY - Certificate of Applied Science

		1st Semester				2nd Semester	
*A.T.	0100	Intro. to Automotive	2	**A.T.	0107	Brakes (Lec)	3
*A.T.	0103	Electrical Systems (Lec)	3	**A.T.	0108	Brakes (lab)	3
*A.T.	0104	Electrical Systems (lab)	4	**A.T.	0112	Engine Performance (Lec)	2
*A.T.	0117	Suspension & Steering (Lec)	3	**A.T.	0113	Engine Performance (lab)	4
*A.T.	0118	Suspension & Steering (lab)	3	M.T.	0220	Employment Strategies	2
WRIT	095	Developmental Writing	3	M	090	Introductory Algebra	4
		Total	18	PSYX	100	Introduction Psychology	3
						Total	21

* Offered only in the Fall
** Offered only in the Spring
Students must enter the program in the Fall semester.

Civil Engineering Technology - AAS

Graduates of this program are prepared to assist professional engineers in a wide variety of projects from transportation, to sewer and water supply, to material testing. The program has a strong math and science foundation reinforced with communication, computers, and area focused electives. Hands-on training provides the student with significant real world experience while enrolled in the program. This program is an excellent way for anyone interested in the engineering field to receive concentrated training in two years and be ready to enter the work force.

Outcomes

- Demonstrate problem solving, informational literacy, technological and communication skills in team and individual learning exercises.
- Develop a sense of pride in one's work and the desire to progress and excel in the Civil Engineering Technician profession.
- Demonstrate the use of equipment typically used in the Civil Engineering Technician field.
- Obtain the skills that will promote occupational growth and life long learning.

Assessment

Student evaluations
Student portfolios
Noel-Levitz Student Satisfaction Survey
Graduate Placement Survey
Survey of seniors
Alumni
Capstone Courses
Advisory Board
National Certification Testing

CIVIL ENGINEERING TECHNOLOGY - AAS

		1st Semester	
WRIT	101	College Writing I	3
*D.T.	0115	Technical Drawing I	5
*D.T.	0125	AutoCAD I	3
PSYX	100	Intro. to Psychology	3
		Total 14	

		2nd Semester	
**CET	0234	Construction Surveying	3
**D.T.	0278	AutoCAD II	3
CAPP	131	Basic MS Office	3
M.T.	0220	Employment Strategies	2
M	151	Pre-Calculus	4
		Total 15	

		3rd Semester	
*CET	0220	Fund of Cemented Aggregate Mix/Test	3
COMM	1216	Principles of Speaking	3
*D.T.	0204	Civil Drafting	3
*ENGR	2300	Construction Estimation	3
*MIN	2100	Plane Surveying	3
*PHYS	1026	College Physics	4
		Total 19	

		4th Semester	
**CET	0235	Legal Doc and Specs	2
**CET	0236	Site Evaluation & Design	3
**CET	0237	Cadastral Surveying	3
CET	0299	Special Projects	3
**D.T.	0205	Civil Drafting II	3
CAPP	156	MS Excel	3
		Total 17	

Minimum credits for an AAS degree in Civil Engineering Technology 65

* Offered only in Fall ** Offered only in Spring

This program is designed for fall entry. If a spring entry is desired, it will take longer than two years to complete.

Construction Technology - Carpentry AAS

Students enrolling in the Construction Technology – Carpentry program will develop their communication and construction skills enabling them to enter a career in residential or commercial construction. The program course work will provide the student with a mix of technical education, general studies, theory and hands-on learning experiences. As students progress in the program they will gain the knowledge and ability to draft; read and interpret building codes for a set of construction blueprints; estimate the amount of material and time required to construct a building with the use of handbooks, spreadsheets and prevailing wage tables. Students will learn how to layout a building on a site and "attach" the building to the site with concrete footings and foundation walls. Students will then progress through the floor, wall and roof framing, exterior and interior finishing, door and window installation and roofing. The Construction Technology – Carpentry program will be reinforced with writing, math and people skills required to successfully communicate and problem solve in the construction trades.

Upon the completion of the required course work, students will be eligible for certification with National Center for Construction Education and Research (NCCER) National Registry and a one-year Certificate of Applied Science or a two year Associate of Applied Science degree.

Students entering the program should have good manual dexterity skills, like to work outdoors in changing weather conditions and be comfortable working at varying heights.

Students completing the program will be able to do the following:

- Demonstrate problem solving, informational literacy, technological and communication skills in team and individual learning exercises.
- Exhibit a sense of pride in one's work and the desire to progress and excel in the carpentry profession.
- Ability to use manual and power equipment typically used in industry.
- Skills that will promote occupational growth and life-long learning.

Assessment

National Center for Construction Education and Research
Student evaluations
Student portfolios
Noel-Levitz Student Satisfaction Survey
Graduate Placement Survey
Survey of seniors
Alumni
Capstone Courses
Advisory Board

CONSTRUCTION TECHNOLOGY - CARPENTRY AAS

		1st Semester				**3rd Semester**	
*CARP	0120	Carpentry Basics & Rough-in Framing (Level I)	5	*CARP	0140	Intro. to Site Layout (Level II)	3
WRIT	095	Developmental Writing	3	*CARP	0260	Cocrt Form, Reinforc/Hand (Level IV)	5
*CNST	0100	Construction Technology Fundamentals & Safety	3	*CARP	0250	Carpentry Practicum II	3
PSYX	100	Introduction to Psychology	3	*D.T.	0125	AutoCAD I	3
M	090	Introductory Algebra	4	M.T.	0220	Employment Strategies	2
		Total	18			Total	16
		2nd Semester					
**CARP	0130	Ext Finish, Stair Constr,& Metal SF (Level III)	4			**4th Semester**	
**CARP	0150	Carpentry Practicum I	3	**CARP	0230	Adv Roof,Floor, & Stair Sys (Level IV)	4
CAPP	131	Basic MS Office	3	**CARP	0220	Interior Finishing (Level III)	4
**CARP	0240	Alternative Construct. Materials	3	**CARP	0270	Building for Solar Energy	3
CNST	0110	Blueprint Reading, Codes, & Estimating	3	**CNST	0280	Building Management	3
**MFAB	0140	Basic Welding	2			Total	14
		Total	18				

*Offered only in the Fall

**Offered only in the Spring

Minimum credits for an AAS degree in Construction Technology - Carpentry 66

Completion of the first two semesters may result in a CERTIFICATE OF APPLIED SCIENCE IN CARPENTRY. Student must complete a course in each of the following areas: *English, Math, and Psychology* to receive a certificate.
This program is designed for fall entry. If a spring entry is desired, it will take longer than two years to complete.

Drafting Technology Program-AAS

The Drafting Technology program prepares the students for work in industry as drafters. The student is able to prepare clear, complete and accurate working drawings similar to those used in industry. The student applies the knowledge of various machines, engineering practices, mathematics, and building materials to complete a set of drawings. Computer-Aided Drafting (CAD) is also utilized during all semesters using industry standard software and hardware.

Outcomes

- Demonstrate problem solving, informational literacy, technological and communication skills in team and individual learning exercises.
- Develop a sense of pride in one's work and the desire to progress and excel in the Drafting profession.
- Provide exercises enabling student to demonstrate the use of manual and Computer Aided Drafting (CAD) equipment typically used in industry.
- Provide students with the skills that will promote occupational growth and life-long learning.

Assessment

Student evaluations
Student portfolios
Noel-Levitz Student Satisfaction Survey
Graduate Placement Survey
Survey of seniors
Alumni
Capstone Courses
Advisory Board

DRAFTING TECHNOLOGY - CARPENTRY AAS

		1st Semester				**3rd Semester**	
WRIT	101	College Writing I	3	COMM	1216	Principles of Speaking	3
D.T.	0115	Technical Drawing I	5	*D.T.	0204	Civil Drafting	3
*D.T.	0125	AutoCAD I	3	*D.T.	0255	Architechtural Drafting	3
I.T.	131	Basic MS Office	3	*D.T.	0280	AutoCAD III	3
		Total 14		CAPP	158	MS Access	3
				M.T.	0220	Employment Strategies	3
						Total 18	
		2nd Semester				**4th Semester**	
**D.T.	0120	Technical Drawing II	3	**D.T.	0205	Civil Drafting II	3
**D.T.	0250	Building Methods & Materials	4	**D.T.	0260	Architectural Drafting II	3
**D.T.	0278	AutoCAD II	3	**D.T.	0284	AutoCAD Applications	3
M	151	Pre-Calculus	4	**D.T.	0285	Special Projects	3
PSYX	100	Introduction Psychology	3	**G.I.	0210	GIS Software	2
		Total 17				Elective	3
						Total 17	

Minimum credits for an AAS degree in Drafting Technology 66
*Offered only in Fall **Offered only in Spring

Completion of the first two semesters may result in a CERTIFICATE IN DRAFTING. Student must complete a course in each of the following areas: *English, Math, and Psychology* to receive a certificate.

This program is designed for fall entry. If a spring entry is desired, it will take longer than two years to complete.

Metals Fabrication Technology - AAS

Completion of the metals fabrication program prepares students to work in an environment constructing major project such as utility trailers, pipelines, manufacturing, industrial construction and repairing heavy equipment. Students are taught to produce these projects by drawing and following various blueprints, diagrams and specification. Products progress from the conceptual stage to completion by using arc, gas, MIG, TIG, and Plasma welding combined with lathe and milling machine applications.

Outcomes

- Function on teams.
- Relevant work experience.
- Express oneself in written and oral form.
- Critical Thinking Skills.
- Appreciation for life long learning.
- Prepared for employment as entry level welders and machinists.

Assessment

Student evaluations
Student portfolios
Noel-Levitz Student Satisfaction Survey
Graduate Placement Survey
Survey of seniors
Alumni
Capstone Courses
Advisory Board

METALS FABRICATION TECHNOLOGY - AAS

1st Semester

BUS	0103	Basic Computers/Beg keyboarding	2
WRIT	095	Developmental Writing	3
M	090	Introductory Algebra	4
*MFAB	0105	Welding Methods I	3
*MFAB	0125	Blueprint Reading & Production	3
		Total	15

2nd Semester

WRIT	101	College Writing I	3
CAPP	131	Basic MS Office	3
**MFAB	0110	Machine Shop I	3
PSYX	100	Intro. to Psychology	3
		Elective	3
		Total	15

3rd Semester

*MFAB	0201	Welding Metallurgy	3
*MFAB	0205	Welding Methods II	4
*MFAB	0210	Machine Shop II	3
*MFAB	0215	Metals Fabrication I	4
*MFAB	0218	CNC Machining I	3
		Total	17

4th Semester

**MFAB	0220	Metals Fabrication II	4
**MFAB	0235	Advanced Machining & Manufacturing	4
**MFAB	0219	CNC Machining II	3
**MFAB	0299	Special Projects	3
M.T.	0220	Employment Strategies	2
		Total	16

Minimum credits for an AAS degree in Metals Fabrication Technology 63

*Offered only in Fall **Offered only in Spring

This program is designed for fall entry. If a spring entry is desired, it will take longer than two years to complete.

Pre-Apprenticeship Line Program

This one-semester certificate program prepares students to be successful in applying for groundmen and apprentice positions within the line trade. It was developed in response to a nation-wide shortage of skilled line workers. A recent survey of the Montana utility industry indicates that there will be a significant need (40-50 new apprentice positions per year) for individuals holding skills offered by this training for at least the next decade, and the industry expects that this trend will continue for the foreseeable future.

The program is limited to 25 new students per semester. Admission to the College of Technology does **not** guarantee admission to the Pre-Apprenticeship Line Program. The following criteria must be met before admission will be granted to the Lineman program.

1. **Application date.** Initial admission to the program is based on a first-come/first-served process. The first 25 individuals who apply for a specific semester will have a slot reserved pending submission of the remaining items listed below (numbers 2-5).
2. **Commercial Driver's License Class A training permit.** This is obtained by passing the written portion of the CDL examination. Students may contact their local DMV office to obtain a study booklet and schedule the written exam. A copy of the Learner's permit must be submitted to the Admissions Office.
3. **Department of Transportation (DOT) physical examination.** Applicants must complete and pass the DOT physical. Applicants should contact their personal physician to fulfill this requirement. A copy of the completed DOT examination form must be submitted to the Admissions office (address below). Please keep your original card.
4. **Math placement.** Applicants must show proof of math proficiency. This can be accomplished by fulfilling **ONE** of the following math requirements.
    - Completing the math portion of the COMPASS placement test. Students must test into the College of Technology's Math 0101 (Introduction to Algebra) course. Call (406) 496-3745 to schedule the COMPASS. To prepare, review the concepts of *fractions, decimals, percents, signed numbers, and order of operations* before test day.
    - Submitting a college transcript showing a grade of a C or better in a math course completed within the last 2 years.
    - Providing proof of ACT or SAT scores within the last two years with a minimum ACT math score of 18 or SAT math score of 450.
5. **Age.** Applicants must be at least 18 years of age before the first 8 weeks of the semester of study are complete.

These items must be submitted to the Montana Tech Admissions Office (1300 W. Park St.) before December 15th (for Spring entry) and July 15th (for Fall entry). If an applicant feels he or she will not meet the criteria for acceptance into the Pre-Apprenticeship Line Program, he or she should notify the Admissions Office immediately so his or her slot can be opened for another applicant.

Students in the program will need to supply their work clothes, Personal Protective Equipment (PPE) and sturdy boots suited for the line profession. All other equipment including specialty tools and certification costs will be covered in the cost of the program. Courses will be offered from 8:00-5:00, Monday thru Friday for the duration of the 16 weeks.

Students will also have the opportunity to earn the following certifications:

- Commercial Driver's License – Class A
- Pole Climbing
- Flagger Training
- First Aid

Participants in the program must not have a fear of heights and should have good manual dexterity skills and like to work outdoors in changing weather conditions. The first two weeks of training will include intensive pole climbing work. If, during the first two weeks of training, an individual determines this is not an appropriate working environment for them, a refund of course fees will be provided.

Outcomes

- Demonstrate communication, problem solving and technical skills with individual and team learning exercises.
- Develop a sense of pride in the students work and the desire to progress and excel in this profession.
- Students demonstrate the use of equipment and techniques typically used in the utility line field.
- Obtain the skills that will promote occupational growth and life-long learning.

Assessment

Hands-on skills tests
Student evaluations
Apprenticeship Placement Survey
Alumni
Advisory Board

SUBJ	CRS #	Course Title	Credits
LINE	0100	Introduction to the Utility Industry	2
M	110	Math for the Utility Industry	6
LINE	0120	Electrical for the Utility Industry	3
LINE	0130	Safety and Certifications	3
LINE	0140	Pole Yard	16
		Total	30

Sustainable Energy Technology - Wind (Certificate)

Sustainable energy as defined by Renewable Energy and Efficiency Partnership (REEP) is *"effectively, the provision of energy such that it meets the needs of the furture without compromising the ability of furture generations to meet their own needs. Sustainable Energy has two key components: renewable energy and energy efficiency."* Sustainable energy encompasses renewable resources such as biofules, wind, solar, geothermal, wave and tidal power.
The first year of this program is designed to prepare students for employement in high skill, high demand jobs as wind, solar, geothermal, electronic and power generation as entry level technicians. During the second year students will concentrate their studies in the fields of: wind, solar and geothermal.

Outcomes

- Demonstrate communication, problem solving and technical skills with individual and team learning exercises.
- Develop a sense of pride in the students work and the desire to progress and excel in the Wind Energy Technology profession.
- Students demonstrate the use of equipment and techniques typically used in the Wind Energy Technician field.
- Obtain the skills that will promote occupational growth and life-long learning.

Assessment

- Hands-on skills tests
- Student evaluations and student portfolios
- Noel-Levitz Stduent Satisfactory Survey
- Graduate Placement Survey
- Survey of senior Alumni
- Capstone Course Advisory Board

Sustainable Energy Technology - Wind Certificate

1st Semester				2nd Semester			
PSYX	100	Intro. to Psychology	3	WRIT	101	College Writing I	3
SET	100	Intro. to Sustainable Energy	2	M	121	College Algebra	3
SET	110	Intro. to Electricity	3	SET	120	Intro. to Programmable Logic Controllers	3
CAPP	131	Basic MS Office	3	SET	130	Advanced Electrical Applications	4
M	095	Intermediate Algebra	3	SET	140	Motors, Generators & Transmissions	3
		Total	14			Total	16

Minimum Credits for Certificate in Sustainable Energy Technology - Wind 30

School of Mines & Engineering

Electrical Engineering
Environmental Engineering
Geological Engineering
Geophysical Engineering
Metallurgical and Materials Engineering
Mining Engineering
Petroleum Engineering
Safety, Health and Industrial Hygiene

Dean: **Dr. H. Peter Knudsen**
(406) 496-4395
Office: MG 119

Administrative Associate: **Donna Conrad**
(406) 496-4262
Office: MG 117
FAX:(406) 496-4260

Departments:	**Programs:**
Electrical Engineering	B.S. in Electrical Engineering M.S. in Electrical Engineering
Environmental Engineering	B.S. in Environmental Engineering M.S. in Environmental Engineering
General Engineering	B.S. in General Engineering Options: Civil Engineering, Mechanical Engineering, Welding Engineering M.S. in General Engineering
Geological Engineering	B.S. in Geological Engineering Options: Geotechnical, Hydrogeology, Mining, Petroleum Minor in Hydrogeology M.S. in Geoscience Option: Geology, Geological Engineering, Hydrogeology, Hydrogeological Engineering
Geophysical Engineering	B.S. in Geophysical Engineering Minor in Geophysics, Minor in Physics M.S. in Geoscience, Geophysical Engineering Option
Metallurgical & Materials Engineering	B.S. in Metallurgical & Materials Engineering Minor in Extractive Metallurgy; Minor in Mineral Processing Engineering. M.S. in Metallurgical & Materials Engineering
Mining Engineering	B.S. in Mining Engineering M.S. in Mining Engineering
Petroleum Engineering	B.S. in Petroleum Engineering M.S. in Petroleum Engineering
Safety, Health, and Industrial Hygiene	B.S. in Occupational Safety & Health Option: Applied Health Science Minor in Occupational Safety and Health M.S. in Industrial Hygiene

INTRODUCTION

The School of Mines and Engineering is comprised of nine departments. The School of Mines traces its history back to 1895 when the Montana State School of Mines was established. The School of Mines opened in 1900 and the first class graduated in 1903. Until 1922, the School graduated only mining engineers, but these engineers had a broad background in mining, geology, metallurgy, and mineral processing. In 1922, separate degrees in Mining Engineering and Metallurgical Engineering were first offered. In 1930, Geological Engineering was added as a separate degree. Master's degrees were first authorized in 1928.

Both bachelors and master's degrees are granted in all programs in the School of Mines and Engineering. The engineering programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC/ABET). The Industrial Hygiene degree is accredited by the RAC of ABET.

School of Mines and Engineering graduates have a sound science and engineering foundation, excellent design skills, and strong computer skills. The college prides itself in preparing engineers and scientists for immediate professional practice and in giving them the skills and knowledge needed to solve the problems of tomorrow. Job placements in summer internships are a major part of that process. A faculty of experienced and dedicated scientists and engineers and laboratories and classrooms equipped with the latest in technology complete the picture. The path blazed by the first 5,000 graduates of the college's degree programs is an easy one to follow as it is wide and world renowned.

Electrical Engineering

Department Head: Dr. Dan Trudnowski
(406) 496-4681
SE 311

Administrative Assistant: Janelle Vincent
(406) 496-4184
SE 313

Department FAX: (406) 496-4849

Electrical engineering (EE) is the largest engineering discipline in the world serving nearly every modern industry and the demand for electrical engineers continues to grow. They are the principal technologists in solving problems related to electrical systems including automation and controls, communication systems, computer design, electronics, and electric energy. Some of the problems electrical engineers solve include: designing the "brains" for automated robotic systems; designing signal-processing algorithms used in sonar, radar, and cell-phone systems; designing high-voltage transmission systems and the automation used to operate the electric power grid; and conceiving the micro-electronic circuitry used in almost all modern equipment.

Montana Tech offers both a Bachelor of Science and a Master's of Science in E.E.. The mission of the Electrical Engineering program at Montana Tech is to provide a quality education that stresses the fundamentals of engineering, mathematics, and science in order to prepare graduates to enter and continue the practice of electrical engineering at the professional level. The Bachelor of Science in Electrical Engineering program is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).

Program Objectives

The objectives of the Electrical Engineering program are to produce graduates who:

1. work effectively on cross-discipline teams, communicating and coordinating with co-workers and clients;
2. can successfully complete an advanced E.E. degree;
3. can apply the principles of mathematics, science, computers, general engineering and business management fundamentals to solve modern technological problems;
4. can design and analyze electrical engineering systems to solve modern technological problems.

Program Outcomes

Students graduating from the Electrical Engineering program at Montana Tech should attain:

a. an ability to apply knowledge of mathematics, science, and engineering.
b. an ability to design and conduct experiments, as well as to analyze and interpret data.
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. an ability to function on multi-disciplinary teams.
e. an ability to identify, formulate, and solve engineering problems.
f. an understanding of professional and ethical responsibility.
g. an ability to communicate effectively.
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. a recognition of the need for, and an ability to engage in life-long learning.
j. a knowledge of contemporary issues.
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
l. the knowledge of advanced mathematics including advanced algebra, differential and integral calculus, differential equations, linear algebra, complex variables, probability and statistics, and discrete mathematics.
m. the knowledge of basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components.

Curriculum

To successfully achieve the program objectives, the BS in E.E. curriculum is arranged so students move gradually towards higher levels of calculation and design concepts that integrate a progressively broader spectrum of basic knowledge in engineering, mathematics, science, and related subjects. Students in the program begin by primarily taking basic calculus, chemistry, physics, and computer programming courses. These courses lay the foundation for engineering topics and design. At the same time, they are taking courses to develop writing skills and complete general education requirements. Students then take lower-level fundamental engineering courses in the areas of mechanics, electric circuits, electronics, digital circuits, embedded systems, electricity and magnetism, electric machines, and signals and systems. At this point, students also take advanced mathematical courses as well as supporting subjects such as engineering economics and technical communications. The curriculum is concluded with upper-division courses such as control theory, communication systems, professional electives, and a capstone design course. Engineering design involving the formulation and solution to open-ended problems is integrated throughout the curriculum beginning the freshman year.

With professional electives, students further develop advanced electrical engineering design knowledge. Several advanced course offerings are available in areas of electric energy and power, instrumentation and control systems, embedded systems, and signal processing.

Facilities

In addition to overall college facilities, Montana Tech offers excellent facilities for the E.E. program. The department maintains three instructional laboratories. The Electrical Engineering lab is equipped for circuit, electronic, and microprocessor applications. The Electric Machines and Power lab is used to conduct electric machinery and high-power experiments. The third is the Instrumentation and Controls lab which is used for I&C related experiments. In addition, the department offers a student study area and a large computer lab for E.E. students.

Faculty

All faculty in the E.E. department have significant industrial experience. All of these faculty teach in the program, advise students, and are involved in program development. The faculty's expertise covers the fundamental areas of electrical engineering as well as advanced knowledge in automation and controls, electric machines, energy and power, instrumentation, electronic design, and communication systems and signal processing. Undergraduate research and design opportunities exist in all of these areas.

ELECTRICAL ENGINEERING

Freshman		**Fall Semester**	
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
ENGR	1010	Intro.. Engineering Problems	3
M	171	Calculus I	3
		*Approved Electives	1
		Humanities Elective	3
		Total 17	

Freshman		**Spring Semester**	
CHMY	143	College Chemistry II	3
M	172	Calculus II	3
PHYS	1046	General Physics-Mechanics	3
E.E.	1010	Intro. to Electrical Eng. I	1
		Social Science Electives	3
		*Approved Electives	3
		Total 16	

Junior		**Fall Semester**	
C.S.	2156	Embedded Systems Development	3
E.E.	3550	Circuits II	4
WRIT	321	Advanced Technical Writing	3
STAT	332	Stats for Scientists & Engineers	3
PHYS	3036	Electronics	3
		Total 16	

Junior		**Spring Semester**	
E.E.	3270	Digital Circuit Design	3
E.E.	3540	Electric Machines	3
EE	3570	Electronic Design	4
E.E.	3580	Signals & Systems	3
PHYS	4056	Electricity and Magnetism	3
		***Professional Electives	1
		Total 17	

Sophomore		**Fall Semester**	
ENGR	2050	Engineering Mech.-Statics	3
M	273	Multivariable calculus	4
M	333	Linear Algebra	3
PHYS	2076	Gen. Phys.-H, S, & O	3
PHYS	2096	Physics Laboratory	1
C.S.	2136	Matlab Programming for Eng/Sci	3
E.E.	2010	Introduction to Electrical Eng. II	1
		Total 18	

Sophomore		**Spring Semester**	
C.S.	2146	C Programming for Eng/Sci	3
ENGR	2060	Engineering Mech-Dynamics	3
E.E.	2530	Electric Circuits	3
E.E.	2550	Electric Circuits Lab	1
M	274	Intro. to Differential Equations	3
PHYS	2086	Gen. Phys.-E, M, & W	3
PHYS	2106	Physics Laboratory	1
		Total 17	

Senior		**Fall Semester**	
ECNS	203	Principles of Economics	3
E.E.	4410	Control Systems Theory	3
E.E.	4440	Communication Systems	3
ENGR	3340	Thermodynamics	3
E.E.	4920W	Eng. Design I (W)	2
		***Professional Electives	3
		Total 17	

Senior		**Spring Semester**	
ENGR	3260	Fluid Mechanics	3
ENGR	4040	Professional Engineering	1
E.E.	4930W	Eng. Design II (W)	1
ENGR	4940	Engineering Seminar	1
M.EC	3630	Eng. Econ. & Fin. Mgmt.	3
		Humanities Elective	3
		***Professional Electives	6
		Total 18	

Minimum credits for a B.S. degree in Electrical Engineering: 136

*Approved electives do not include CHMY 121, 123, 194, M 61, 194, STAT 131, 216, OR PHYS 1026 or 1036. Also, HPER credits are limited to 2 credits except for first responder.

***Professional Electives - must be selected from: E.E. 4280, 4420, 4450, 4460, 4470, 4500, 4510, 4520, 4910 (2 cr.. max), PHYS 4536, GEOP 430, 446, graduate level Electrical Engineering courses, or consent of advisor.

Environmental Engineering

Department Head: Dr. Kumar Ganesan
(406) 496-4239
SE 316B

Administrative Assistant: Shelley Reed
(406) 496-4115
SE 316A

Department FAX: (406) 496-4650

Environmental Engineering Program Mission:
The mission of the Environmental Engineering program at Montana Tech is to provide a quality education that blends theory with practice and enables graduates to successfully pursue professional careers in the field of Environmental Engineering.

The Bachelor of Science degree in Environmental Engineering is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET)

EnvironProgram Educational Objectives (PEOs):

The PEO's for the Bachelor of Science degree program in Environmental Engineering at Montana Tech are as follows:

1.) Graduates will be prepared for entry level employment in environmental engineering or acceptance into a graduate program in environmental engineering, science, or related fields.
2.) Graduates will be equipped to apply principles of mathematics, science, and engineering to characterize, solve, design, and prevent environmental problems.
3.) Graduates will be able to work individually and in diverse teams while effectively communicating with peers, clients, and the public.
4.) Graduates will be primed to adjust to the changing nature of the environmental field recongizing the social and economic constraints of a global community.

Environmental Engineering Program Outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering.

b. An ability to design and conduct experiments, as well as to analyze and interpret data.

c. An ability to design a system, component, or process to meet desired needs within realistic constrains; such as, economic, environmental, social, political, ethnical, health and safety, manufacturability, and sustainability.

d. An ability to function on multi-disciplinary teams.

e. An ability to identify, formulate, and solve engineering problems.

f. An understanding of professional and ethical responsibility.

g. An ability to communicate effectively.

h. An understanding of the impact of engineering solutions in a global and societal context.

i. A recognition of the need for, and an ability to engage in, life-long learning.

j. A knowledge of issues facing contemporary society.

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

l. Demonstrate proficiency in the engineering sciences, including statics, mechanics of materials, fluid mechanics, and thermodynamics.

m. Demonstrate proficiency in environmental engineering topics that emphasize understanding of environmental principles and processes.

n. Demonstrate ability to be able to apply mathematics through differential equations, calculus-based physics, general chemistry, and probability and statistics through environmental applications.

o. Demonstrate ability to apply the principles of environmental engineering to design solutions to engineering problems to resolve and prevent environmental problems in air, water, and land.

In order to achieve these program objectives and outcomes, the Environmental Engineering degree is founded upon a strong background in mathematics, physics, chemistry, biology, engineering fundamentals, as well as economics and the humanities and social sciences - a background that will support changing career requirements, challenges, and the pursuit of life long learning.

Engineering Design is integrated throughout the Environmental Engineering curriculum beginning in the freshman year with ENVE 1940. In ENVE 1940, students are exposed to an overview of the responsibilities of environmental engineers in solving problems. The engineering design concepts are brought to their attention through MIN 1010 with practical examples. In the sophomore year students are taught problem solving skills through ENVE 2040. This course offers the necessary skills to analyze environmental engineering problems applying their mathematical and physical sciences background. During the junior year the students take four environmental engineering courses and a geological engineering course that provides design knowledge. Specifically courses such as ENVE 4020, Surface Water Hydrology; ENVE 4180, Air Pollution Engineering I; and ENVE 4290, Hazardous Waste Engineering provide the students with engineering design experience including economic and safety factors. In the senior year twelve environmental engineering courses provide environmental engineering and design experience including the ENVE 4810, a capstone design course that requires a formal design report and oral presentation based on a real world design project. ENVE 4400 and ENVE 4500 are also designated writing courses where students have to write and present project reports. These twelve senior level courses are focused to strengthen the student's ability to expand the engineering design capabilities and integrate the necessary communication skills, computer application skills, economic, safety and community acceptance analysis skills. Overall, the Environmental Engineering curriculum integrates an engineering design component from the freshman year to the senior year.

All courses in the Environmental Engineering curriculum are taught by faculty with strong academic backgrounds and industry or government experience. Department facilities for laboratory studies and computer applications are excellent, with state-of-art computer equipment and software available to all students beginning with their freshman year. Montana Tech campus is situated in the heart of Montana's mining activity and the area's diverse and challenging environmental issues that stimulate field instruction and research.

Past graduates have been highly successful in finding and doing challenging jobs. Opportunities appear excellent for future graduates because of continued national and international emphasis upon air and water, the cleaning up of hazardous wastes, and the prevention of detrimental impact on land use. Co-op Education assignments and scholarships are available to majors on a competitive basis. Internships and summer jobs are excellent mechanisms to receive additional practical experience.

Regular input from students, alumni, faculty, and industry practitioners are used to assess the program objectives and outcomes.

ENVIRONMENTAL ENGINEERING

Freshman		**Fall Semester**	
BIOL	1086	Introduction to Ecology	2
BIOL	1096	Introduction to Biodiversity	2
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
ENVE	1940	Environmental Seminar I	1
M	171	Calculus I	3
MIN	1010	Intro. to ENGR. Calcs. & Prob. Solving	3
		Total 18	

Freshman		**Spring Semester**	
BIOL	1116	Cell Biology	4
CHMY	143	College Chemistry II	3
CHMY	144	College Chemistry Lab II	1
ENVE	1060	Environmental Software	2
ENVE	1180	Environmental Sampling I	1
M	172	Calculus II	3
PHYS	1046	General Physics-Mechanics	3
		Total 17	

Junior		**Fall Semester**	
ECNS	203	Principles of Economics	3
WRIT	321	Advanced Technical Writing	3
ENGR	3260	Fluid Mechanics	3
ENVE	4150	Environmental Laws & Regulations	2
GEOE	420	Hydrogeology for Engineers	3
STAT	332	Stats for Scientists & Engineers	3
		Total 17	

Junior		**Spring Semester**	
ENGR	3350	Mechanics of Materials	3
ENVE	4020	Surface Water Hydrology	3
ENVE	4180	Air Pollution Control Engr I	3
ENVE	4290	Hazardous Waste Engr	3
M.EC	3630	Engineering Economy	3
		Humn/Social Sci. Elective	3
		Total 18	

Sophomore		**Fall Semester**	
ENGR	2050	Engineering Mechanics-Statics	3
ENVE	2040	Environmental Process Engineering	3
ENVE	2170	Environmental Sampling II	1
M	273	Multivariable Calculus	4
PHYS	2076	General Physics-H, S, & O	3
PHYS	2096	Physics Lab - H, S, &O	1
		Humn/Social Sci. Elective	3
		Total 18	

Sophomore		**Spring Semester**	
ENVE	3130	Air Diffusion Modeling	3
CHMY	210	Survey of Organic Chemistry	3
GEO	101	Intro. to Physical Geology	3
M	274	Intro. to Differential Equations	3
PHYS	2086	General Phyics-EM & WM	3
PHYS	2106	Physics Lab - EM & WM	1
		Total 16	

Senior		**Fall Semester**	
ENGR	3340	Thermodynamics	3
ENVE	4040	Surface Water Quality	3
ENVE	4140	Land and Stream Restoration	3
ENVE	4190	Air Poll. Control Engr. II	3
ENVE	4210	Risk Analysis	2
ENVE	4400W	Pollution Prevention	2
ENVE	4810	Environmental Design I	1
		Total 17	

Senior		**Spring Semester**	
ENVE	4030	Water & Waste Water Treatment	3
ENVE	4160	Environmental Permitting	1
ENVE	4300	Soil & Subsurface Remediation	3
ENVE	4500W	Sustainable Env. Quality Mgmt.	2
ENVE	4820W	Environmental Design II	2
ENVE	4940	Environmental Seminar II	1
		Humn./Social Sci. Elective	3
		Total 15	

Minimum credits for a B.S. degree in Environmental Engineering 136

General Engineering

Department Head: Dr. Butch Gerbrandt
(406) 496-4109
SE 313A

Administrative Assistant: Janelle Vincent
(406) 496-4184
SE 313

Department FAX: (406) 496-4849

The Engineering department at Montana Tech offers the Bachelor of Science and Master of Science degrees in General Engineering. The mission of the undergraduate degree program is to provide the student with an interdisciplinary engineering education that emphasizes mechanical, electrical, civil, and welding engineering fundamentals but also to provide flexibility in choosing a specialization through open engineering technical electives and specified options. Students gain a broad training in science, mathematics, computers, and engineering and are encouraged to select an area of specialization. Formal specialized **options** within the department include **Civil Engineering, Mechanical Engineering**, and **Welding Engineering**. Other specialization can also be pursued through proper advising. Students are exposed to courses with laboratories that emphasize applied engineering concepts and others with design aspects of engineering.

The General Engineering program stresses professionalism and a solid fundamental engineering education, which the student can apply to a wide range of industrial situations. The department offers a degree plan accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET) which leads to a Bachelor of Science degree in General Engineering. The goal of this program is to prepare graduates to enter and continue the practice of engineering at a professional level. Also, the program provides a solid foundation for an advanced engineering degree.

Graduates will be prepared to assume a wide range of positions as engineers in th early years of their careers. In additional to acquiring a broad range of engineering skills, graduates will be able to master workplace skills required in their areas of engineering. In the first years following graduation, graduates are expected to:

a. Perform engineering work in a highly ethical manner, placing public safety and welfare in the forefront while understanding social and global impacts of technology.
b. Progress in their respective fields to become technical and work leaders, assuming advanced responsibilities through experience and licensure.
c. Develop sub-areas of expertise through experience and pursuit of life-long learning opportunities.
d. Take on roles of marketing and project overview by advancing skills in written, oral and graphic communication.
e. Work effectively on cross-function teams, communicating and coordinating with clients, customers, co-workers, contractors, and public agencies.
f. Instill eagerness to learn and continue learning whether it be through advanced degrees or courses or staying current on industry issues.

Engineering programs must demonstrate that their students attain the following outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. An ability to function on multi-disciplinary teams.
e. An ability to identify, formulate, and solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. A recognition of the need for, and an ability to engage in life-long learning.
j. A knowledge of contemporary issues
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

The curriculum meets all general criteria specified by ABET and provides both breadth and depth in the range of topics included in the program. The curriculum is broken into mathematics and basic sciences including computer use, humanities and social sciences, economics, technical writing and presentations, the engineering core with advanced engineering topics and laboratories, and the engineering design experience. The engineering core includes the study of mechanics, thermodynamics, fluid mechanics, engineering graphics, and electrical circuits. In addition, the student selects engineering elective courses to provide further depth and specialization. The **Civil Engineering option** requires courses in surveying, structural engineering, and in water resources and includes courses taught in the environmental engineering, geological engineering, and mining engineering departments. The **Mechanical Engineering option** involves the classic mechanical engineering topics of machine design, mechanics, and thermal-energy. There are other mechanical courses to choose from including HVAC (heating, ventilation, and air conditioning), industrial plant design, structural mechanics, concurrent engineering, etc. The **Welding Engineering option** of curriculum involved welding processes such as arc, laser and solid-state, welding metallurgy of ferrous and non-ferrous alloys, design of welded connections for structures and manufacturing operations, and nondestructive evaluation techniques using x-ray, ultrasonics and magnetics. The Welding Engineering option also emphasizes the use of robotics and automation.

Engineering design is incorporated into the curriculum and applied to the formulation and eventual solution of open-ended design problems. The design process is introduced in a freshman course, ENGR 1010 Intro. to Engineering Calculations & Problem Solving. The design process further evolves in a sophomore course, ENGR 2150, and a junior course, ENGR 3150, where advanced techniques are taught in the use of CAD/CAM software, and culminates in a senior capstone design project. Design projects are also integrated into a majority of the upper-level engineering electives,. The design process stresses the use of sound engineering principles and includes economics, group interactions, ethics considerations, feasibility studies of alternative solutions, and social impact studies. A solution of the design problem is required, with a clear, concise, and detailed presentation of the design process, the critical decisions made, and the results.

Outcome assessment of the General Engineering program includes alumni surveys, standardized exams, industry feedback, and student evaluations. All graduating seniors are required to take the Fundamentals of Engineering exam to provide feedback on improving the program. This provides the initial step toward professional registration, is used as an assessment tool, and requires a thorough review of the basic course work required for graduation.

Graduates currently work in energy production, mineral production, product manufacturing, aerospace design and production, in atomic energy, highway and bridge design, robotics and in research. Engineering alumni currently hold positions that range from design engineer to engineering manager to corporate CEO.

GENERAL ENGINEERING CORE REQUIREMENTS

Freshman		**Fall Semester**	
CHMY	141	College Chemistry I	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
ENGR	1010	Intro.. Engineering Problems	3
ENGR	1050	Intro. to General Engineering	1
M	171	Calculus I	3
		*Approved Electives	2
		Total 16	
		Spring Semester	
CHMY	143	College Chemistry II	3
M	172	Calculus II	3
PHYS	1046	General Physics-Mechanics	3
		*Approved Electives	1
		**Technical Electives	6
		Total 16	

Junior		**Fall Semester**	
ECNS	203	Principles of Economics	3
ENGR	3260	Fluid Mechanics	3
ENGR	3340	Thermodynamics	3
ENGR	3350	Mechanics of Material	3
M	xxx	***Math Elective	3
HUMN	xxxx	Humanities Elective	3
		Total 18	
		Spring Semester	
WRIT	321	Sci. & Tech. Writing (W)	3
		**Technical Electives	3
		****Professional Electives -	9
including ENGR 3150 & 2 credits 3000-level Lab Courses			
		Total 15	

Sophomore		**Fall Semester**	
ENGR	2050	Engineering Mech.-Statics	3
M	273	Multivariable Calculus	4
PHYS	2076	Gen. Phys.-H, S, & O	3
PHYS	2096	Physics Laboratory	1
HUMN	xxxx	Humanities Elective	3
		Social Science Elective	3
		Total 17	
		Spring Semester	
ENGR	2060	Engineering Mech-Dynamics	3
ENGR	2150	Engineering Graphics	2
E.E.	2530	Electric Circuits	3
E.E.	2550	Electric Circuits Lab	1
M	274	Intro. to Differential Equations	3
PHYS	2086	Gen. Phys.-E, M, & W	3
PHYS	2106	Physics Laboratory	1
		Total 16	

Senior		**Fall Semester**	
M.EC	3630	Eng. Econ. & Fin. Mgmt.	3
		****Professional Electives	10
		including 1 credit 4000-level Lab course	
ENGR	4920W	Engineering Design (W)	2
		Total 15	
		Spring Semester	
ENGR	4040	Professional Engineering	1
ENGR	4930W	Engineering Design (W)	1
ENGR	4940	Engineering Seminar	1
****Professional Electives			12
		Total 15	

Minimum credits for a B.S. degree in General Engineering with no option: 128
Minimum credits for a B.S. degree in General Engineering with a civil, mechanical, or welding option: 136

*Approved electives do not include CHMY 121, 123, or 194 PHYS 1026 or 1036, or M 095, 121 or 1066. Also, HPER credits are limited to 2 credits except for first responder. Internship education is limited to 4 credits at 2 credits per semester.
**Technical Electives must be science, math, or engineering courses approved by advisor; cannot be those excluded for Approved elective.
***Math Elective: may choose from M 333 or STAT 332.

NOTE: Each option has specific requirements for electives

MATH 1516 Calculus I with Algebra Enhancement may be substituted for M 171.

General Engineering Degree No Option:
****Professional Electives must be 3000 level or higher (unless otherwise noted) with a technical focus and approved by an advisor. They must include at least one of the following sequences:

E.E. 3270, 3550, 3570, PHYS 3036	Electronics
E.E. 3550, 4280, 4410, 4420, PHYS 3036, CS 2156	Control Systems
ENGR 4840, 4860, 4880	Structures
ENGR 4870, 4500 ENVE 4020, 4030	Surface Water
GEOE 420, 422, 429	Geology
ENGR 2300, MIN 4580, 4610	Management
ENGR 2300, 4860, MIN 2100, 4580	Construction
ENGR 4550, PET 2020, 3010, 3020, & 4020 or 5020	Petroleum Tooling
ENGR 3140, 3440, 4430, 4750,4760, 1110, 2120, 3400, 4400	Welding
ENGR 3380, 4340, 4480, 4490	Energy
ENGR 4150, 4260, 4550, 4570, 3150	Machine Design

GENERAL ENGINEERING SPECIALIZED OPTIONS

The student is encouraged to specialize in one of the three General Engineering options: Civil Engineering, Mechanical Engineering, and Welding Engineering. These areas of concentration offer the advantage of specialization but still retain the core and flexibility of the traditional general engineering curriculum. Required technical electives for each of these four areas are listed following the core curriculum required of all general engineering majors.

Civil Engineering. This option requires courses in surveying, structural engineering, and land development and includes courses taught in the environmental engineering, geological engineering, and mining engineering departments. In addition to the general engineering core, this option offers the student a specialization in the civil engineering areas of foundations and structures and surface water hydrology and hydraulics. The remainder of the civil engineering technical electives are chosen from areas in advanced structures, water and soil remediation, mine construction, environmental issues, hydrogeology, and geomechanics.

Mechanical Engineering. This option involves the classic mechanical engineering topics of machine design, mechanics, and thermal-energy. There are other mechanical concentrations to choose from including mechatronics, HVAC (heating ventilating and air conditioning), industrial plant design, structural mechanics, and concurrent engineering. The mechanical engineering option prepares the graduate for jobs in the broad field of mechanical engineering and includes power production, equipment design, manufacturing, mechanical system design and maintenance.

Welding Engineering. This unique program qualifies graduates to secure jobs in a variety of industrial sectors from heavy, light and aerospace manufacturing, maintenance and repair, and inspection work. There is a huge demand for this type of hands-on engineering in industry today and there are few schools filling this demand. The Welding Engineering Curriculum is multidisciplinary and includes welding processes, automation, metallurgy, design and nondestructive evaluation. This exciting field is critical for the success of engineering projects. The Welding Engineering emphasis at Montana Tech is unique, and its graduates are in high demand in many industries.

The Engineering Department has maintained steady growth and nearly 100% placement for the past decade. The 2006 graduate survey reported an average starting salary of $51,313. Graduates currently work in areas such as energy production, mineral production, product manufacturing, aerospace design and production, highway and bridge design, robotics and automation, and research.

Specified Technical Electives for NO Option

Freshman/Sophomore Year	C.S. 2146, GEO 101, M&ME 2020
Junior Year	ENGR 3150, 3280, 3360 & M 333 or STAT 332
Senior Year	ENGR 4450, 4460

Required credits for General Engineering No Option - 128

Specified Technical Electives for Civil Engineering Option

Freshman	GEO 101, M&ME 2020
Sophomore Year	ENVE 2040, MIN 2100
Junior Year	ENGR 3150, 3360, 2300 & 4840 or 4880
Senior Year	ENGR 4860, 4870, ENVE 4020

Additionally, select a minimum of 13 professional electives from the following list:
GEOE 420, 422, 440, 429, 541, 542,
ENGR 4450, 4460, 4760, 4840, 4880, 5500, 5710, 5850
ENVE 4030, 4040, 4140, 4290, 4300, 4970
MIN 4440, 4500, 4580, 4610, 4670, 5200, 5300, 5610, 5750,

Required credits for Civil Engineering Option - 136

Specified Technical. Electives for Mechanical Engineering Option

Freshman/Sophomore Year	CHMY 144 & C.S. 2136, M&ME 2020
Junior Year	ENGR 3150, 3360, 3380, 4550 M 333 or STAT 332
Senior Year	ENGR 3280, 3540, 4020, 4340, 4450, 4460, 4570

Required credits for Mechanical Engineering Option - 136

Specified Technical Electives for Welding Engineering Option

Freshman Year	CHMY 144, ENGR 1110
Sophomore Year	ENGR 2120, 2400, CS 2136
Junior Year	ENGR 3360, 3400, 4400, M&ME 3510-3540
Senior Year	BUS 3616W, ENGR 4430, 4750, 4760 METE 4880 ENGR/METE Elective (2 credits)

Required credits for Welding Engineering Option - 136

Geological Engineering

Department Head: Dr. Mary MacLaughlin
(406) 496-4655
MG 213B

Administrative Associate: Donna Conrad
(406) 496-4262
MG 117

Department FAX: (406) 496-4260

Geological engineers focus on designing solutions to problems related to the materials of the Earth's crust, including minerals, sediments, rocks, water, and solid and fluid hydrocarbons (coal, oil, and natural gas). Their specialized engineering knowledge is required in the design and construction of civil works such as roads, dams, and foundations for buildings and bridges; the evaluation and utilization of groundwater resources and their interaction with surface waters; the search for, development, and extraction of rock, mineral and energy resources; and the protection and remediation of the environment. Geological Engineers are also routinely involved in the characterization and mitigation of geologic hazards, such as earthquakes, landslides, ground subsidence, and volcanic activity.

Geological Engineering, one of the three "founding" engineering programs of Montana Tech, offers a Bachelor of Science degree in Geological Engineering, as well as a Master of Science degree in Geoscience with several areas of emphasis.

Geological Engineering Program Mission:

Provide a quality education that blends theory with practice.

The Bachelor of Science degree in Geological Engineering is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).

Geological Engineering Program Objectives:

Enable graduates to embark upon and successfully pursue professional careers in the field of Geological Engineering.

Geological Engineering Program Outcomes:

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. An ability to function on multidisciplinary teams.
e. An ability to identify, formulate, and solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic , environmental and societal context.
i. A recognition of the need for, and an ability to engage in life-long learning.
j. A knowledge of contemporary issues.
k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.
l. Demonstrated proficiency in the engineering sciences, including statics, properties/strengths of materials, and geomechanics.
m. Demonstrated proficiency in geological science topics that emphasize geological processes and identification of minerals and rocks.
n. Demonstrated ability to visualize and solve geological engineering problems in three and four-dimensions (space and time).
o. Demonstrated ability to apply the principles of geology, elements of geophysics, geological and engineering field methods, and engineering knowledge to design solutions to geological engineering problems.

To achieve its objective, the B.S. degree is founded upon a strong background in mathematics, physical and geological sciences, and engineering fundamentals; as well as economics and the humanities and social sciences - a background that will support changing career requirements and objectives and the pursuit of life long learning. During their sophomore through senior years, all students are introduced to four fundamental areas of Geological Engineering: Mining Geology, Hydrogeology, Geomechanics, and Engineering Geology. Students are then required to select an area of emphasis (option) for completion of their degree, or to design a program of electives that better serves their personal interests and objectives in concert with their faculty advisor.

The students of the geological engineering program receive their total design experience by taking courses systematically, as defined by the curriculum published in the catalog. Courses in the geological engineering curriculum are arranged so that students move gradually towards higher levels of calculations and design concepts that integrate a progressively broader spectrum of basic knowledge in engineering and geological science topics and related subjects. Although there is, of necessity, some interdigitation of course work, students in the program begin by taking basic mathematics, physics, and geological science courses, which lay the foundation for engineering topics and design, together with courses that develop their writing and computer skills. Students then take lower-division engineering topics courses, such as statics and mechanics of materials; advanced topics in mathematics and geological science; and supporting subjects such as engineering economics and technical communications.

DEGREE OPTION REQUIREMENTS

All Students majoring in Geological Engineering must meet the general core requirements of Montana Tech.

Students must select one of the following options in Geological Engineering no later than the Spring Semester of their Junior Year. Students who do not select one of the approved elective sequences must design one that meets their educational objectives and have it approved by their Faculty Advisor and Department Head no later than the Spring Semester of their Junior Year.

Courses listed are considered "GEOE and technical electives" and satisfy the majority of their designated credits in the B.S. program of study.

Geotechnical Option Required Courses

GEOE	541	Advanced Engineering Geology	3
GEOE	542	Slope Stability Analysis & Design	3
ENGR	4860	Soil Mechanics	3
MIN	5200	Finite Element Method in Geomechanics	3

Hydrogeology Option Required Courses

GEOE	422	Groundwater Flow Modeling	3
GEOE	429	Field Hydrogeology	3
ENGR	4860	Soil Mechanics	3
GEOE	528	Contaminant Transport	3

Mining Option Required Courses

MIN	1050	Introduction to Mining	2
METE	2320	Processing of Particulate Systems	2
METE	2340	Particulate Systems Processing Lab I	1
MIN	3100	Computer Aided Mine Design	2
GEOE	411	Metallic Ore Deposits	3
MIN	4180	Ore Reserve Estimation	3
MIN	4080	Valuation of Mineral Properties	2

Petroleum Option Required Courses

To meet the requirements of this option, the following courses must be taken in addition to the general requirements for the Geological Engineering degree.

PET	2010	Elements of Petroleum Engineering	2
PET	2020	Petroleum Engineering Field Practice	1
PET	3040	Rock Properties	3
PET	3480	Petroleum Well Logging	3
PET	4040	Reservoir Engineering	3

The following course substitutions may be made with the approval of the student's Advisor, Department Head(s), and the Dean of the School of Mines & Engineering.

GEOE 457, Subsurface Methods in Petroleum Geology (3 credits) for PET 4040, Reservoir Engineering (3 credits).

PET 4920W, Engineering Design (3 credits) for GEOE 499W, Senior Design (3 credits).

Geological Engineering

Freshman		**Fall Semester**	
CHMY	141	College Chemistry I	3
CHMY	142	College Chemistry Lab I	1
GEO	101	Introduction to Physical Geology	3
M	171	Calculus I	3
MIN	1010	Intro. to Eng. Calcs. & Problems	3
		Social Science Elective	3
		Total 16	

		Spring Semester	
CHMY	143	College Chemistry II	3
WRIT	101	College Writing I	3
GEOE	104	Intro. To Geological Engineering	1
M	172	Calculus II	3
MIN	1520	Mapping, Surf, Model & Vol.	3
PHYS	1046	General Physics-Mechanics	3
		Total 16	

Sophomore		**Fall Semester**	
GEO	257	Sedimentology & Pet Geol.	3
GEO	209	Intro. to Field Geology	1
ENGR	2050	Engr. Mechanics-Statics	3
M	273	Multivariable Calculus	4
MIN	2100	Plane Surveying	3
PHYS	2076	Gen Phys.-H, S, & O	3
		Total 17	

		Spring Semester	
GEO	204	Intro. to Mineralogy-Petrology	3
ECNS	203	Principles of Economics	3
M	274	Intro. to Differential Equations	3
PET	2050	Petroleum Engr. Lab I	1
PHYS	2086	Gen. Phys. -E, M, & W	3
		Total 13	

Junior		**Fall Semester**	
ENGR	3350	Mechanics of Materials	3
GEOE	440	Engineering Geology	3
GEOP	302	Elements of Geophysics	3
M.EC	3630	Eng. Econ. & Fin. Mgmt.	3
STAT	332	Stats for Scientists & Engineers	3
HUMN	xxxx	Humanities Elective	3
GEOE	420	Hydrogeology for Engineers	3
		Total 21	

		Spring Semester	
WRIT	321	Advanced Technical Writing	3
ENGR	3260	Fluid Mechanics	3
GEOE	403	Structural Geology for Engineers	3
MIN	4670	Geomechanics	3
ENGR		Engineering Fundamentals Electives*	3
HUMN	xxxx	Humanities Elective	3
		Total 18	

Senior		**Summer Semester**	
GEOE	409	Field Geology & Geophysics	6

		Fall Semester	
GEOE	410	Mining Geology	3
		GEOE & Technical Electives	6
ENGR		Engineering Fundamentals Electives *	6
		Total 15	

		Spring Semester	
ENGR	4040	Professional Engineering	1
GEOE	499W	Geol. Engr. Design Project	3
		GEOE & Technical Electives	10
		Total 14	

Minimum Credits for a B.S. degree in Geological Engineering: 136

* Select fundamentals of engineering electives from ENGR 2060-Dynamics, E.E. 2530-Electrical Circuits, ENGR 3340-Thermodynamics (or PET 3720-Petroleum Fluids & Thermodynamics), M&ME 2020-Introduction to Metallurgical & Materials Engineering, and C.S. 2136-Matlab Programming for Engineers and Scientists (or C.S. 2146-C Programming for Engineers and Scientists).

Minor in Hydrogeology, please refer to reference section “MINORS”.

GEOPHYSICAL ENGINEERING

Department Head: Dr. Curtis Link
(406) 496-4165
ELC 303

Administrative Assistant: Theresa O'Leary
(406) 496-4401
ELC 301

Department FAX: (406) 496-4704

Geophysical engineering involves the application of physics and engineering principles to geological problems. The geophysical engineer is concerned with measurements and techniques for the mapping and imaging of physical properties of the earth's crust much as the medical profession uses a variety of techniques to measure and image the interior of the human body.

Maps, cross-sections and images of physical properties are often required for economic, engineering, safety and environmental reasons. Geophysical measurements are essential for the detection, delineation and development of oil, gas, and mineral deposits as well as groundwater resources. Exploration geophysics is the name often applied to this branch of geophysics. Subsurface information may also be required for the placement of large engineered structures such as dams and bridges or the characterization of sites affected by environmental impacts. Engineering geophysicists conduct investigations for these applications.

The Geophysical Engineering program provides interdisciplinary course study in physics, geology, math, computer science, and engineering. The geophysical engineer is prepared to work on teams which might include geologists, geohydrologists, petroleum engineers, mining engineers, and environmental engineers.

Program Objectives

Graduates of the Geophysical Engineering Program are expected to:

1. Demonstrate a solid foundation in basic mathematics, science, and computer technology.
2. Demonstrate an ability to apply engineering principles and techniques towards the practical application of geophysical methods.
3. Demonstrate the skills necessary to enter the geophysical exploration industry at the professional level and be successful throughout their careers.
4. Demonstrate a sufficient background and awareness for life-long learning.

Geophysical Engineering Program Outcomes:

Graduates of the Geophysical Engineering Program will have demonstrated:

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within heath and safety, manufacturability, and sustainability.
d. An ability to function on multi-disciplinary teams.
e. An ability to identify, formulate, and solve engineering problems.
f. An understanding of professional ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. A recognition of the need for, and an ability to engage in life-long learning.
j. a knowledge of contemporary issues.
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program Assessment

The curriculum and objectives are reviewed periodically by the faculty with input from students, alumni and an industry advisory board. Students from the Society of Exploration Geophysicists Student Chapter are solicited for their input on the program and suggestions for improvements. The faculty reviews student performance in certain courses and makes suggestions for changes and identifies areas that need improvement. The Advisory Board reviews the curriculum, course content and student support, and helps to make sure that the curriculum and objectives meet current and future industry needs. The Advisory Board, along with industry recruiters, provides important sources of information on industry trends and their impact on the academic background required of students. All of this information is used to update and reshape the curriculum and program objectives.

Faculty

The faculty in Geophysical Engineering consists of four Ph.D. geophysicists and a laboratory director. All of the faculty teach in the program, advise students and are involved in the development of the program.

Program expertise covers all of the major geophysical technique areas with specialties and research interests in potential fields (gravity, magnetics and self potential), electrical and electromagnetic methods, ground penetrating radar, seismic exploration and tomography, image processing and remote sensing, neural networks and reservoir characterization. Undergraduate and graduate research opportunities exist in these areas.

Facilities

Facilities, besides the usual classrooms and laboratories, include a student library/lounge where informal interaction between students and faculty is encouraged. Computer facilities for the program include a dedicated PC lab equipped with software for word processing, spreadsheet and internet connection, as well as more specialized software for engineering calculations, graphics and geophysical applications. A number of Linux computers are distributed within the department, for use in more advanced course work and research.

The program also has specialized equipment for field measurements. This equipment consists of gravimeters, magnetometers, a gamma ray spectrometer, a spectroradiometer, two infrared radiometers, an imaging spectrometer, electrical equipment for resistivity, IP, VLF, TDEM and CSAMT measurements, ground penetrating radar, and seismic systems.

Fifth Year M.S.

Undergraduates majoring in Geophysical Engineering can obtain a Master's Degree in Geophysics after receiving their B.S. with one extra year of study. Students in the Fifth Year M.S. program can complete over half of the course requirements for a M.S. in their Junior and Senior years. The requirements for this program are the same as for a standard two-year M.S. degree and are outlined in the Graduate School and M.S. Academic Programs sections of this catalog.

Minor in Physics and Geophysics

The Department of Geophysical Engineering offers Minors in Physics and Geophysics. Each minor requires 20 credits of course work. Details on the requirements for these programs can be found in the Minors section of the catalog.

GEOPHYSICAL ENGINEERING

Freshman		**Fall Semester**	
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
GEO	101	Intro. to Physical Geology	3
GEOP	101	Introduction to Geophysics I	1
M	171	Calculus I	3
HUMN	xxxx	Humanities Elective	3
		Total 17	

Freshman		**Spring Semester**	
CHMY	143	College Chemistry II	3
CHMY	144	College Chemistry Lab II	1
GEOP	102	Intro. to Geophysics II	1
M	172	Calculus II	3
PHYS	1046	General Physics-Mechanics	3
HUMN	xxxx	Humanities Elective	3
SOCS	xxxx	Social Science Elective	3
		Total 17	

Junior		**Fall Semester**	
WRIT	321	Advanced Technical Writing	3
GEOP	302	Elements of Geophysics	3
M	333	Linear Algebra	3
PHYS	3036	Elementary Electronics	3
PHYS	4536	Methods of Theoretical Physics	3
		Total 15	

Junior		**Spring Semester**	
ENGR	xxxx	ENGR. Elective	3
GEOE	403	Structural Geology for Engineers	3
GEOP	412	Gravity & Magnetic Exploration	3
GEOP	446	Applied Linear Systems	3
STAT	332	Stats for Scientists & Engineers	3
		Total 15	

Junior		**Summer Semester**	
GEOP	4210	Geophysics Field Camp	6

Sophomore		**Fall Semester**	
C.S.	2136	Matlab Programming for Eng/Sci.	3
ENGR	2050	Engineering Mechanics-Statics	3
M	273	Multivariable Calculus	4
MIN	2100	Plane Surveying	3
PHYS	2076	Gen. Phys.-H, S, & O	3
PHYS	2096	Physics Laboratory	1
		Total 17	

Sophomore		**Spring Semester**	
GEO	204	Mineralogy & Petrology	3
GEOP	225	Physics of the Earth	3
M	274	Intro. to Differential Equations	3
PHYS	2086	Gen. Phys.-E, M, &W	3
PHYS	2106	Physics Laboratory	1
ECNS	203	Principles of Economics	3
		Total 16	

Senior		**Fall Semester**	
GEOP	401	Intro.. to Seismic Processing	3
GEOP	408	Seismic Prospecting	3
GEOP	410	Electrical Prospecting	3
GEOE	xxxx	GEOE Elective	3
		Total 12	

Senior		**Spring Semester**	
ENGR	4040	Professional Engineering	1
GEOP	450	Inversion: Exper Design and Int.	3
GEOP	475	Geophysical Engineering Design	3
M.EC	3630	Eng. Economy & Financial Mgmt.	3
GEOE	xxxx	GEOE Elective	3
		Total 13	

Minimum credits for a B.S. degree in Geophysical Engineering: 128

ENGR Elect Engr 2060, 3260, 3340, or 3350.
GEO/GEOE Elect: 257, 420, 411, 422, 406, 414, MIN 4180, or Pet 3480.

Electives - 2 Humanities courses and 1 Social Science course from the list of approved general education courses.

Minor in Geophysics & Physics, please refer to reference section "MINORS".

METALLURGICAL & MATERIALS ENGINEERING

Department Head: Dr. Courtney Young
(406) 496-4158
ELC 208A

Administrative Associate: Cheryl duToit
(406) 496-4341
ELC 208

Department Fax: (406) 496-4664
Department E-mail CduToit@mtech.edu

Mission

As one of the oldest programs at Montana Tech, the Metallurgical & Materials Engineering program continues to fulfill the historical mission of the School of Mines and Engineering as well as the needs and interests of mineral and metal-related industries while simultaneously addressing those of the materials industries in order to provide a broad and quality education with an appropriate blend of theory and practice so students can successfully and confidently enter into a career and contribute to the profession and society.

General

Metallurgical & Materials Engineering (MetE/M&ME) is an exceptionally broad field that encompasses five disciplines:

Mineral processing: the engineer takes advantage of differences in physical and/or chemical properties to develop, manage, and control processes for liberating, separating and concentrating valuable minerals in associated waste rock,

Extractive metallurgy: the engineer produces and purifies metals from ores, concentrates and scrap (recycling) using hydrometallurgy (water chemistry), electrometallurgy (electrochemistry), and/or pyrometallurgy (thermal chemistry);

Physical metallurgy: the engineer processes the metals into product by, for example, alloying, forging, casting and powdering to control chemical, physical and mechanical properties such as corrosion resistance, strength and ductility;

Materials processing: the engineer applies similar principles as the above to develop the best materials for an application from, for example, ceramics, glasses, composites, and polymers as well as certain minerals and metals, and;

Welding metallurgy: the engineer is concerned with joining materials together, particularly metals, to produce efficient joints with minimum damage to the integrity of the materials being joined.

Together, these disciplines represent the chemical and process engineering of minerals, metals and materials. Courses in each discipline are offered and, in this manner, the program retains its "School of Mines" heritage but has evolved to include the five disciplines to keep pace with the changing needs of industry and society. The evolution ultimately increased the breadth of the program and allowed course contents and research efforts to include environmental remediation, sustainable industrial processing development, recycling, maintenance engineering, forensics, and nanoscale and aerospace materials development. Growth in the metallurgical and materials engineering discipline and the related fields has been substantial in each disciplines and has therefore increased the opportunities for graduates of the program. In this regard, graduate placement has been 100% for over two decades with starting salaries recently averaging $57,000 and ranging between $48,000 and $72,000. Additionally many employers offer significant signing bonuses and moving expenses.

Vision

The Metallurgical and Materials Engineering Department will attract and retain the highest quality engineering students in order to provide resource-based industries with minerals, metals and materials process engineers while maintaining the heritage of Montana Tech. The department will sustain coveted programs with broad, hands-on learning experiences, supported by industry, in order to research and provide solutions for the future needs of society. Graduates of the program will be contributing members of the community, have a passion for excellence, and be recognized among the world's most versatile engineers.

Curriculum

Freshman and sophomore,Metallurgical & Materials Engineering students take a general education core of chemistry, physics, mathematics, social sciences, and humanities, along with computer applications to engineering design. MetE/M&ME courses include *Freshman Seminar* in the first semester and *Processing of Particulate Systems* in the second semester. The former exposes the student to all disciplines through seminars and field trips and simultaneously helps the student to learn how to succeed. The latter introduces the student to particulate systems predominantly focusing on mineral processing but also emphasizing the importance on "downstream" operations and is therefore a core course to the program. Other introductory MetE/M&ME courses are taken, often in conjunction with laboratory exercises and demonstrations including presentations on safety and ethics. In mineral processing/extractive metallurgy, the basic educational emphasis is in mass balancing, thermodynamics, modeling, and unit operations in size reduction, classification, thickening, filtration, drying, flotation, gravity, electrostatic, magnetic, leaching, solution concentration, solution purification, smelting and refining. Extensive consideration is given to the economic and social impact of all these processes and the student is trained in methods and technologies that promote sustainability and environmental responsibility. In physical metallurgy, materials processing, and welding, the chemical, physical and mechanical properties of the various materials are introduced and related to bonding as well as crystal, molecular and grain structures. Unit operations that are used to control the bonding and structures and thereby the properties are covered in detail and include, for examples, alloying, forging, extruding, casting, rolling, joining, heat treating, surface engineering, and powdering. Additional courses such as *Transport Phenomena & Design, Mass Transfer & Chemical Kinetics,* and *Metallurgical & Materials Thermodynamics* also help build the foundation to the program. Having mastered these courses, students will advance to the junior and senior level to learn more about diffusion and other mass transfer processes; high-temperature chemistry of liquid and solid alloys, oxide/silicate solutions (slags), sulfide solutions (mattes), fused salts, cement, and metal-bearing vapors; binary and ternary phase diagrams; aqueous inorganic chemistry; heat-treating, casting, working and mechanical testing; plant and laboratory safety; elements of process design; and fundamentals of ceramic and polymeric materials. Basic scientific knowledge of analytical instrumentation, including Inductive-Coupled Plasma (ICP) Spectroscopy, X-Ray Diffraction (XRD), Ion Chromatography (IC) and Scanning Electron Microscopy with Energy Dispersive X-Ray with novel applications for Mineral Liberation Analysis (SEM/EDX/MLA) is gained through *Materials Characterization & Analysis*. *Environmental Degradation of Materials* and *Process Instrumentation and Control* are examples of required courses with a relationship to each of the disciplines. During the junior and senior years, increasing emphasis is placed on engineering design. The program culminates with real-world design projects in the two-semester course *Senior Design*.

Electives

Through careful selection of department and technical electives, seniors can emphasize at least one of the five disciplines in their education. Technical electives in mineral processing include energy resources processing, materials handling design, and primary & secondary resource processing, the latter being predominantly flotation and surface chemistry. Electives in extractive metallurgy cover topics such as precious metal processing, remediation of hazardous/toxic elements (arsenic, selenium, thallium, mercury and lead), thermodynamic stability calculations, flowsheet development and design, and iron and steel making. Materials-related courses include biomaterials, composite materials, SEM/EDX, electrical, optical and magnetic properties

of materials, and nanoscale materials & technology. Physical metallurgy courses can be chosen from mechanical behavior of materials, failure analysis & design life, ballistics, explosives engineering, casting and solidification, and the metallurgy of ferrous welds.

Design

Design courses are integrated throughout the curriculum. The design experience begins in the first semester of the freshman year with MIN 1010 and MetE 1940 in which students learn to solve and present engineering problems using software and then builds in the next semester and particularly in the sophomore and junior years. Early on, the students are introduced to mineral processing and unit operations in MetE 2320, 2330, 2340 and 2350. In these courses, the student learns separation principles, conducts experiments, and utilizes data to size equipment, develop process flowsheets, and begins to perform economic analyses. Extractive metallurgy courses with similar design experiences include MetE 2500 and 3400. Furthermore, in M&ME 2510, 3510 & 3520, the student begins to learn that materials selection is often a compromise reached after careful evaluation of the pros and cons of material properties. Principles are demonstrated with hands-on experiences in two laboratory courses, M&ME 3530 and 3540, which deal with microstructure analysis and the fundamentals of physical metallurgy and materials engineering. In the last year and a half, students expand upon the design experience by taking courses such as M&ME 4020, 4410, 4500 and 4750 as well as possible technical electives in MetE/M&ME 5110, 5200, 5340, 5690, 5700, 5830 and 5870. Finally, the program culminates in the senior year with a real-world design project, MetE 4920/4930 – *Senior Design*, in which all of the cumulative knowledge of general engineering fundamentals, metallurgical and materials engineering, computer applications, engineering economics, safety, communication skills, etc. are integrated.

Objectives

The objectives of the undergraduate program in Metallurgical and Materials Engineering are to provide a broad and quality education with an appropriate blend of theory and practice so students:

- can successfully and confidently enter into a career,
- meet the needs of industry, and
- engage in life-long learning and thereby contribute to the profession and society.

To help satisfy these objectives, the curriculum has evolved to (1) train students to understand a wide range of metallurgical and materials engineering methods which apply to the five disciplines as well as related fields, (2) prepare the student to adapt to an ever-changing world and its demands for minerals, metals and materials, and (3) give the student practical, hands-on experiences with numerous laboratory courses and field trips. In this regard, it is highly recommended that the students gain employment appropriate to metallurgical and materials engineering or related fields during all summer breaks and even the school year to help guide the student in his or her career choices, pay for college expenses, and ultimately make the student more marketable upon graduation.

Outcomes

Graduates of the Metallurgical and Materials Engineering program will be able to:

- apply knowledge of mathematics, science and engineering,
- design and conduct experiments, analyze and interpret data,
- design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability,
- function on multi-disciplinary teams,
- identify, formulate, and solve engineering problems,
- understand professional and ethical responsibility,
- communicate effectively,
- understand the impact of engineering solutions in a global, economic, environmental and societal context,
- recognize the need for and engage in life-long learning,
- understand contemporary issues, and
- use the techniques, skills and modern engineering tools necessary for engineering practice.

Graduates of the Metallurgical and Materials Engineering program will also:

- be able to apply advanced math, science (chemistry and physics), and engineering principles to metallurgical and materials systems,
- have an integrated understanding of the scientific and engineering principles underlying the major elements of the field which include structure, properties, processing, and performance related to metallurgical and material systems,
- be able to apply and integrate knowledge from each of the four elements of the field to solve metallurgical and materials selection and design problems, and
- have the ability to utilize experimental, statistical and computational methods which are consistent with the educational objectives of the metallurgical and materials engineering program.

Assessment

These objectives and outcomes are constantly assessed through pre/post course surveys, course evaluations, mid-student surveys, exit interviews, graduate surveys, student satisfaction surveys, and advisory board feedback. Assessment responses from students, alumni, employers and the advisory board are documented and evaluated periodically by the faculty in order to make changes to and thereby improve the quality of the program as needed. The Metallurgical and Materials Engineering department faculty believe that the quality of the program is ultimately defined by the long-term success of its graduates. If these objectives and outcomes are met, graduates will be well-prepared for a career and consequently will be very successful. Thus, the assessment goal is to insure that the program is maintained and continuously improved so that graduates meet the objectives and thereby achieve the outcomes.

"Empowering success through knowledge and experience."

$$4 = E^4$$

Metallurgical & Materials Engineering alumni working at MSE-TA, an R&D company located in Butte, MT. Left to right, Front Row: Mary-Anne Harrington-Baker, Suzanne Nordwick, Michele Lee; Back Row: Jay McCloskey, Brian Park, Krag Filius, Diane Jordan; Not Pictured: Jeff Lefevre and Ron Glovan. Mary-Anne and Jay serve on the department's advisory board. Jay now works for the Center for Advanced Mineral & Metallurgical Processing (CAMP) which provides a large part of the R&D efforts in the MetE Department and thereby offers a great additional resource for learning and experience.

METALLURGICAL & MATERIALS ENGINEERING

Freshman		Fall Semester	
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
M	171	Calculus I	3
METE	1940	Freshman Seminar	1
MIN	1010	Intro.. to Engr.. Calc. & Problems	3
		**Humanities Elective	3
		Total 17 (17)	

Freshman		Spring Semester	
CHMY	143	College Chemistry II	3
CHMY	144	College Chemistry Lab II	1
M	172	Calculus II	3
METE	2320	Processing of Particulate Systems	2
METE	2340	Particulate Systems Processing Lab I	1
PHYS	1046	General Physics-Mechanics	3
		**Humanities Elective	3
		Total 16 (33)	

Junior		Fall Semester	
CHMY	371	Phys. Chm-Quantum Chm & Spec.	3
CHMY	372	Physical Chemistry Lab	1
***E.E.	2530	Electrical Circuits & Power	3
***E.E.	2550	Electrical Circuits & Power Lab	1
STAT	332	Statistics for Scientists & Engineers	3
METE	3400	Mass Transfer & Chemical Kinetics	3
M&ME	3510	Fundamentals of Materials	2
M&ME	3530	Microstructural Interpretation	1
		Total 17 (84)	

Junior		Spring Semester	
WRIT	321	Advanced Technical Writing	3
ENGR	3350	Mechanics of Materials	3
ENGR	3360	Mechanics of Materials Lab	1
M&ME	3520	Materials Engineering & Design	2
M&ME	3540	Materials & Phys. Metallurgy Lab	1
M&ME	4500	Adv. Transport Phenomena & Design	2
M&ME	4710	Mat Characterization & Analysis	3
M.EC	3630	Engr.. Economy & Financial Mgmt.	3
		Total 18 (102)	

Sophomore		Fall Semester	
*ECNS	203	Principles of Economics	3
ENGR	2050	Statics	3
M	273	Multivariable Calculus	4
METE	2330	Design of Particulate Systems	2
METE	2350	Particulate Systems Processing Lab II	1
PHYS	2076	Heat, Sound, & Optics	3
PHYS	2096	Physics Laboratory	1
		Total 17 (50)	

Sophomore		Spring Semester	
M	274	Intro. Differential Equations	3
METE	2500	Transport Phenomena & Design	2
M&ME	2510	Intro. to Mat & Physical Metallurgy	2
M&ME	3220	Met & Mat Thermodynamics	3
PHYS	2086	Gen. Phys.-Elect, Mag, & Wave	3
PHYS	2106	Physics Laboratory	1
		**Social Science Elective	3
		Total 17 (67)	

Senior		Fall Semester	
ENGR	4040	Professional Engineering	1
METE	4010	Processing of Aqueous Systems	3
M&ME	4020	Processing of Elevated Temp Systems	3
METE	4050	Aqueous & Elev. Temp Processing Lab	1
M&ME	4860	Polymeric Materials	2
M&ME	4750	Environmental Degradation of Mat.	3
METE	4920	Senior Design I	1
METE	4940W	Senior Seminar	1
		Technical Electives	3
		Total 18 (120)	

Senior		Spring Semester	
M&ME	4230	Multicomponent Phase Diagrams OR	
M&ME	4410	Flowsheet Development & Design	3
M&ME	4510	Process Instrumentation & Control	3
M&ME	4620	Ceramic Materials	2
METE	4930W	Senior Design II	2
		Technical Electives	6
		Total 16 (136)	

Minimum Credits for a B.S. degree in Metallurgical & Materials Engineering 136

Departmental approval is required for all technical electives. Of the 9 credits of technical electives, 3 must have a significant engineering design component and 3 must be in either METE or M&ME. PERMISSIBLE TECHNICAL ELECTIVES include MIN 1050, BIOL 1116, ENVE 2040, GEO 204, ENGR 2060, CHMY 210, and any course numbered 3000 or higher in CHMY, ENGR, E.E., ENVE, GEOE, GEOP, MATH, METE, M&ME, MIN, or M.EC. Students should consider taking ENGR 2060, 3260 and 3340 as "Engineering Fundamentals" courses. Students interested in Mineral Processing and Extractive Metallurgy should consider METE/M&ME 5010, 5020, 5040, 5110, 5200, 5230, 5250, 5260, 5310, 5340, 5410, 5710, 5800, 5820 and 5830. Students interested in Welding, Physical Metallurgy and Materials Engineering should consider METE/M&ME 5200, 5230, 5410, 5440, 5690, 5700, 5710, 5800, 5840, 5870 and 5890. All students should also consider completing Minors in Chemistry, Math and Physics as well as those in other engineering programs.

*ECNS 203 is a required social science course and is used to satisfy the Gen-Ed Requirements (GER), p 32.

**METE/M&ME students must complete 6 credits of humanities and 3 credits of social sciences. See Gen-Ed Requirements (GER), p 32.

***PHYS 3036 Elementary Electronics may be substituted for E.E. 2530/2550, but students must take an additional technical elective credit.

**** Minors available from the Metallurgical & Materials Department are limited to students seeking outside engineering degrees as described in Reference Information Section, subsection Minors for Curriculum Information, p 135.

MINING ENGINEERING

Department Head: Mr. David Armstrong
(406) 496-4867
MG 118

Administrative Associate: Donna Conrad
(406) 496-4262
MG 117

Department FAX: (406) 496-4260

Mining Engineering is the founding program of Montana Tech. Mining Engineers design, construct, and manage surface and underground mines. Montana Tech offers Bachelor of Science and Master's of Science degree programs in Mining Engineering. Faculty with strong, academic and industrial backgrounds teach the courses in the Mining Engineering Curriculum.

In addition to a comprehensive engineering foundation, the Mining Engineering program provides training in the mechanics of geologic materials, rock fragmentation, materials handling, mine valuation, ventilation, environmental considerations, and the design and operation of surface and underground mines. Students have access to the latest computer graphic equipment with support hardware and software or computer-assisted mine planning and evaluation. The computer lab in the Mining Engineering department provides students with advanced personal computer systems.

Mining Engineering students are urged to seek summer employment in the mining industry to gain experience to apply in the classroom and for the future. This combination of academic and "real world" experience helps to make Montana Tech a college where "theory and practice meet."

Mining Engineering Program Mission

Provide a quality education that blends theory with practice.

The Bachelor of Science degree in Mining Engineering is accredited by the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).

Mining Engineering Program Objectives

Enable graduates to embark upon and successfully pursue professional careers in the field of Mining Engineering.

Mining Engineering Program Objectives

a. An ability to apply knowledge of mathematics, science, and engineering.
b. An ability to design and conduct experiments, as well as to analyze and interpret data.
c. An ability to design a system, component, or process to meet desired needs within realistic constraints; such as, economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d. An ability to function on multidisciplinary teams.
e. An ability to identify, formulate, and solve engineering problems.
f. An understanding of professional and ethical responsibility.
g. An ability to communicate effectively.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
i. A recognition of the need for, and an ability to engage in life-long learning.
j. A knowledge of contemporary issues.
k. An ability to use techniques, skills and modern engineering tools necessary for engineering practice.
l. Demonstrated proficiency in statics, dynamics, strength of materials, fluid mechanics, thermodynamics, and electrical circuits.
m. A fundamental knowledge of the geological sciences; including mineral and rock identification and properties.
n. Demonstrated proficiency in engineering topics related to both surface and underground mining; including, mining methods, planning and design, ground control and rock mechanic, health and safety, environmental issues, and ventilation.
o. Demonstrated proficiency in additional engineering topics; such as, rock fragmentation, materials handling, mineral processing, mine surveying, and valuation and resources/reserve estimation.

The Mining Engineering program believes that the quality of our academic program is ultimately defined by the long-term success of its graduates. Program objectives and the curriculum are assessed regularly on the basis of input from students, alumni, faculty, and industry practitioners.

MINING ENGINEERING

Freshman		Fall Semester	
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
MIN	105	Introduction to Mining	2
M	171	Calculus I	3
MIN	1010	Intro.. to Eng. Calcs. & Problems	3
GEO	101	Intro. to Physical Geology	3
		Total	15
		Spring Semester	
CHMY	143	College Chemistry II	3
WRIT	101	College Writing I	3
M	172	Calculus II	3
MIN	1110	Miner Safety Training	2
MIN	1520	Mapping, Surf Model & Vol.	3
PHYS	1046	General Physics-Mechanics	3
		Total	17

Sophomore		Fall Semester	
ENGR	2050	Engineering Mechanics-Statics	3
M	273	Multivariable Calculus	4
MIN	2100	Plane Surveying	3
MIN	2150	Mining Methods	3
PHYS	2076	Gen. Phys.-H, S & O	3
PHYS	2096	Physics Laboratory	1
		Total	17
		Spring Semester	
ECNS	203	Principles of Economics	3
ENGR	2060	Engineering Mechanics-Dynamics	3
GEOE	204	Mineralogy & Petrology	3
M	274	Intro. to Differential Equations	3
MIN	4060	Mine Surveying	1
PHYS	2086	Gen. Phys.-E, M & W	3
		Total	16

Junior		Fall Semester	
E.E.	2530	Elect. Circuits	3
ENGR	3350	Mechanics of Materials	3
ENGR	3360	Mechanics of Material Lab	1
MIN		Mining or Tech Elective	3
ENGR	3260	Fluid Mechanics	3
WRIT	321	Advanced Technical Writing	3
		Total	16
		Spring Semester	
STAT	332	Stats for Scientists & Engineers	3
MIN	3050	Unit Mining Operations	4
M.EC	3630	Eng. Economy	3
MIN	4670	Geomechanics	3
MIN	3100	Computer Aided Mine Design	2
METE	2340	Particulate Processing Lab I	1
METE	2320	Processing of Particulate Syst.	3
		Total	19

Senior		Fall Semester	
ENGR	3340	Thermodynamics I	3
MIN	4010	Mine Design-Surface	3
MIN	4580	Mine Management	3
M.EC	4000	Econ. of Mineral Industry	3
HUMN	xxxx	Humanities Elective	3
MIN		Mining or Tech Elective	3
		Total	16
		Spring Semester	
MIN	4560	Mine Ventilation	3
MIN	4700W	Mine Design Project	3
MIN	4080	Mine Valuation	3
MIN		Mining/Environmental Elec	3
HUMN	xxxx	Humanities Elective	3
		Social Science Elective	3
ENHR	4040	Professional Engineering	1
		Total	19

Minimum credits for a B.S. degree in Mining Engineering 136

Mining/Environmental Elective: MIN 4440, MIN 5610, or ENVE 4140

A total of 9 credits of technical electives must be taken to complete the curriculum in Mining Engineering. Of these, 6 credits must be mining electives.

The remaining credits of technical electives may be completed by taking any metallurgy, any mineral economics course, any General Engineering, or Environmental Engineering course above 2000-level, any course at or Geological or Geophysical Engineering above 3000-level, and any MATH course at the 4000-level.

The Department of Mining Engineering must approve the selection of all electives. In addition all students must meet the general core requirements of the college in completing electives.

PETROLEUM ENGINEERING

Department Head: Mr. Leo Heath
(406) 496-4507
PET 205

Administrative Assistant: Lana Petersen
(406) 496-4197
PET 209

Department FAX: (406) 496-4417

The primary mission of the Petroleum Engineering Program is to prepare its graduates to enter and continue the practice of Petroleum Engineering at a professional level. The program is designed to provide both breadth and depth across the range of topics included in the curriculum.

Petroleum engineers are concerned with the design and construction of wells and well systems for producing oil, gas, and other natural resources from the earth, and for conveying fluids into, out of, or through the earth's subsurface. Responsibilities of the engineer include the design of the drilling, production, recovery, and field processing systems to provide the most economical recovery and utilization of crude oil and natural gas. Effective synthesis of these systems is based on a comprehensive knowledge of basic mathematics, science and engineering principles.

The primary objective of the Petroleum Engineering curriculum is to impart knowledge of the physical and chemical laws of petroleum and their application to the analysis and solution of engineering problems. The challenges include increasing production rates, improving recovery and protecting the environment. The development of analytical problem solving and of verbal and written communication skills is emphasized throughout the program. An appreciation of the humanities and social sciences, together with a confident enthusiasm for a professional career as a petroleum engineer, are instilled in the student as they proceed toward graduation.

There are three primary sub-disciplines within Petroleum Engineering that deal with the specific aspects of producing crude oil and natural gases: Drilling, Production, and Reservoir Engineering. The curriculum is designed to give each student a working knowledge of all three and the skills to succeed in any of these areas.

Drilling Engineering
The study of drilling oil and gas wells. Students learn to design and drill shallow and deep oil and gas wells both onshore and offshore. Students learn the basics of drilling equipment, mud systems, wellbore hydraulics, pressure control, and directional drilling.

Production Engineering
The study of the principles and methods involved with the production of oil, gas, and water from subsurface reservoirs and the surface processing of oil and gas. Students learn to design efficient and cost-effective procedures for lifting oil and gas from underground reservoirs, installing oil and gas pipelines and surface facilities, and performing well stimulation treatments.

Reservoir Engineering
The study involves geological and physical properties of oil and gas reservoirs with the goal of maximizing recovery under economic constraints. Students learn critical rock and fluid properties, volumetric and material balance methods of estimating reserves, analysis of well logs, methods of projecting reservoir performance characteristics using analytical and numerical models, and perform economic evaluations of petroleum projects.

Students can also elect to take specialized courses in areas such as well stimulation, enhanced oil recovery, and pressure transient analysis. Five labs, equipped for studying drilling and drilling fluids; flow of oil and gas in pipes; computer assisted mapping of subsurface reservoirs; measurement of natural gas properties and flow rates; and the analysis of rock and fluid properties, provide essential "hands-on" experience.

The program is designed to provide for specialization in Petroleum Engineering within a strong general engineering core. The specialization provides necessary skills to compete in the job marketplace. The general engineering, science, mathematics, humanities and social science courses provide a foundation to become an effective engineer and world citizen.

The faculty's close liaison with the oil and gas industry gives students many opportunities for work experiences and scholarships. For a number of years, all USA students with a GPA greater than 3.00 have had scholarship support from the college or industry of $500 to $5,000. Almost all sophomores and juniors and some freshmen obtain summer jobs in the industry with salaries ranging from $5,000 - $7,000/month.

The Petroleum Engineering Department offers the advantage of current technology and engineering practice studied both in the classroom and in real oil and gas fields through summer jobs. The Petroleum Engineering degree program prepares students for a career that will span several decades and possibly take them to all corners of the world. Placement of graduates has been near 100% for the past ten years. Recent salaries have averaged in excess of $80,000/yr.

Companies who have hired recent Petroleum Engineering graduates include Aera, Anadarko, BP, Baker Hughes, Cabot, Chesapeake, ConocoPhillips, Devon, En Cana, Halliburton, Hess, Marathon,Merit Energy, New Field, Harbors Drilling,Sanjel, St. Mary's Land, and Venoco, among others.

Curriculum and the design experience
The courses that make up the curriculum are chosen to encompass the broad array of topics which define petroleum engineering. Students are given ample experience in the design/problem solving process so that they can quickly become contributing members of the profession after graduation. The curriculum begins in the freshman year with a mix of basic science and mathematics courses. These courses provide background and understanding in the areas of chemistry, physics, geology, calculus and differential equations and a set of courses to hone communication skills (writing, speaking and computing). Students are required to take Technical Writing (WRIT 321) and Senior Technical Communication Seminar (COMM 4921) as prerequisites and corequisites to Engineering Design. Design is taught beginning in both the Introduction to Engineering Calculations and Problem Solving (MIN 1010) and in Elements of Petroleum Engineering (PET 2010) with simple problems involving one or more elements in the design process. Design is then nurtured in each of the petroleum engineering courses as students

move from drilling to production to reservoir engineering. In the final semester, the various aspects of petroleum engineering and the complete design methodology are brought to bear in the Engineering Design (PET 4920) and Petroleum Project Evaluation (PET 4460) classes. Students work in teams and discover the material they need to solve a field design problem and develop a design package. The required written and oral reports then build on the writing and speaking skills learned earlier. In addition, **students are required to take the FE exam to complete the degree requirements**. Results of the exam are used in the Petroleum Department as an assessment tool for evaluating the success of the petroleum engineering program.

Educational Objectives of Bachelor of Science

The educational objectives for the Petroleum Engineering program are listed below along with some of the specific outcomes required to achieve each.

1. Graduates will be prepared to assume positions as Petroleum Engineers upon graduation. As a minimum they will be required to demonstrate the competencies required by ABET/EAC under the program for Petroleum and similarly named engineering programs, which are:

   a. Demonstrated proficiency in the engineering sciences, including statistics, properties/strength of materials, and geomechanics.
   b. Demonstrated ability to apply mathematics through differential equations, probability and statistics, calculus-based physics, and chemistry to solve petroleum engineering problems.
   c. Demonstrated proficiency in petroleum engineering science topics that emphasize petroleum engineering processes.
   d. Demonstrated ability to visualize and solve petroleum engineering problems in three and four dimensions (space and time).
   e. Demonstrated ability to apply the principles of geological and engineering field methods, and engineering knowledge to design solutions to petroleum engineering problems which include one or more of the following considerations: the distribution of physical and chemical properties of earth materials, including oil and gas fluids and ground water; the effects of naturally occurring and man-made processes in the recovery of hydrocarbons fluids, the mechanics of development and extension of natural resources and subsequent remediation; disposal of wastes; and the effects of the recovery of oil and gas on other activities of society.

2. In common with all engineering programs, Petroleum Engineering graduates will have demonstrated:

   a. An ability to identify, formulate, and solve engineering problems.
   b. An ability to apply knowledge of mathematics, science, and engineering.
   c. An ability to design and conduct experiments, as well as to analyze and interpret data.
   d. An ability to design a system, component, or process to meet desired needs.
   e. An ability to function on multidisciplinary teams.
   f. An ability to communicate effectively.
   g. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

3. Graduates will understand the role of engineering in society and their obligations to the profession and society by demonstrating:
   a. An understanding of professional and ethical responsibility.
   b. An understanding of the impact of engineering solutions in a global and societal context.
   c. A knowledge of issues facing contemporary society.
   d. A recognition for the need for, and the ability to engage in, life long learning.

4. All graduates will be prepared by their education at Montana Tech to be successful in obtaining entry-level engineering positions. Students will become familiar with the function of the career services office, prepare a resume and interview for summer jobs in the oil and gas industry beginning with their first semester.

Students will be encouraged and assisted in obtaining at least two summers of industrial experience prior to graduation.

Assessment

An assessment of the attainment of these goals will be used to update the goals and to modify the activities used to achieve them. This feedback process will ensure the continued improvement of the program and its graduates.

Assessment will include:

1. Results of the Fundamentals of Engineering Exam
2. Survey of employers at specific times after graduation.
3. Survey of graduates at specific times after graduation.
4. Placement data for both summer and full-time employment.
5. Exit interviews of graduating seniors.
6. Monitoring of placement rates and starting salaries.

PETROLEUM ENGINEERING

Freshman		**Fall Semester**	
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
GEO	101	Intro. Physical Geology	3
M	171	Calculus I	3
MIN	1010	Intro.. to Eng. Calcs. & Problems	3
PET	2010	Elements of Petroleum Engineering	2
		Total 15	

Freshman		**Spring Semester**	
CHMY	143	College Chemistry II	3
WRIT	101	College Writing I	3
GEO	257	Sedimentology & Pet Geology	3
M	172	Calculus II	3
PET	2050	Petroleum Engineering Lab I	1
PHYS	1046	General Physics-Mechanics	3
		Total 16	

Junior		**Fall Semester**	
WRIT	321	Advanced Technical Writing	3
GEOE	457	Subsurface Methods in Petroleum Geol	3
STAT	332	Stats for Scientists & Engineers	3
PET	3010	Well Drilling	3
PET	3030	Drilling Fluid Lab	1
PET	4040	Reservoir Engineering	3
HUMN	xxxx	Humanities Elective	3
		Total 19	

Junior		**Spring Semester**	
M.EC	3630	Engineering Economy	3
PET	3020	Petroleum Production Engineering	3
PET	3070	Petroleum Production Lab	1
PET	3480	Petroleum Well Logging	3
PET	4260	Petroleum Reservoir Characterization	3
HUMN	xxxx	Humanities Elective	3
SOCS	xxxx	Social Science Elective	3
		Total 19	

Sophomore		**Fall Semester**	
ENGR	2050	Engineering Mechanics-Statics	3
M	273	Multivariable Calculus	4
PET	2020	Petroleum Engineering Field Practices	1
PET	2060	Petroleum Engineering Lab II	1
PET	3040	Introduction to Rock Properties	3
PHYS	2076	Gen. Phys.-H, S & O	3
PHYS	2096	Physics Laboratory	1
		Total 16	

Sophomore		**Spring Semester**	
ECNS	203	Principles of Economics	3
ENGR	3260	Fluid Mechanics	3
ENGR	3350	Mechanics of Materials	3
M	274	Intro. to Differential Equations	3
PHYS	2086	Gen. Phys.-E, M & W	3
PET	3720	Petroleum Thermodynamics	3
		Total 18	

Senior		**Fall Semester**	
ENGR	3340	Thermodynamics	3
ENGR	3360	Mechanics of Materials Lab	1
PET	4100	Reservoir Simulation	3
PET	4520	Natural Gas Engineering	3
PET	4530	Natural Gas Engineering Lab	1
PET	xxxx	Petroleum Design Elective	3
PET	xxxx	Petroleum Elective	3
		Total 17	

Senior		**Spring Semester**	
PET	4440	Enhanced Oil Recovery	3
PET	4460	Petroleum Project Evaluation	3
PET	4920W	Engineering Design*	3
	xxxx	Technical Elective	3
	xxxx	Technical Elective	3
COMM	4921W	Senior Tech. Comm Seminar	1
		Total 16	

Minimum credits for a B.S. in Petroleum Engineering 136

Recommended Petroleum Electives include Pet 4000 and 5000-level courses which are not required for graduation.

Technical Elective - The other technical electives may be any 3000 or 4000 level Science, Engineering, Math or Business courses.

*FE Exam is Required.

SAFETY, HEALTH AND INDUSTRIAL HYGIENE

Department Head: Dr. Terry Spear
496-4445
SE 325

Administrative Associate: Shelley Reed
(406) 496-4115
SE 316A

Department FAX: (406) 496-4650

Occupational Safety and Health Degree (OSH)

The Occupational Safety and Health (OSH) degree is designed for the science-oriented student who likes to work with people, and who is concerned about employee safety and health.

The OSH professional may work wherever health or safety hazards exist. Past graduates work for a diversity of employers, including manufacturing, mining, construction and utility industries, government bodies, insurance companies and consulting firms. Opportunities for graduate study are also excellent. At the graduate level, the OSH student usually specializes in either industrial hygiene or industrial safety related areas.

The OSH graduate is educated to recognize, evaluate and control workplace hazards. As such, this person is a valuable asset to the employer because the OSH professional helps prevent lost working time caused by either workplace health hazards or traumatic events. Present-day managers realize that good worker health is vital to their operations. Also, OSH professionals understand safety and health regulations and therefore often assist their employers in complying with government regulations.

The Montana Tech OSH program is interdisciplinary and gives the student a background in the sciences and pertinent engineering areas. Emphasis is placed on hands-on work in the laboratory and/or relating the subject matter to real world situations.

The quality of the program has been recognized by the National Institute for Occupational Safety and Health through annual training grants for student travel and scholarships.

Opportunities exist for Internship appointments in government and industry. Scholarships are available to department majors on a competitive basis.

APPLIED HEALTH SCIENCE (AHS) OPTION

The AHS degree option within the Occupational Safety and Health degree program is designed for the science-oriented student who wishes to work with people, and who is concerned about their health and physical well being. The AHS student will be trained to appraise an individual's life-style, health habits, and fitness level. The student will learn how to complete a personal fitness assessment and utilize the information gathered to recommend a personalized fitness program that will help the participant improve or maintain their overall health and their physical working capacity. The AHS option is able to take full advantage of many of the other college departments and provides the student, through the Career Services office, with actual on-the-job training.

Upon graduation the AHS student major is qualified to accept a job in a private health club, corporation, hospital, YMCA, or educational institution where he or she will perform health related fitness testing, and prescribe an individualized exercise program that will allow an individual to maintain or improve his or her fitness level. The graduate is able to help the participant maintain an active lifestyle well into his or her senior years, thereby improving the overall quality of his or her life. Furthermore, since the AHS program is a degree option under the Occupational Safety and Health degree program, the AHS graduate will be able to assist a corporate employer with worker safety and health programs. The AHS graduate will also be qualified for immediate enrollment in a variety of graduate programs dealing with industrial hygiene or other applied health fields.

The majority of our graduates attend graduate school, pursuing a variety of master's degrees. They have pursued and graduated from physical therapy, physicians' assistant, cardiac rehabilitation, industrial hygiene, and other health science programs.

Mission

The mission of the Safety, Health and Industrial Hygiene Department is to provide a formal practical program which prepares science-oriented students to assess and control occupational and public health and safety risks through the development and maintenance of policies and programs and to prepare students for graduate work in industrial hygiene, safety or health related areas such as physical therapy, occupational therapy, cardiac rehabilitation.

Assessment

The goal of the Department assessment activities is to insure the achievement of our mission and continuously improve our curriculum to allow our graduates to achieve the goals of the programs. The Safety, Health and Industrial Hygiene Department believes that the quality of its academic programs is reflected in the long-term success of its graduates.

Educational Objectives

I. Graduates will be prepared to develop, implement and manage public health, occupational health, industrial hygiene and/or safety policies and programs.

Outcomes:

Upon graduation, the student should demonstrate the following:

a. Ability to anticipate, recognize and mitigate potential hazards
b. Understand mandated and recommended health and safety standards.
c. Understand the public health philosophy of protection and enhancement of health through preventative measures.

II. Graduates will be prepared to assume professional positions in industrial, safety or health science careers.

Outcomes:

a. Be able to select and implement assessment methods and sampling strategies.
b. With internships experience, will be familiar with employer expectations and program implementation.
c. Be able to assess health status in relation to physical activity and recognize lifestyle disease.
d. Be able to develop exercise programs.
e. Effectively communicate both orally and in written form.
f. Be able to manage and control losses associated with work place injuries and illnesses.

III. Graduates will have an understanding of the role of health and safety professionals in both occupational and public health and their obligation to their profession and the public.

Outcomes:

a. Recognize diversity of health status
a. Serve as advocates for occupational and public health issues
b. Maintain a commitment to continued professional development and participate in professional societies
c. Understand both professional and ethical responsibilities

OCCUPATIONAL SAFETY & HEALTH

Freshman		Fall Semester	
AHS	1156	Intro.. to Applied Health Science	3
CHMY	141	College Chemistry	3
CHMY	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
CAPP	131	Basic MS Office	3
M	151	Precalculus	3
		Total 17	

	Spring Semester		
AHS	2156	First Reponder	3
BIOL	1116	Cell Biology	4
CHMY	143	College Chemistry	3
*CHMY	144	College Chemistry Lab II	1
PSYX	100	Intro to Pyschology	3
		Total 14	

Sophomore		Fall Semester	
BIOL	2516	Human Anatomy and Physiology	4
COMM	1216	Principles of Speaking (3 credits)	OR
COMM	2016	Presenting Tech info	2
M	171	Calculus I	3
OSH	2246	Safety Administration & Programs	3
PHYS	1026	College Physics	4
		Total 16	

	Spring Semester		
BIOL	2526	Human Anatomy and Physiology	4
CHMY	123	Basic Organic & Biochemistry	**OR**
CHMY	210	Survey of Organic Chemistry	3
STAT	131	Intro. to Biostatistics	**OR**
STAT	216	Introduction to Statistics	3
OSH	2266	Safety Eng. & Tech.	3
PHYS	1036	College Physics	4
		Total 17	

*AHS Students - Do not need CHMY 144 (Take free elective)

OSH Concentration:

Junior		Fall Semester	
OSH	3546	Industrial Toxicology	3
WRIT	321	Advanced Technical Writing	OR
WRIT	325	Writing in the Sciences	OR
WRIT	322	Advanced Business Writing	3
OSH	3226	Haz Material Management	3
OSH	3236	Fire Protection	3
OSH	4216	Industrial Hygiene Fundamentals	3
		Free Elective	1
		Total 16	

Junior		Spring Semester	
BUS	3616W	Management	3
ECNS	202	Principles of Macroeconomics	OR
ECNS	203	Principles of Economics	3
OSH	3246	Construction Safety	3
OSH	3266	Safety Laboratory	1
OSH	4226	Industrial Hygiene Controls	3
OSH	xxxx	Upper DivisionOSH Elective	3
		Total 16	

Senior		Fall Semester	
OSH	4066	Small Particle Technology	3
OSH	4546	Ergonomics	3
OSH	4916	OSH Internship	2
	XXXX	Eng or Sci Elective	6
HUMN	xxxx	Humanities Elective	3
		Total 17	

Senior		Spring Semester	
OSH	4296	Sampling & Eval. of Hlth. Haz.	3
OSH	4896W	Senior Project	3
	XXXX	Eng or Sci Elective	3
HUMN	xxxx	Humanities Elective	3
	xxxx	Free Elective	3
		Total 15	

AHS Option Concentration:

Junior		Fall Semester	
AHS	3636	Physiology of Exercise	3
AHS	3646	Anatomical Kinesiology	4
AHS	3656	Human Perf. Lab. Tech	2
OSH	3546	Industrial Toxicology	2
HUMN	xxxx	Humanities Elective	3
		Total 14	

	Junior	Spring Semester	
AHS	4656W	Exercise Testing & Prescription	3
BIOL	2586	Basic Nutrition	2
ECNS	202	Principles of Macroeconomics	OR
ECNS	203	Principles of Economics	3
WRIT	325	Writing in the Sciences	OR
WRIT	322	Advanced Business Writing	3
BIOL	2706	Bioethics	OR
HUMN	3016W	Professional Ethics	3
		Science Elective	3
		Total 17	

Senior		Fall Semester	
AHS	xxxx	Elective	3
AHS	4356	Strength and Conditioning	3
AHS	4916	Internship	2
BUS	3616W	Management	3
OSH	4216	Industrial Hygiene Fundamentals	3
PSYX	340	Abnormal Psychology	OR
PSYX	361	Industrial & Organiczational Psyc.	3
		Total 17	

Senior		Spring Semester	
AHS	2256	Prevention and Care	3
AHS	4366	Health Fitness Instructor	3
AHS	4606	Electrocardiography	3
**OSH	4226	Industrial Hygiene Controls	OR
**OSH	4546	Ergonomics (FALL Only)	3
	xxxx	Free Electives	4
		Total 16	

All students in Occupational Safety and Health must meet the general education core requirements of the College.

For engineering/science electives see advisor for specific courses.

MATH 1516 Calculus I with Algebra Enhancement may be substituted for M 171.

Students are required to complete one 3-credit hour upper division OSH course that is not part of core curriculum. Choose from: 4276 Mining Safety, 4606 Systems Safety, 4956 Special Topics, and 4706 Welding Safety and Health.

Graduate School
General Information
Regulations
M.S. Academic Programs

Associate Vice Chancellor of Academic Affairs & Research: Dean of Graduate School

Dr. Joseph Figueira
(406) 496-4456
Office: Museum 210

Administrator:

Cindy Dunstan
(406) 496-4304/FAX: (406) 496-4710
Office: MG 207

Introduction
The Graduate School provides opportunities for advanced study and research in science, engineering, and communication. Its aim is to foster a community of closely associated faculty and post-baccalaureate scholars imbued with a common interest in advanced professional study and creative effort while seeking to stimulate extensive academic achievement by encouraging diverse development in creative thought and accomplishment.

The Graduate School Administration
The Graduate School is administered by the Dean of Graduate Studies under the guidance of the Graduate Council. The Dean serves as Chairman of the Graduate Council and is responsible for its agenda and the interpretation of its actions.

The Graduate Council employs guidelines from various associations to maintain the Graduate School's high standards. Montana Tech holds membership in the American Association of State Colleges and Universities, The American Society for Engineering Education, The American Council on Education, and similar groups.

Each graduate student shall be governed by the catalog and policies in effect on the date of initial registration or by newer regulations if so requested and approved by the Graduate School. Information posted on individual Department web pages is for student information and should not be considered as superseding the policies of this catalog.

Master Degree Programs
The Master of Science may be taken in most fields under either of two options. One option requires a thesis or publishable paper (Option A); the other does not require a thesis (Option B). In all programs, the thesis option is strongly recommended for the vast majority of students. Master's of Science programs are available in the following fields. The letters in parentheses indicate the options available.

Master of Science Programs:
• ELECTRICAL ENGINEERING (A,B)
• GENERAL ENGINEERING (A,B)
• ENVIRONMENTAL ENGINEERING (A,B)
• GEOSCIENCES with options in:
Geology (A,B), Geochemistry (A,B), Geological Engineering (A,B)
Geophysical Engineering (A,B), Hydrogeology (A,B)
Hydrogeological Engineering (A,B)
• INDUSTRIAL HYGIENE (A) INDUSTRIAL HYGIENE ONLINE (B)
• METALLURGICAL/MINERAL PROCESSING ENGINEERING (A,B) with options in:
Metallurgical Engineering, Metallurgical/Mineral Processing Engineering
• MINING ENGINEERING (A,B)
• PETROLEUM ENGINEERING (A,B)
• PROJECT ENGINEERING & MANAGEMENT (on-line) (B)
• TECHNICAL COMMUNICATION (A,B)

Of the degrees previously listed, those specifying engineering are designed to accommodate graduate students who have an undergraduate degree in the appropriate field of engineering. The other degrees are to accommodate graduate students who do not have an engineering baccalaureate. However, a graduate student who does not hold an engineering degree may qualify for an advanced degree in one of the engineering categories by removal of deficiencies in engineering subjects, either concurrently with the graduate program or before being admitted to graduate standing, depending on the number of deficiency credits that need to be taken.

The student's graduate program is a flexible guide and may be changed as the student progresses and as the student's committee or advisor considers desirable. However, changes must be requested before or during the semester affected. The deadline for filing final changes in graduate programs is one month prior to the end of the semester in which degree requirements will be completed.

Interdisciplinary Master's of Science
The Interdisciplinary Master of Science Program (IMS) allows students to work with faculty in the design of a graduate curriculum tailored to their unique academic, creative and professional objectives. A GPA of 3.0 is required for regular admission. The IMS program offers a non-thesis option (37 credits) and a thesis option (31 credits). The non-thesis option will typically be available to only those students who can document a history of written and oral publications and presentations. A comprehensive exam is required of non-thesis students.

Applicants to the IMS program should follow the instructions for applying to the Montana Tech Graduate School, which are available at http://www.mtech.edu/gradschl/ . Because of the unusual nature of this degree program, the IMS has several additional admission and program conditions.

- Each student needs to establish a program committee prior to admission to the program.
- All prospective applicants must first consult with the Dean of Graduate Studies before beginning the application process.
- The student must seek out and identify a Program Committee of at least 3 university faculty members from at least two different academic departments who are willing to serve. At least one committee member must be from a Master's Degree granting department of Montana Tech. The Chair of the Program Committee does not have to be from Master's Degree granting department. Each discipline in the proposed interdisciplinary program must be represented on the Program Committee.
- In consultation with the Chair and other members of the Program Committee, the applicant will develop a clear set of written goals for his or her research program and curriculum plan, listing each course the student will take in the degree program. This Degree Plan should strike a rough balance of work among the various disciplines represented. The program committee members and chair must approve the proposed degree plan by signing the proposal. The Program Committee members and the Department Chairs must approve the proposed Degree Plan.
- The Program Committee will be the student's surrogate department and will meet to consider the student's application materials and submit those materials and an admission recommendation to the Graduate School.
- Applicants may wish to spend at least a term of enrollment at Montana Tech, either as a non-degree graduate student or as a student admitted to an existing graduate degree program. Experience has shown that it is nearly

impossible for a student to find members of a committee and negotiate a program of study from a distance.

Ph.D. Individualized Interdisciplinary Program (IIP)

The IIP is a degree program of The University of Montana-Missoula that is available to qualified Montana Tech students. The program allows the student to bring forward a problem or series of problems to research.

The student must seek out faculty with the resources and expertise to assist them in defining and executing the research goals and the skills and competencies (objectives) needed to reach those goals. These faculty can be from Montana Tech or The University of Montana. The program requires 45 credits beyond the master's degree, a comprehensive exam and a dissertation. The application deadlines are April 1 for fall semester and November 15 for spring semester.

Interested students should note that this program has several unique features including,

- The student must develop a plan of study in consultation with his or her faculty committee **before** submitting an application to the chair of his or her committee.
- The student must seek out and identify a prospective graduate committee of at least 5 university faculty who are willing to serve.
- All members of the doctoral IIP committee must hold a doctorate degree - one member must be from a doctoral granting program at The University of Montana-Missoula. The Dean of The University of Montana Graduate School or the Dean's designee from a doctoral program will serve as an ex officio (non-voting) member of the committee.
- The chair of the student's committee may be a Montana Tech faculty member, will be the principal advisor throughout the program, and must be from a discipline that offers a graduate degree.

Interested students should contact the Montana Tech Graduate School and review The University of Montana IIP application process at http://www.umt.edu/grad/program. In addition, all prospective applicants must consult with the Dean of The University of Montana Graduate School before beginning the application process.

Thesis Abroad Information

Montana Tech graduate students can participate in the International Exchange Program by applying to the Thesis Abroad Program. The intent of the program is to provide qualified graduate students with the opportunity to augment their graduate research while obtaining cultural and academic experiences at a foreign host institution.

How to Apply

Students interested in the program should contact the Department Head of any of the participating departments: Environmental Engineering, Geological Engineering, Geophysical Engineering, Metallurgical/Mineral Processing Engineering, and Biological Sciences. They can provide specific details of ongoing research and graduate student exchange opportunities. For general program information please contact the Montana Tech Graduate Studies Office.

Application Procedures - Graduate Students

The Graduate School encourages applications from qualified students holding bachelor's, master's, or terminal degrees from accredited colleges and universities. Degrees, diplomas, or certificates in engineering technology fields generally do not qualify as accredited bachelor's degrees for purposes of admission.

All required application materials are available on the Graduate School web site: http://www.mtech.edu/gradschl/. To request information contact our office at (406) 496-4304, 1-800-445-8324, menu choice 6; fax: (406) 496-4710; e-mail: cdunstan@mtech.edu.

All required application materials are available on the Graduate School web site: http://www.mtech.edu/gradschl/. To request information contact our office at (406) 496-4304, 1-800-445-8324, menu choice 6; fax: (406) 496-4710; e-mail: cdunstan@mtech.edu.

Application Procedures - U.S. Citizen

1. **Application:** Complete and submit all required forms included in the Montana Tech of The University of Montana Graduate School Admission Application Packet. Forms are also on the website shown above.
2. **Application Fee:** The application form must be accompanied by a nonrefundable check or money order payable to Montana Tech in the amount of $30.00 (subject to change). **An application will not be processed until the application fee is received.** This fee expires after one year.
3. **Financial Award Application:** If applying for institutional financial aid (not federal funds or loan), submit this form with the admission application.
4. **Reference Forms:** Three references are required and are included in the application packet. **The forms must be received by the Graduate School directly from the reference or in a sealed envelope with the reference's signature over the seal.** References from relatives are not acceptable.
5. **Transcripts:** Official transcripts are required from **all** undergraduate and graduate schools attended. Contact the Registrar(s) at your previous school(s) and request that official transcripts be forwarded directly to the Graduate Studies Office. At least one transcript must include evidence of receipt of a bachelor's degree.
6. **Personal/Professional Statement:** Include a typewritten statement outlining academic and professional goals and how they relate to the chosen field of study. Petroleum Engineering requires two brief technical papers authored by the applicant. Technical Communications also requires supplemental materials.
7. **Mandatory General Examination:** The GRE General Test is **required** for admission for most programs with the exception of Industrial Hygiene Online, Project Engineering and Management, Electrical Engineering, General Engineering, Mining Engineering, and Petroleum Engineering. Applicants taking the GRE General Test should instruct the Educational Testing Service to submit **official** scores to the Graduate Studies Office (Institutional Code is 4487). Montana Tech does not require GRE Subject Tests.
8. **Immunization Records:** If you were born after December 31, 1956, submit proof of two separate doses of measles and rubella immunization (MMR) by immunization record or a physician's record of diagnosis (with **day/month/year of immunization and signature or initials of doctor or nurse**). Students enrolled exclusively in distance-delivered courses are exempt from the measles requirements.

Application Procedures - International Student

1. **Application:** Complete and submit all required forms included in the Montana Tech of The University of Montana Graduate School International Student Admission Application Packet.
2. **Application Fee:** The application form must be accompanied by a nonrefundable check or money order payable to Montana Tech in the amount of U.S. $30.00 (subject to change) **An application will not be processed until the application fee is received.** This fee expires after one year.
3. **Financial Award Application:** If applying for institutional financial awards, submit this form with the admission application.
4. **Reference Forms:** Three references are required in English. Forms can be printed from the website and are also included in the application packet. **The forms must be received by the Graduate School directly from the reference or in a sealed envelope with the reference's signature over the seal.** References from relatives are not acceptable.
5. **Transcripts:** Official transcripts are required from **all** undergraduate and graduate schools attended **in the native language with an accompanying English translation**. Contact the Registrar(s) at your previous school(s) and request that official transcripts be forwarded directly to the Graduate Studies Office or in a sealed envelope with the Registrar's signature over the seal. At least one transcript must include evidence of receipt of a bachelor's degree. The applicant is responsible for having transcripts evaluated on a course-by-courses basis by Educational Credential Evaluators, Inc (ECE). See their website at www.ece.org for complete information. One ECE report must be sent to Montana Tech's Graduate Studies Office.
6. **Personal/Professional Statement:** Include a typewritten statement outlining academic and professional goals and how they relate to the chosen field of study.
7. **Mandatory General Examinations:** GRE General Test is **required** for admission to all programs except Industrial Hygiene Online, Project Engineering and Management, Electrical Engineering, General Engineering, Mining Engineering, and Petroleum Engineering. Applicants taking the GRE General Test should instruct the Educational Testing Service to submit **official** scores to the Graduate Studies Office. Montana Tech does not require GRE Subject Tests. Montana Tech's School Code is 4487.
8. **Test of English as a Foreign Language (TOEFL): Official** TOEFL scores, with a **minimum score of 525 PBT, 195 CBT, or 71 IBT**, are required for all applicants except for citizens of Australia, Canada, England, Ireland, New Zealand, Scotland, or Wales. Have official scores sent to the Graduate

Studies Office. Montana Tech's School Code is 4487.

9. **Statement of Financial Support:** An original, current, certified financial statement (in English) from your bank/sponsor must verify that funding will be available to cover estimated expenses of at least $23,740 (U.S. Dollars) while attending Montana Tech. NOTE: The financial statement should cover expenses for dependents accompanying you to the United States by certifying an additional $4,000.00 for your spouse, and $1,000.00 for each child. Canadian students must provide a certified financial statement showing at least $21,000 (U.S.) with an additional $4,000 for a spouse and $1,000 for each child. Please note that all required dollar amounts are subject to change. **This documentation is required.**
10. **Immunization Records:** A physician-validated certification on medical stationery, Montana Tech's International Student Health Form or the World Health Organization Certificate showing immunization for rubella, measles (two doses of measles vaccine after 1st birthday, including month, day, and year) and a recent (within the last year) skin test for tuberculosis. **Each of these must be identified on the record in English and must be signed by a physician or registered nurse and include month, day, and year of each immunization.**
11. **Medical Health Insurance:** For enrollment in classes, proof of medical health insurance is required for all international students. Students without such insurance or with inadequate coverage will be required to obtain medical health coverage through a campus approved policy. Students are automatically enrolled in the campus insurance plan, and the premium for coverage is added to tuition. Students showing proof of adequate coverage may request a waiver of the campus insurance by contacting the Student Life Office.

Please understand that health care in the United States is *largely a private*, not a governmental, *function*. Fees for many medical services and procedures will be directly charged to the student. These charges may range from a few dollars for very simple procedures to thousands of dollars for extended hospitalization or major operations. All J-Visa international students and dependents are required to obtain a minimum medical health insurance as required by the U.S.I.S. through a campus endorsed policy.

Application Procedures (Re-Admission) - Former Student

Graduate students who break the continuity of enrollment at Montana Tech, excluding summer school, are required to apply for readmission.

How to apply for readmission

1. Complete and submit a Montana Tech Graduate School Returning Student Application form. An application fee is not required for returning students.
2. Complete and submit a Montana Tech Graduate School Financial Award application if interested in applying for institutional financial assistance.
3. If applicable, submit official transcripts from all colleges or universities attended since leaving Montana Tech. Transcripts must be sent directly to the Graduate School from the Registrar of school(s) attended.
4. Submit proof of two separate doses of measles and rubella (MMR) immunization (including month, day, and year of immunization with physician's/nurse's initials) if born after December 31, 1956 and not currently on file at Montana Tech.
5. Submit official GRE scores if not currently on file. See previous GRE information for program exclusions.

When to Apply - All Students

All of the above should be received by the Graduate Studies Office according to the following schedule:

	US:	International:
Fall Semester applicants:	*April 1*	*Mar 1*
Spring Semester Applicants:	*October 1*	*Jul 1*
Summer Session Applicants:	*Jan 1*	*Dec 1*

If completed applications are not on file by these dates, processing may be delayed. However, late applications will be considered if circumstances permit.

General Information

1. Any qualified applicant will be accepted for admission to Montana Tech regardless of race, color, creed, sex, national origin, or handicap.
2. Failure on the part of the applicant to provide all of the requested information will cause delays in processing the application for admission and may result in denial of admission or cancellation of registration.
3. The falsification or willful suppression by the applicant of any information requested on the application form may result in cancellation of registration and prohibition from subsequent attendance at Montana Tech.
4. The term "official" in reference to academic credentials or standardized test scores indicates that the documents are forwarded by the Registrar of each school attended or by the applicable testing service directly to the Graduate Studies Office at Montana Tech. Photocopies, faxed copies or those "Issued to Student" will not be accepted. An official transcript must have a signature, stamp or seal from the initiating institution.
5. Information regarding residency classification for fee purposes is available from the Graduate Studies Office**.**
6. The application credentials of admitted students who do not register will be retained for **one year**. At the end of this period, a new application and fee will be required to apply for admission.
7. All application credentials become the property of the Montana Tech Graduate School upon receipt by that office.
8. Admission is generally permitted for only one graduate degree program at a time.

Admission to the Graduate School

Students may be admitted with regular, provisional, or provisional probation status. Admission status is recommended by that department's graduate program head with the concurrence of the Dean of Graduate Studies.

Regular Admission

To be granted regular standing, the student must (1) hold a baccalaureate, MS, MA, MBA or terminal degree in a field acceptable to the applicable graduate program; (2) have a grade point average of 3.00; (3) have acceptable GRE scores if required by the department; and (4) have demonstrated potential for graduate study.

Provisional Admission

Provisional standing may be granted to a student who (1) lacks certain basic undergraduate courses in his or her major field, or (2) has not satisfied requirements for regular admission, such as a cumulative grade point average lower than a 3.00. The Graduate School will not accept an applicant with a cumulative GPA lower than 2.7 with the exception of applicants who have achieved a 3.0 cumulative GPA during the last four full-time semesters of his or her undergraduate career. Students admitted on provisional status must remove the provisions stated within the specified period of time (usually two semesters). The credits earned in the removal of deficiency courses cannot be applied toward the requirements of a graduate degree. An applicant needing 15 deficiency credits or less may be admitted to graduate school on a provisional basis; those needing more than 15 credit hours must enroll as a post-baccalaureate non-degree student.

Provisional Probation Admission

The Graduate School has developed an admission category for students who meet the criteria for Provisional Admission but who have a grade point average between 2.5 - 2.69.

Students admitted under this status are admitted on academic probation. This student is allowed to register for no more than 9 credits and has one semester to achieve the 3.0 GPA or the student will be dismissed from Graduate School. No financial awards can be assigned during the probationary period.

This status is only granted to a student who presents above-average credentials in other admission areas (GRE Scores, work experience, recommendations, etc.) and who demonstrates a strong expectation for a successful graduate career. The admitting Department must request consideration for admission under this status and have a reasonable expectation that the student will be successful in graduate courses.

Non-degree Status

Non-degree students are not admitted to the Graduate School but are under the supervision of the Undergraduate Admissions Office. Courses completed during semesters in which a student is in non-degree status may only be applied toward graduate degree requirements at the College by action of the Department Head and approval of the Graduate School. Non-degree students who wish to apply courses toward a graduate program are strongly encouraged to meet with the Department Head and the Graduate School prior to beginning their studies.

Financial Aid

Application procedures and eligibility criteria are subject to change without notice.
The applicant must be unconditionally accepted for admission to the Graduate School and be in good standing at Montana Tech. Completed Financial Aid Forms should be sent to the application processor. Contact the Enrollment Services Office, MG 207 for further information and assistance.

Enrollment Requirements
To be eligible to receive financial assistance such as graduate teaching assistantships, other student employment or tuition waivers, graduate students must be registered for a minimum of 6 credits at the 4000 and 5000 level. Graduate students receiving federal graduate student loans or an hourly wage position must be registered as full-time students taking a minimum of 9 graduate credit hours at the 4000 and 5000 level. Full-time for VA benefits and GI Bill is 6 credits for the Industrial Hygiene Online and Project Engineering and Management programs for Fall & Spring semesters. For summer, VA full-time is 3 credits.

Graduate Assistantships
Assistantships are granted for teaching or research and require a prescribed number of hours of work on a specified project. Assistantship holders must be admitted to the Graduate School and be registered each semester the assistantship is held.

Teaching assistants often assist in teaching one or two sections of an undergraduate class or laboratory. Research assistants may be assigned to a research project being conducted by a faculty or staff member. Research done on an assistantship may or may not be applied to the student's thesis, depending on the type of research and the terms of the assistantship.

The work requirement for a full teaching assistantship is stipulated to be 20 hours per week. The work requirement for a full-time research assistant is 20 hours per week. The academic course load that an assistant may take is subject to the advice of the assistant's advisor or thesis supervisor. Any regular graduate student, registered for 6 or more hours of graduate level courses during a regular semester or three hours during the summer who is working on a research project in relation to his or her thesis, is qualified for support under the research project as a research assistant if extramural financial support is available from the particular project to pay salary and benefits.

Graduate Tuition Waivers
Resident and non-resident tuition may be waived for qualified graduate students. Fees are the responsibility of the student. Graduate students applying for tuition waivers may do so by checking the appropriate box on the financial award form which accompanies the application form. Eligibility to continue these awards is determined by the Department and is based upon the following criteria: satisfactory progress towards the degree, maintaining a 3.0 Grade Point Average, and continued registration for at least 6 credits at the 4000-5000 level for the duration of these awards. Contact the Graduate School Office for further information.

Loans
U.S. citizens may apply for long-term assistance under the Federal Stafford Loan Program by filing the Free Application for Federal Student Aid with the Enrollment Services Office, MG 207.

Regulations

Academic Residence Attendance Requirements
A minimum of two semesters of full-time enrollment will normally satisfy the requirement for academic residency. Part-time students will be deemed to have completed residence requirements when a minimum of 12 credit hours has been earned.

Residency For Tuition and Fee Purposes
Students attending Montana Tech from out-of-state for the sole purpose of furthering their education will not be able to declare Montana residency for the entire time they are enrolled**.** Establishment of Montana residency is subject to strict rules, described in "THE STUDENT GUIDE TO MONTANA RESIDENCY POLICY", available from the Graduate School Office**.** Information regarding residency classification for tuition and fee purposes is available from the Graduate Studies Office or on the Graduate School website: www.mtech.edu/gradschl/forms.html**.**

Registration Requirements
A student who has been admitted to the Graduate School for study toward an advanced degree must be registered on a continuing basis for a minimum of three (3) credit hours of graduate courses (4000 and above) during each semester of the regular academic year (fall and spring), whether the student is in residence, off-campus, or is pursuing a degree on a part-time basis. Students participating in the Thesis Abroad Program may be subject to additional requirements and should contact the Graduate School. A minimum registration for one (1) credit hour is required if all required course work, seminar, and thesis credits have been completed, but the student has not defended the thesis or presented the publishable paper or submitted the required paperwork to the Graduate Studies Office. If registration is allowed to lapse, the student must apply for readmission. Please see "Former Student Application Procedures" for details.

Graduate students consult with their advisor before each registration to plan courses in accordance with the graduate program. The graduate program and thesis project should be approved by the thesis committee or the program director in the case of non-thesis options. All subsequent changes must be similarly approved. The graduate program must be filed with the Graduate School Office immediately following the second registration and should be updated as necessary.

A late fee will be charged for graduate students who register for more than six credits after the first day of class. Registration will not be allowed after the last day to add a class (10 days after the first day of class).

Academic Loads
The average graduate student enrolls for nine (9) credits hours per semester. Fifteen (15) credit hours per semester is considered to be the normal maximum graduate load. Higher loads must be approved by the Department and may be permitted if the student is taking a combination of courses at the graduate and undergraduate level. Students applying for financial aid should refer to the Financial Aid section for minimum registration requirements.

A faculty member with permanent faculty status may undertake a limited program leading to the Master of Science degree. By faculty action, such programs are limited to an average of 5 credit hours of course work per semester over the course of the program of study with a maximum load of 6 hours permitted during any one semester to facilitate scheduling. Such faculty are eligible for tuition waivers.

Courses and Credits Applicable to Graduate Programs
Students may petition the Montana Tech Graduate School to accept courses taken prior to enrolling in the Graduate School. The following information discusses the procedures and regulations for accepting these previous course credits.

General Requirements
1. Graduate students may not challenge courses for graduate credit.
2. Correspondence credits are not acceptable toward meeting the requirements for an advanced degree.
3. Courses completed during a semester in which a student is in non-degree status may not be applied toward graduate degree requirements without prior approval of the Graduate School.
4. Additional limitations related to the various degrees also apply as indicated in the Graduate School sections of the catalog.
5. For all master's degree programs, at least one-half of the minimum credit requirements, excluding thesis and seminars, must be at the 5000 level.
6. Additional regulations may apply for collaborative programs with other units of the Montana University System.

Courses taken at Montana Tech as an undergraduate student
1. Graduate courses (5000 level) for which credit has been received prior to admission to the Graduate School do not necessarily apply to graduate programs. The decision on the applicability of courses to a graduate program rests with the student's Graduate Committee. A petition listing these courses and approved by the Department Head of the proposed graduate program must be filed with the Graduate School.
2. Courses listed in the 4000 series may become part of a student's graduate degree program if the courses are approved by the student's Graduate committee and were not required to obtain the bachelor's degree. A petition listing these courses and approved by the Department Head must be filed with the Graduate School.
3. For students who have applied to the Montana Tech Graduate School, graduate level courses taken prior to completion of a bachelor's degree may

be reserved and/or applied toward any graduate program requirements with approval of the Department Head and concurrence of the Graduate School. Such credits may not be used to satisfy the requirements for the bachelor's degree.

Courses taken at other institutions
Up to 6 credits taken at other graduate schools may be applied to Montana Tech graduate programs subject to the following requirements:

a. The course must be acceptable for graduate credit at the school where it was taken.
b. The course must be applicable to the student's graduate program at Tech as determined by the Graduate Committee.
c. A "B" grade or better must have been earned. No transfer "C" or "P" grades will be accepted for graduate credit.

Acceptable Academic Progress
All graduate students are required to maintain a 3.0 cumulative grade point average (CGPA) for graduate level courses (4000 and 5000 level). A 3.0 CGPA for course work and thesis is required for graduation. Any course listed in the major or minor in which a grade lower than a "C" has been received must be repeated.

Incompletes
Incompletes ("I" grades) can be granted if a student's work is satisfactory with at least 70% of the course work having been completed and the student cannot complete the work of the course for reasons beyond his or her control. Incompletes at the graduate level can constitute unacceptable progress toward a degree and may result in the withdrawal of financial aid received by the student. If Incompletes are the appropriate grade, the faculty should provide a written rationale for the grade to the Graduate School to prevent the grade from adversely impacting the student's continued eligibility for Federal Financial Aid. In general, for Special Topics courses that are ongoing and the project has not been completed, the grade of "N" (Continuing) is more appropriate and should be used instead of "I".

An Incomplete must be removed at a time designated by the instructor, but before the end of the next semester of residence; the Enrollment Services Office announces the deadlines for each semester. Students should not re-enroll in a class in which they have an Incomplete. In unusual circumstances, the time for removal of the "I" may be extended by permission of the instructor and the Dean of Graduate Studies.

Withdrawal, Auditing Classes
Graduate students withdrawing from a special class or changing a class to an audit must secure the signature of their advisor prior to submitting the "drop/add" card to the Enrollment Services Office.

Complete Withdrawal from College
Students requesting a complete withdrawal from college must obtain the appropriate form from the Enrollment Services Office. Upon completion of the form and obtaining all of the appropriate signatures, the student must bring the completed form to the Enrollment Services Office in MG 207 for processing.

Academic Probation Policy
Continued enrollment in the Montana Tech Graduate School requires the maintenance of a 3.00 cumulative GPA (CGPA) for graduate level courses and evidence of academic progress toward the student's degree objectives. Failure of the student to achieve either of these conditions will result in academic probation and can result in ineligibility for financial assistance. The student may not exceed the maximum of one semester of probation and may be suspended from Graduate School if this limit is surpassed.

Suspension Policy
Any student whose cumulative graduate level grade-point average is less than 3.0 ("B") at the end of the semester of probation may be suspended from the Graduate School. A student who is suspended from graduate standing may continue to take graduate courses as a non-degree student. Reconsideration for graduate admission may be requested after one or more semesters in non-degree status by reapplying for admission. See "Former Student Application Procedures" for details.

Change of Major
Students who request a change in major upon first registration must continue one semester in the program into which they were admitted. They may file an "intent to transfer" form with the Graduate School during any semester but must await evaluation and approval of their application materials by the new program before the transfer can be effected. The change of major and transfer to the new major program is subject to the written approval of the Dean of Graduate Studies acting upon the recommendation of the head of the intended major program.

Minor Programs
At least twelve (12) credits of course work in one subject matter of a Montana Tech graduate program can be considered a minor. Minor credits are in addition to those required to fill the master degree requirements for the major program and must be approved by the committee chair and the student's advisor. A minor can be earned only in a subject in which a graduate degree is granted. A representative from the minor subject area must be a member of the student's Graduate Committee. A minor and related course work must be declared on the student program sheet and filed in the Graduate School Office by the end of the second semester. The majority of credits must be in the major field and the Major and Minor credits are indicated on the Student Program form.

Dual Majors
Montana Tech does not permit, in general, credit hours that have been used to satisfy requirements for one Master of Science degree to be applied toward another master's degree from the institution. However, under exceptional circumstances, a student may petition the Dean of Graduate Studies through the student's own Graduate Committee for a variance from this policy.

5 Year Master's Degree Program
Participating departments allow qualified **undergraduate** students to begin work on the master degree in their junior year at Montana Tech. To qualify for admission to the program, a student must have completed 75 semester credit hours, usually corresponding to the second semester of the junior (3rd) year, and have a cumulative GPA of 3.25 or better. *Courses undertaken as a Fifth-Year Master Degree student cannot be counted towards both degrees.* Students should file a petition with the Graduate School listing those courses that will apply toward the Master Degree. Students must meet all other requirements for admission to graduate school.

Participating Departments include Electrical Engineering, Environmental Engineering, General Engineering, Geochemistry, Geological Engineering, Geology, Geophysical Engineering, Hydrogeological Engineering, Hydrogeology, Industrial Hygiene, Metallurgical/Mineral Processing Engineering, Mining Engineering, Petroleum Engineering, and Technical Communication. Interested students should contact the Graduate School Office for additional information.

Time Limitation
A Master of Science degree program must be completed within 6 calendar years dating from the student's formal entrance into a degree-seeking program. Courses taken by the student at any institution that are requested to be part of his or her degree program and were taken more than six years prior to the date of anticipated graduation must be reviewed by the student's advisor and the Dean of Graduate Studies for acceptance into the graduate program. Following this review, the Dean of Graduate Studies will determine whether a reduction in credits applicable toward the degree, a re-examination, or both is required for the student to complete the degree program.

Supervision of the Master's Program – Graduate Committee
Each incoming graduate student will be assigned a graduate advisor by the student's home department. This advisor will be responsible for assisting the student in designing a program of study until the student selects a permanent Graduate Committee. All students, whether thesis, publishable paper, non-thesis, or project are required to have a Graduate Committee. The Graduate Committee, once selected, shall be responsible for advising the student on all academic and research matters and will serve as the student's examining committee.

The Chair of the Graduate Committee will be selected by the student and will be responsible for approving the student's program of academic study and research as indicated by the signature on the Student Program form. In those cases where the student elects to pursue a research project outside the home department, the Chair of the Graduate Committee may be chosen from the department hosting the research project and a graduate advisor must be chosen from the student's home department. This departmental advisor may serve as Co-Chair of the Graduate Committee.
The Graduate Committee will consist of two members from the student's major program, one from a minor program (if applicable), and additional members as

selected by the chair and student; voting members must have at least a Master's degree. The Chair and student will select one member to the Graduate Committee from outside the student's home department. The Graduate Committee should be appointed by the end of the second semester of graduate study. Substitutions on this committee for examination purposes can be made with the approval of the Graduate Committee Chair and the Dean of Graduate Studies. An Amended Program Form must be submitted to the Graduate School to reflect any changes in the committee membership, course work, thesis title, or thesis option.

Program of Study

The student's Graduate Committee will assist the student in formulating a program of study leading to the master's degree. **The student's program of study, approved by the Graduate Committee Chair, must be filed with the Graduate School by the end of the second semester of study.** The student is required to seek the Graduate Committee's approval for any subsequent modification of the original plan of study. The student will submit a copy of any amended program to the Graduate School. Each program of study, and any amendments thereof, must have the signature approval of the student, the Chair of the student's Graduate Committee, and the Environmental Health and Safety Director, if required.

Thesis: Option A

This is the classical research-oriented degree and is particularly recommended to the student whose educational and professional goals make early research experience desirable. A thesis (maximum of 8 thesis credits apply toward degree), seminar (2 credits minimum) and at least 20 credits of additional course work are required for a minimum of 30 hours total; a student's department and/or Graduate Committee may require more. See department sections for specific requirements. Thesis credits should be assigned to the committee chair during the registration process.

An individually written thesis based on original research is a requirement for Option A of the Master of Science degree. The thesis should represent an effort of such quality and construction that it can be displayed in the school library with similar scholarly works. The thesis is written under the direction of the committee chair, but the student is encouraged to seek guidance from all members of his or her Graduate Committee. Before starting to write the thesis, the student should review the "Thesis and Style Guide" and "Thesis Template" posted on the Graduate School website (www.mtech.edu/gradschl) and consult style manuals in the library. In general, the thesis may follow the style of captions, footnotes, and bibliographical references used by the leading technical journal in the student's field.

Note that the Library must review the thesis draft no later than 4 weeks before the defense to insure adequate binding margins. The thesis draft should also be distributed to the committee for review 30 days prior to the defense.

A final draft of the thesis must be submitted by the student to each member of his or her Graduate Committee at least two weeks before the time and date of the student's scheduled thesis defense.

To be eligible to participate in Commencement ceremonies, a student must successfully defend his or her thesis, present the publishable paper or project, and/or complete the oral examination at least one week before the last day of scheduled classes for Spring Semester.

The completed thesis, after all revisions recommended by the committee have been made, must be signed by the author, and approved and signed by a majority of the student's Graduate Committee, including the advisor and the chair of the student's Graduate Committee. The student is encouraged to consult with the Director of Libraries prior to final reproduction to determine the required written and electronic formats required by the Library.

The institution requires two "original" unbound copies of the thesis in final form submitted directly to the library after the defense-of-thesis-exam. Usual practice has included submission of two additional bound copies for the student's major program division. Submit a Thesis Bindery Authorization form to the library.

Thesis credits receive a grade of "P" or "F" (Pass/Fail) upon completion of defense and thesis. A fail grade will impact a student's GPA. The grade of "N" is used for continuing thesis research.

Publishable Paper

The student, with approval of the student's Graduate committee, may elect to write a paper for publication in lieu of a traditional thesis. The paper should be of acceptable quality for publication in a peer-reviewed journal and will be formatted in accordance with the chosen journal's requirements for submission. The Graduate Committee will ensure that the student documents and archives the research results in accordance with accepted research practices. A formal defense of the paper for publication is required and a final draft must be submitted to each member of the student's Graduate Committee no later than two weeks before the time and date of the student's scheduled paper defense. The publishable paper, after the inclusion of all revisions recommended by the Committee and approval by a majority of the Committee, must be submitted to the selected journal.

Non-Thesis: Option B

In some study areas, a student needs more course work beyond the baccalaureate degree before attempting original research. In such fields, Option B allows the student to defer original research until a doctoral program. For students with an advanced degree or terminal degree, a thesis program may unnecessarily repeat a process that the student has already mastered. Under this option, course work is substituted for the thesis requirement. At least 34 credits of course work and 2 credits of graduate seminar (additional to course work) must be completed.

Final Examination/Thesis Defense/Publishable Paper Presentation

All Master of Science degree candidates will be given a final examination covering course material. Students electing to pursue the non-thesis option will be given both a comprehensive written and oral exam on their course work. The examination is open to all interested faculty members. The major advisor for students passing both the oral and thesis exams will inform the Graduate School Office in writing of such successful completion.

The student, in consultation with the committee chair, shall select the time for the examination. The committee chair shall seek the approval of all committee members and shall inform the Graduate School in writing of the time and location of the oral examination**,** and notify the general faculty no later than one full week before the selected time.

The thesis defense, paper presentation, or examination will normally be held during the last three weeks of the final term, but it may be given at any time after the thesis (if applicable) has received final committee approval. It may not be scheduled during the period of final examinations. **For graduation in a given semester, the thesis defense, publishable paper presentation, or examination must be completed satisfactorily one week before the last day of scheduled exams for that semester.** The program determines the number of advance copies of the thesis (if applicable) that will be available during the examination.

The student's Graduate Committee constitutes the examining board for thesis defense, publishable paper presentation, or final examination. The committee chair is responsible for scheduling the date, time, and location of the defense or publishable paper presentation in a timely manner and is also responsible for ensuring that a majority of the committee and the representative outside the Department is present. The defense, publishable paper presentation, or examination will not be held if these conditions cannot be met. A negative vote by a majority of members of the student's committee will signify failure of the defense, presentation, or examination.

If the candidate fails to satisfy the examiners on course work, thesis, publishable paper, written or oral examinations, the committee may schedule a re-examination over general background, thesis, or both. The re-examination will be scheduled at the discretion of the candidate's Graduate Committee, normally 8 to 12 weeks after the date of the first examination.

Application for Degree

Graduate students must complete and file an Application for Master of Science Degree with the Graduate School Office no later than the first week of the semester in which the student expects to complete the degree requirements. This form indicates intent to graduate in a given semester. If degree requirements are not met during the semester indicated on the application, an updated degree application is required. Failure to submit the application by the specified date may result in not receiving commencement information and/or not being included on the Commencement program. Please note: if degree requirements are not met during the term indicated on the Application for Degree, continuing enrollment is required until requirements are met.

Graduate Students are required to enroll for a minimum of 3 credit hours until all required course work, seminars, and thesis credits are satisfactorily completed. In the final semester, a student may enroll for a minimum of 1 credit hour of thesis credit for the purpose of thesis defense, publishable paper presentation, or final examination if all other conditions for graduation have been met.

Certification of Degree

Before a diploma can be released, the Dean of Graduate Studies must certify to the Director of Enrollment Management that the candidate has fulfilled all degree requirements including the submission to the Graduate School of a completed Graduate Student Check-Out List (available in the Graduate Office) with all appropriate signatures. For certification of the degree for a given semester, this release form must be submitted to the Graduate Office by June 30 for Spring graduation, September 30 for Summer graduation, or January 30 for Fall graduation. Candidates are cautioned not to make travel plans or other arrangements that will be difficult or costly to change until they are certain that all degree requirements can and will be satisfied.

Appeal Procedure

Procedures for appealing or petitioning for a variance from certain policies are set forth in the relevant sections of this document when such variances are permitted in unusual or exceptional circumstances. Appeals or petitions involving such matters as grade changes should be logged with the Graduate School Office.

Appeals concerning probation or suspension decisions should first be filed with the Department Head of the student's major area. Before rendering a decision on the Departmental appeal, the Department Head will seek a recommendation from the student's Graduate Committee. If the student is not satisfied with the decision on the appeal, the student may petition the Graduate Council for reconsideration. Such petitions must be filed with the Graduate School Office. The final decision will rest with the Dean of Graduate Studies.

In those cases where this document does not provide appropriate information concerning the resolution of a conflict or problem encountered by the graduate student, or if the student is dissatisfied with a prior appeal decision, the student should refer to the college grievance procedures as stated in the catalog and/or seek advice of the Dean of Graduate Studies to determine what resource is available to assist in seeking a solution to such problems.

SUMMARY OF PROCEDURES AND DEADLINES TO COMPLETE MASTER'S DEGREE REQUIREMENTS

WHAT	*WHEN*	*PROCEDURE*
1. Assignment of Advisor	Upon Admission.	Assigned by Department Head.
2. Change of Advisor (if desired)	By the beginning of the second semester in regular standing.	See head of the Division; Submit recommendation to Graduate Studies Office
3. Graduate Program Defined	By the end of the second semester.	Consult advisor; submit program on official forms to the Graduate Studies Office with all required signatures.
4. Selection of Graduate Advisory Committee	As early as possible.	If thesis Chair is outside degree department, an advisor must be maintained in degree granting department.
5. Thesis Outline Submitted to Committee Chair	As early as possible. Meet with Committee on regular basis to review progress.	Submit outline to graduate committee members for approval.
6. Application for Master of Science Degree	Due by first week of semester in which completion of degree is expected.	Complete application form, (available at Graduate Studies Office and on the website.)
7. Final Changes in Program	Submit no later than one month prior to the end of semester of completion of degree requirements.	Submit Amended Student Program form to Graduate Studies Office (changes in courses, graduation date, etc.).
8. Thesis Draft	Submit draft to Committee and Library 30 days before scheduled defense.	Submit draft to Committee for review and to Library to check binding margins.
9. Comprehensive Examination	Must be held no later than one week before the last day of regularly scheduled classes of semester in which graduate work is completed.	Make arrangements with advisor and graduate advisory committee.
10. Defense of Thesis or Publishable Paper	Must be held no later than one week before the last day of regularly scheduled classes of semester in which graduate work is completed and cannot be scheduled during the period of final examinations. Final draft must be submitted to Committee 2 weeks before scheduled defense.	Make arrangements with chair. Graduate Studies Office notified at least one week in advance.
11. Submission of Thesis	After the defense of the thesis exam and upon completion of corrections.	Submit to the Library.
12. Submission of Graduate Student Check-Out Form and Hazardous Waste Check-Out Form (if applicable)	After successful completion of oral and written exam and/or thesis defense,or submission of publishable paper to journal.	Secure all applicable signatures on Check-Out Form and return to the Graduate Studies Office. This document is required to post your degree.
13. Conferring of degrees	End of each semester.	Contact Graduate Studies Office for more information.
14. Commencement	End of Spring semester only. Completion of defense, presentation of publishable paper or project by last day of scheduled classes is required for participation in Commencement Ceremony.	

M.S. Academic Programs

M.S. ENVIRONMENTAL ENGINEERING

Department Head: Dr. Kumar Ganesan
(406) 496-4239
SE 316B

Field of Study

This rapidly growing interdisciplinary field allows students to pursue their area of environmental interest. Generally, research projects at Montana Tech relate to the environmental challenges facing the minerals industry. However, the research results and course work have general application to the solution of environmental engineering problems worldwide.

There are opportunities for graduate research in the areas of air, water quality and pollution control; hazardous waste minimization, treatment, and control; and waste cleanup. Current students are actively involved in government and industry sponsored projects in air and water quality engineering, biotechnology applied to minerals wastes, and land disposal of waste sludges. Specific areas of current research include the water chemistry of heavy metals, and hazardous organics; ground and surface water modeling; air emission inventories; biosorption of heavy metals; wetland research, land reclamation, atmospheric diffusion processes; and cleanup of "RCRA" and "super-fund" sites.

Degree Program

Option A: Thesis

A research thesis is required. A program of courses is required and is established in consultation among the student, the major advisor and the graduate committee. Depending upon the student's background, deficiency courses in sciences or engineering may be required as part of the graduate program.

Option B: Non-Thesis

The MS non thesis candidates must complete a total of 36 credits. This includes two credits of graduate seminar, one writing seminar, and three credits of special topics/project. The specifics of the thirty credits of course work will be determined by the student's graduate committee based on student's educational goals. The student must complete all thirty credits of course work satisfactorily to earn the degree. The student must also pass an oral and a comprehensive examination.

Admission generally requires a B.S. in an engineering field. Regular admission into the M.S. program requires a 3.0 or higher GPA in undergraduate engineering program. Provisional admission into the M.S. program will be considered on an individual basis. Students from science backgrounds are also encouraged to apply with the understanding that a background "engineering core" will become part of the overall graduate program.

Seminar Requirements: Three credits of Graduate Seminar are required, including ENGR 5150 Graduate Writing Seminar or equivalent, ENVE 5940 Graduate Seminar (*must be taken twice*).

Examinations

Option A: Thesis
Candidates for a master's degree must write or publish a paper and present their thesis and pass an oral examination. The oral examination may also include general questions related to environmental engineering.

Option B: Non-Thesis
Candidates for a master's degree must present their project work and successfully complete a comprehensive test.

M.S. GENERAL ENGINEERING

Department Head: Dr. Butch Gerbrandt
(406) 496-4109
SE 313A

Field Of Study

A Master of Science student may elect to study in any one of several areas and be directed by the General Engineering faculty. Students may elect to focus on the emphasis of Civil, Mechanical, or Welding Engineering. The *Civil Engineering emphasis* focuses on the structural engineering, geotechnical, and water hydraulics and hydrology fields of civil engineering. *Mechanical Engineering emphasis* includes mechanical power and machines, energy studies, and concurrent engineering. *The Welding Engineering emphasis* focuses on advanced studies of welding processes, automated manufacturing, welded design, welding metallurgy and nondestructive evaluation.

Degree Program

The Master of Science degree in General Engineering may be obtained under either Option A (thesis or publishable paper option) or Option B (non-thesis option). *The required number of credits (30 or 36 depending whether the student is following Option A or Option B) will be selected upon approval of the student's graduate committee, in a manner such that the Graduate School requirements are met.*
Seminar Requirements: Two credits of Graduate Seminar are required: ENGR 5150 Graduate Writing Seminar or equivalent, and ENGR 5940.

Examinations

When the candidate for a master's degree has elected Option A (thesis option), the student must present the thesis and pass an oral examination. The oral examination will include an examination on the thesis presentation, but may also include questions relating to the graduate study program.

Students who elect the non-thesis option must complete at least six (6) credits of special problems and pass an oral and comprehensive exam.

M.S. ELECTRICAL ENGINEERING

Department Head: Dr. Dan Trudnowski
(406) 496-4681
SE 311

Field Of Study

A Master of Science student may elect to study in Electrical Engineering and be directed by the Electrical Engineering faculty. Montana Tech offers advanced studies in Electrical Engineering in the areas of signals and systems, controls, and electrical power systems. All students must successfully complete E.E. 5380. Also, students must select two courses from E.E. 5220, 5270, 5370, 5400, 5410, 5550.

Degree Program

The Master of Science degree in Electrical Engineering may be obtained under either Option A (thesis or publishable paper option) or Option B (non-thesis option). *The required number of credits (30 or 36 depending whether the student is following Option A or Option B) will be selected upon approval of the student's graduate committee, in a manner such that the Graduate School requirements are met.*

Seminar Requirements: Two credits of Graduate Seminar are required: ENGR 5150 Graduate Writing Seminar or equivalent, and ENGR 5940.

Examinations

When the candidate for a master's degree has elected Option A (thesis option), the student must present the thesis and pass an oral examination. The oral examination will include an examination on the thesis presentation, but may also include questions relating to the graduate study program.

Students who elect the non-thesis option must complete at least six (6) credits of special problems and pass an oral and comprehensive exam.

M.S. GEOSCIENCE

Dean, School of Mines & Engineering: Dr. Pete Knudsen
(406) 496-4395
MG 119

Field of Study

Geoscience is a multi-disciplinary field emphasizing the chemistry, physics, geology, hydrology, fate and contaminant transport, and economics of the earth and its naturally occurring mineral resources. Six degree options are available in the Geosciences curriculum, including three options with an engineering focus.

Degree Program: M.S. in Geoscience with options in:

* Geochemistry
* Geological Engineering
* Geology
* Geophysical Engineering
* Hydrogeological Engineering
* Hydrogeology

Option in Geochemistry

Department Head: Dr. Douglas Cameron
(406) 496-4247
CBB 215

Geochemistry is an interdisciplinary field of study in which the science of chemistry is used to solve earth science problems. Areas of study include the full spectrum of topics from the determination of the thermodynamic properties of minerals, to the determination of the migration of pollutant species within a soil or hydrologic environment and the geobotanical/biogeochemical search for ore deposits. The geochemistry option is centered in the Chemistry and Geochemistry Department. Students acquire relatively strong backgrounds in chemistry and can choose thesis topics ranging among a large variety of geochemical/environmental topics.

Admission requirements: B.S. in chemistry, geology, or any area of science or engineering.

Prerequisite geology and chemistry courses: A reasonable number of courses in chemistry and geology.

Option: Thesis, Publishable Paper or Non-Thesis

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent; GSCI 5940 Geoscience Seminar

Option in Geological Engineering

Department Head: Dr. Mary MacLaughlin
(406) 496-4655
MG 213B

A Master of Science in Geoscience with an "Option in Geological Engineering" requires that the student have an engineering background and allows specialization in several areas of Geological Engineering. Students in related non-engineering fields who have a strong background in mathematics and physics may be admitted to the option on a provisional basis. At a minimum, such students must successfully complete undergraduate-level engineering course work in statics and mechanics of materials.

The department has excellent facilities and equipment for field investigations, laboratory experiments, and numerical modeling. In recent years, student research has focused on slope stability analysis and design, support of underground mine openings, and engineering characterization of geological materials.

Admission Requirements: B.S. in Geological, Mining, Geophysical, or Civil Engineering.

Option: Thesis, Publishable Paper, or Non-Thesis

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent; GSCI 5940 Geoscience Seminar (1)

Examinations:
The final examination for thesis and publishable paper-option students will consist of an oral presentation and defense of the thesis. Questions may be asked on any topic related to the thesis/paper or course work taken as part of the graduate program. The presentation will be open to all interested parties, but the defense will be open only to the student's graduate committee.

The final examination for non-thesis option students will consist of a written and/or oral examination formulated by the student's graduate committee. The oral examination will draw questions from the written examination plus any course work undertaken as part of the graduate program.

Other:
Students who are not already certified as an Engineer-In-Training are required to take the national Fundamentals of Engineering examination.

Students who select the non-thesis option are required to take GEOE 590W Graduate Research or Design Project as part of their course work.

Option in Geology

Contact: Dr. Larry Smith
(406) 496-4859
MG 213F

A Master of Science in Geoscience with an "Option in Geology" allows specialization in any field of Applied Geology. For example, recent graduate students in this option have investigated the origin of hydrothermal talc mineralization in SW Montana, water-rock interaction and acid mine drainage in Butte, and the bio-geochemisty of natural wetlands near abandoned mines.

Admission Requirements: B.S. or B.A. in Geology or Geophysics.

Option: Thesis, Publishable Paper, or Non-Thesis

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent; GSCI 5940 Geoscience Seminar (1)

Placement:
All recent MS graduates in Geology have found jobs in their chosen field. Employment opportunities for geologists with an M.S. degree are diverse and include State and Federal government agencies (e.g., Montana Bureau of Mines and Geology, USDA Forest Service, US Bureau of Land Management), resource extraction industries (mining, petroleum), and private consulting companies.

Option in Geophysical Engineering

Department Head: Dr. Curtis Link
(406) 496-4165
ELC 303

Graduate students, both thesis and non-thesis, are encouraged to begin participation in a variety of research and field exploration projects early in their graduate program. Major equipment includes a 24 bit 96 channel seismograph, a time domain EM system, a ground penetrating radar system, gravimeter, magnetometer, gamma-ray spectrometer, horizontal loop EM system, and resistivity, IP, controlled source AMT system. Extensive use is made of the department's computing facilities including PC and LINUX workstations. Software packages include ProMax, Hampson-Russell, and MATLAB among many others.

Recent research includes projects on reservoir characterization, the use of neural networks in interpretation problems and processing of ground penetrating radar data and remote sensing data. Engineering geophysical applications are also of interest and a recent project involved the combined use of seismic and electrical techniques in a groundwater development investigation.

Admission requirements: B.S. in geophysics, geology, physics, mathematics, or related engineering area.

Option: Thesis, Publishable Paper, or Non-Thesis

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent; GSCI 5940 Geoscience Seminar

Option in Hydrogeological Engineering

Contact: Dr. Bwalya Malama
(406) 496-4272
MG 213E

Graduate students in Hydrogeological Engineering will study the occurrence, movement, and chemistry of groundwater with additional engineering emphasis. Typical thesis investigations are related to environmental or supply problems associated with mining or agricultural activities, and frequently involve research participation with the Montana Bureau of Mines and Geology.

Admission Requirements: B.S. in Geological Engineering, Geophysical Engineering, Environmental Engineering, or Civil Engineering.

Option: Thesis, Publishable Paper, or Non-Thesis

Core Requirements:

GEOE	422	Groundwater Flow Modeling
GEOE	429	Field Hydrology
GEOE	520	Advanced Hydrogeology
GEOE	522	Groundwater Monitoring
GEOE	523	Groundwater Monitoring Laboratory

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent; GSCI 5940 Geoscience Seminar (1)

Examinations:
An oral diagnostic examination is required during the first semester of residence. Any deficiency courses identified may be taken concurrently with graduate program courses if they do not exceed more than 15 credit hours of deficiencies.

The final examination for thesis-option students will consist of an oral presentation and defense of the thesis. Questions may be asked on any topic related to the thesis or course work taken as part of the graduate program. The presentation will be open to all interested parties, but the defense will be open only to the graduate committee.

The final examination for non-thesis option students will consist of a written and/or oral examination formulated by the student's graduate committee. The oral examination will draw questions from the written examination plus any course work undertaken as part of the graduate program.

Option in Hydrogeology

Contact: Dr. Chris Gammons
(406) 496-4763
MG 213C

Graduate students in Hydrogeology will study the occurrence, movement, and chemistry of groundwater. Typical thesis investigations are related to environmental or supply problems associated with mining or agricultural activities, and frequently involve research participation with the Montana Bureau of Mines and Geology.

Admission Requirements: B.S. in Geology, Geophysics, Chemistry, or Physics.
Option: Thesis, Publishable Paper, or Non-Thesis
Core Requirements:

GEOE	422	Groundwater Flow Modeling
GEOE	429	Field Hydrology
GEOE	520	Advanced Hydrogeology
GEOE	522	Groundwater Monitoring
GEOE	523	Groundwater Monitoring Laboratory

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent; GSCI 5940 Geoscience Seminar (1)

Examinations:
The final examination for thesis-option students will consist of an oral presentation and defense of the thesis. Questions may be asked on any topic related to the thesis or course work taken as part of the graduate program. The presentation will be open to all interested parties, but the defense will be open only to the graduate committee.

The final examination for non-thesis option students will consist of a written and/or oral examination formulated by the student's graduate committee. The oral examination will draw questions from the written examination plus any course work undertaken as part of the graduate program.

M.S. INDUSTRIAL HYGIENE

Program Manager: Dr. Terry Spear
(406) 496-4445
SE 321

Field of Study
Industrial Hygienists are responsible for the recognition, evaluation, and control of workplace environmental factors that may affect the health, comfort or productivity of the worker. Industrial hygiene is considered a "science", however, it is also an art that involves judgement, creativity, and human interaction. Communication skills are very important. Although some occupations may appear more dangerous than others, potential short-term and long-term health hazards occur in every profession whether a person is employed in an office or chemical plant. Industrial hygienists play an important role in ensuring that the workplace is as free from hazards as possible and that the workers and the community at large are protected from potential health threats.

Moreover, industrial hygienists work with management to anticipate problems that could occur and take action to prevent them before they happen. Also, industrial hygienists play an important role in shaping and implementing government policy concerning worker health and safety. Job diversity is a major benefit to consider when choosing a career in health/environmental sciences.

A wealth of unique employment opportunities exists for industrial hygienists. Unlike many other professions, industrial hygienists are not limited to one particular type of industry; they are employed in a variety of organizations such as public utilities; government; research laboratories; hospitals; insurance companies; consulting firms; oil, chemical and manufacturing companies; and mining operations.

Graduate Admission Requirements:
Applicants are admitted in the basis of acceptable academic preparation. Applicants must have a bachelor's degree in a scientific or engineering discipline with a minimum cumulative grade point average of 3.0. Candidates for Industrial Hygiene master's-level degree programs shall hold a baccalaureate degree based on a minimum of 120 semester hours or equivalent. That shall include 63 or more semester-hour credits in undergraduate or graduate-level courses in science, mathematics, engineering and technology with at least 15 of those at the upper (junior, senior or graduate) level and a minimum of 21 semester-hour credits, or the equivalent in communications, humanities, and social sciences. The undergraduate degree of any applicant must meet the minimum ASAC-ABET requirements for a bachelor's degree program. The Graduate Record Exam (GRE) is required for admittance into the on-campus program. The GRE is not required for admittance into the online program.

Candidates for Industrial Hygiene master's-level online program must have a minimum of two years of significant work experience related to industrial hygiene in additional to the above requirements.

Degree Programs
Graduate students with a B.S. degree from Montana Tech who have previously matriculated OSH 4216, OSH 4226 and/or OSH 4296 will be required to complete elective courses to replace those credit hours.

Graduate Students with a B.S. degree from Montana Tech who have previously matriculated OSH 4606, Systems Safety, will not be permitted to take I.H. 5606, System Safety Management. These students will be required to complete an additional 3 credit elective.

Graduate students with a B.S. degree in OSH from Montana Tech have an adequate background in safety and are not required to complete the Safety Core. These students will be required to complete an additional three credit elective

The above pertain to both on-campus and on-line programs.

On-Campus M.S. Industrial Hygiene Program
Accredited by the Applied Science Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET/ASAC), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 telephone: (410) 347-7700).

Educational Objectives:

I. Graduates will be prepared to develop, implement and manage occupational health, and/or industrial hygiene policies and Programs.

Outcomes:
Upon graduation, the student should demonstrate the following:
- Ability to anticipate, recognize and mitigate potential hazards.
- Understand the philosophy of protection and enhancement of health through preventative measures.
- Be able to write occupational health policy and programs.
- Research, select, recommend and design appropriate control technologies.

II. Graduates will be prepared to assume professional positions in industrial hygiene, safety or health science careers.

Outcomes:
- Be able to select and implement assessment methods and sampling

strategies.
- With internships experience, will be familiar with employer expectations and program implementation.
- Be able to communicate effectively.
- Be able to manage and control losses associated with work place injuries and illness.

III. Graduates will have an understanding of the role of health and safety professionals in occupational health settings and their obligation to their profession and the public.

Outcomes:
- Serve as advocates for occupational and public health issues.
- Maintain a commitment to continued professional development.
- Understand both professional and ethical responsibilities.

A program of courses is established in consultation between the student, the graduate advisory committee, and the major advisor. Thirty-six major credits, plus one credit writing seminar (T.C. 5150) are minimally required. A maximum of 6 transfer credits from a regionally accredited institution will be accepted.

Option: Thesis or Publishable Paper 37 credit degree requirement

Core Requirements (34 credits)

OSH	4216	Industrial Hygiene I	3
OSH	4226	Industrial Hygiene II	3
T.C.	5156	Graduate Writing Seminar	1
I.H.	5296	Sampling & Eval. of Health Haz.	3
I.H.	5276	Advanced Industrial Toxicology	3
I.H.	5686	Advanced Ergonomics	2
I.H.	5426	Principles of Epidemiology	3
I.H.	5136	Industrial Hygiene Management	2
I.H.	5076	Statistical Analysis	3
		Safety Core[1]	3
I.H.	5946	Graduate Seminar	2
I.H.	5996	Thesis Research	6

[1] Graduate students can choose from the following courses to satisfy the Safety Core requirement: OSH 4276, Mining Safety; OSH 4956, Behavior Based Safety; I.H. 5606, System Safety and Process Safety Management.

Electives (3 Credits)

I.H.	5156	Noise	3
I.H.	5476	Strat. for Occ. Exp. Assessment	3
I.H.	5676	Industrial Respiratory Protection	3
I.H.	5606	Sys. Saf. & Process Saf. Mng.	3
I.H	5626	Radiological Health & Safety	3
I.H.	5976	Special Problems	3
OSH	4066	Small Particle Technology	3

Examinations:
Candidates for a master's degree must present their thesis or publishable paper and pass an oral examination. The oral examination will focus on the thesis presentation or publishable paper, but may also include questions relating to the graduate study program.

M.S. Industrial Hygiene Program Online
Accredited by the Applied Science Accreditation Commission of the Accreditation Board of Engineers and Technology (ABET/ASAC), 111 Market Place, Suite 1050, Baltimore, MD 2120-4012 telephone:(410) 347-7700).
Offered on-line to experienced industrial hygienists and scientists.

Option: Online non-thesis 37 credit degree requirement

Educational Objectives

I. Graduates will be prepared to develop, implement and manage occupational health, and/or industrial hygiene policies and programs.

Outcomes:
Upon graduation, the student should demonstrate the following:
- Ability to anticipate, recognize and mitigate potential hazards.
- Understand mandated and recommended health and safety standards.
- Understand the philosophy of protection and enhancement of health through preventative measures.
- Be able to write occupational health policy and programs.
- Research, select, recommend and design appropriate control technologies.

II. Graduates will be better prepared to practice professional positions in industrial hygiene, safety or health science careers.

Outcomes:
- Be able to select and implement assessment methods and sampling strategies.
- Be familiar with employer expectations and program implementation in the field of industrial hygiene.
- Be able to communicate effectively.
- Be able to manage and control losses associated with work place injuries and illnesses.

III. Graduates will have an understanding of the role of health and safety professionals in occupational health settings and their obligation to their profession and the public.

Outcomes:
- Serve as advocates for occupational and public health issues.
- Maintain a commitment to continued professional development.
- Understand both professional and ethical responsibilities.

Core Requirements (28 Credits)

OSH	4216	Industrial Hygiene I	3
OSH	4226	Industrial Hygiene II	3
I.H.	5286	Sampling & Eval. of Health Haz.	3
I.H.	5276	Advanced Industrial Toxicology	3
I.H.	5686	Advanced Ergonomics	2
I.H.	5426	Principles of Epidemiology	3
I.H.	5136	Industrial Hygiene Management	2
I.H.	5076	Statistical Analysis	3
I.H.	5606	Sys. Saf. & Process Saf. Mgmt..	3
I.H.	4066	Industrial Hygiene Report	3

Electives (9 Credits)

I.H.	5156	Noise	3
I.H.	5476	Strat. for Occ. Exp. Assessment	3
I.H.	5676	Industrial Respiratory Protection	3
I.H.	5626	Radiological Health & Safety	3
I.H.	5976	Special Problems	3
OSH	4066	Small Particle Technology	3

Students licensed as certified industrial hygienists (CIH), may waive OSH 4216, Industrial Hygiene I, and these students would be required to complete 34 credits for the online industrial hygiene degree. Students licensed as certified safety professionals (CSP), may waive I.H. 5606, System Safety and Process Safety Management, and these students would be required to complete 34 credits for the online industrial hygiene degree. For students licensed as both CIH and CSP, OSH 4216 and I.H. 5606 may be waived, and these students would be required to complete 31 credits for the online industrial hygiene degree.

Examinations:
Candidates for a master's degree must present their Industrial Hygiene Report and pass an oral examination. The oral examination will focus on the report presentation, but may also include questions relating to the graduate study program.

Laboratories:
Online students must complete a five (5) day on-campus laboratory as part of I.H. 5286.

M.S. METALLURGICAL/MINERAL PROCESSING ENGINEERING

Department Head: Dr. Courtney Young

(406) 496-4158
ELC 208A

Field of Study
Metallurgical/Mineral Processing Engineering deals with all aspects of metal and non-metal processing and manufacturing. Mineral processing engineers have the responsibility of accepting ore mined from the earth, comminuting the ore until liberation occurs, and then removing the valuable minerals in the form of concentrates. Extractive metallurgical engineers extract the valuable metals from the concentrates, remove impurities from the metals using aqueous or thermal chemistry, and then market the purified metal as a commodity. Physical metallurgical engineers accept various purified metals and alloy them to control a number of characteristics including strength and corrosion resistance. Materials engineers control the same characteristics but pertaining to plastics, composites, glasses, ceramics, etc. Finally, welding engineers join the various materials together but with minimal destruction of the integrity of the metals and materials.

Degree Program
M.S. degrees in Metallurgical/Mineral Processing Engineering can be obtained by two options. Option A, the thesis option, requires 20 course credits, 8 thesis credits, and 3 seminar credits. Option B, the non-thesis option, requires 34 course credits and 3 seminar credits. Curricular programs will be established by the student and the graduate advisor in consultation with the graduate advisory committee. The student must demonstrate competence in both oral and written communication, advanced mathematics, and use of computers.

Graduate research may be pursued with an Option in Metallurgical Engineering (Option A or B) or Option in Mineral Processing Engineering (Option A or B). Recent thesis topics have included (1) Dual Ecosystem Enhancement by Slag Remediation of ARD, (2) Selective Recovery of Valuable Metals from Acid-Rock Drainage, (3) Decontamination of Stainless Steel by Melt Refining/Slagging, (4) Arsenic Removal by Modified Ferrihydrite, (5) Simultaneous Ferrous Oxidation/Copper Reduction in Membrane Systems, (6) Alkaline Sulfide Leaching of Gold, (7) Selenium and Thallium Removal by Zero Valence Iron, and (8) Nanopolysilicon Powder Formation.
Off-campus research is encouraged. The degree requirements are the same as those described above for in-house research thesis projects. This allows students to pursue a thesis research project at their place of employment. Selection of a student to participate in the off-campus research option is dependent upon specific criteria, i.e.,

a. The student must already be employed by the company;
b. The student must be able to attend in residence at least one semester in order to complete course requirements. Some courses can be completed on-line or self-study;
c. There must be a qualified on-site thesis instructor;
d. The thesis research project must be well defined and acceptable to the graduate student's advisory committee;
e. A student must be registered every semester that he or she is working toward fulfillment of the degree requirements;
f. The student must be able to travel to Montana Tech at least once to present a seminar; and
g. The thesis defense must be conducted on campus, and the student must follow the guidelines for thesis defense.

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent, MetE 5940 Metallurgical Engineering Seminars (*twice*).

Examinations
The final examination for the thesis-option students will consist of an oral presentation and defense of the thesis. Questions may be asked on any topic related to the thesis or course work taken as part of the graduate program. The presentation will be open to all interested parties, but the defense of the thesis will be open only to the graduate committee.

The final examination for the non-thesis-option students will consist of a written and/or an oral examination. The committee chairman will administer a written examination formulated by the committee. The oral examination will draw questions from the written examination plus any of the course work that is part of the graduate program.

M.S. MINING ENGINEERING

Department Head: Mr. David Armstrong
(406) 496-4867
MG 118

Field of Study
Mining engineers design, construct, and manage surface and underground mines in an environmentally responsible manner. A mining engineer must be proficient in the permitting, planning, development, operation, reclamation and closure of mines and be able to apply, in the field, the technical skills required. Master of Science candidates in Mining Engineering may choose to study in the areas of mechanics of geologic materials, blasting, materials handling, mine valuation, ventilation, geostatics, mine design, mine safety, and environmental management and design of mines.

Degree Program
Thesis, Publishable Paper and Non-Thesis options are offered. A program of courses is established in consultation between the student and the graduate committee chairman with the aid and advice of committee members. The graduate committee chairman will be assigned on the basis of the thesis chosen or the program outlined. Deficiency courses may be taken concurrently with the graduate program courses defined if they do not exceed more than 15 credit hours of deficiencies.

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent, MIN 5940 Mining Engineering Seminar (*need to take twice*)

Examinations
The final examination for the thesis-option students will consist of an oral presentation and defense of the thesis. Questions may be asked on any topic related to the thesis or course work taken as part of the graduate program. The presentation will be open to all interested parties, but the defense of the thesis will be open only to the graduate committee. The final examination for the non-thesis-option students will consist of a written and/or an oral examination. The committee chairman will administer a written examination formulated by the committee. The oral examination will draw questions from the written examination plus any of the course work that is part of the graduate program

M.S. PETROLEUM ENGINEERING

Department Head: Mr. Leo Heath
(406) 496-4507
PET 205

Field of Study
Master of Science candidates must become proficient in the advanced levels of reservoir, drilling or production engineering. Drilling involves all aspects of wellbore drilling, casing design and cementing, and well completion. Reservoir engineering deals with all aspects of modeling the reservoir, studying fluid movement, and maximizing oil and gas recovery. Production is primarily the work of removing crude oil, gas, and water from the reservoir to the surface and separating and treating each fluid.

Degree Program with Thesis
A student pursuing a Petroleum Engineering Master's degree with thesis will be required to take 30 semester hours of graduate credits. This includes a minimum of 21 semester hours of 4000-5000 level graduate course work, plus at least 6 semester hours in thesis research, plus at least 3 semester hours of graduate seminar courses. Of the 21 graduate credit hours, 15 hours must be selected from the Master's Core Curriculum (see below) and the remaining 6 credit hours may be selected from Petroleum Engineering 4000-5000 level elective courses or technical 4000-5000 level elective courses.

Entering master's students will be advised on curriculum by their assigned Petroleum Department advisor. The advisor will also schedule the Qualification Exam with the student. The student, in consultation with the advisor, will select a Master's Committee. The Master's Committee will consist of three or four professional people who are adequately experienced to advise and judge the merits of the particular master's work. At least two members of the Master's Committee must be from the Petroleum Engineering Department faculty, including the student's advisor. At least one member should be from faculty of other departments at Montana Tech. Other members can be from industry, or business, or other academia, providing their experience and interest is appropriate. All Master's Committee members must agree to serve and must be available in-person for,

at least, the oral thesis defense. The Department Master's Advisory Committee must approve Master's Committee members, and any changes in the advisor or committee members.

The advisor will collaborate with the student to define the student's thesis topic. This topic will require original laboratory or theoretical research and experimentation by the student. Special topics, special problems, and thesis research courses will be designed by the advisor and committee to focus study of the thesis topic.

The Master's Thesis is a written work which describes and explains the results of research and experimental work conducted by the student with conclusions and supporting information included. The intent of the thesis is to convey the results of new knowledge gained through the work of the student, in professional written format. The content and conclusions of the thesis must be deemed acceptable for master achievement by the members of the Master's Committee. The procedures and deadlines for formatting and submitting a Master's Thesis are detailed in the "Graduate School Handbook" available from the Graduate Studies Office. Additional requirements and guidelines are listed in the Petroleum Department "Thesis Guide".

Graduate students are expected to **maintain a 3.0 GPA** in the Master of Science program and the accumulation of three grades of "C" in formal courses will be cause for dismissal from the program.

Degree Program with Report (Non-Thesis)
A student pursuing a Petroleum Engineering Master's degree with report will be required to take 34 semester hours of graduate credits. This includes a minimum of 28 semester hours of 4000-5000 level graduate course work, plus 3 semester hours in report research, plus at least 3 semester hours of graduate seminar courses. Of the 28 graduate credit hours, 15 hours must be selected from the Master's Core Curriculum (see below) and the remaining 13 credit hours may be selected from Petroleum Engineering 4000-5000 level elective courses or technical 4000-5000 level elective courses.

Entering master's students will be advised on curriculum by their assigned Petroleum Department advisor. The advisor will also schedule the Qualification Exam with the student. The student, in consultation with the advisor, will select a Master's Committee. The Master's Committee will consist of three or four professional people who are adequately experienced to advise and judge the merits of the particular master's work. At least one member should be from faculty of other departments at Montana Tech. Other members can be from industry, or business, or other academia, providing their experience and interest is appropriate. All Master's Committee members must agree to serve and must be available in-person for, at least, the oral thesis defense. The Department Master's Advisory Committee must approve Master's Committee members, and any changes in the advisor or committee members.

The advisor will collaborate with the student to define the student's report topic. This topic will require in-depth engineering study by the student. Special topics, special problems, and report research courses will be designed by the advisor and committee to focus study on the report topic.

The Master's Report is a written work which describes and explains the results of research and study conducted by the student with conclusions and supporting information included. The intent of the report is to convey the results of new knowledge gained through the work of the student, in a professional written format. The content and conclusions of the report must be deemed acceptable for master achievement by the members of the Master's Committee. The procedures and deadlines for formatting and submitting a Master's Thesis are detailed in the "Graduate School Student Handbook" available from the Graduate Studies Office. Additional requirements and guidelines are listed in the Petroleum Department "Thesis Guide".

Changing from thesis to non-thesis or vice-versa requires the approval of the petroleum faculty. The student's advisor and graduate advisory committee may need to be changed if the option is changed. Election to change to non-thesis may result in additional course requirements beyond the minimum. The new graduate committee will make the decision.

M.S. Core Curriculum

Although the general structure of a student's selection of courses for the M.S. degree will be adapted to the student's area of interest, every candidate must include in the selection at least five (5) of the following courses, which then constitutes the core curriculum for the M.S. in Petroleum Engineering:

PET 5010 Advanced Drilling Design
PET 5020 Production Operations Design-Stimulation
PET 5030 Surface Production Facilities
PET 5040 Advanced Reservoir Engineering
PET 5050 Pressure Transient Analysis
PET 5080 Thermal Recovery Methods
PET 5110 Advanced Reservoir Simulation
PET 5440 Advanced Enhanced Oil Recovery

Seminar Requirements: ENGR 5150 Graduate Writing Seminar or equivalent, and PET 5940 Graduate Seminar (*need to take twice*)

Examinations
A qualifying exam is required for all options in the Petroleum Engineering Department. Refer to the Petroleum Engineering Department Master's Degree bulletin for details.

WEB-BASED Master's IN PROJECT ENGINEERING AND MANAGEMENT (MPEM)

Department Head: Dr. Kumar Ganesan
(406) 496-4239
SE 316B

Field of Study
The Master of Project Engineering and Management degree is designed to give working professionals an opportunity to enhance their technical and managerial skills with minimum disruption to their workday. The 30 credit non-thesis degree is structured around three primary areas: 1) Advanced Engineering Principles; 2) Industrial and Management Engineering; and 3) Business and Organizational Management.

Degree Program
All the courses for this unique, interdisciplinary degree program are offered through web-based, on-line courses. All courses are three credits each for a total of 30 semester credits. A student is required to have a Bachelor of Science Degree in Engineering or technical degree in this graduate degree program. Students with non-engineering (technical degree) may be required to take additional courses as prerequisites. Admission into the program will be evaluated based on individual applicants educational background and work experience.

This online courses allows students to coordinate their study with their professional and personal demands. This Internet based offering allows students to pursue studies at times and places convenient to them.

Curriculum
This 30 credit, non-thesis degree is structured around technical management as the focus. Courses are offered during fall, spring, and summer semesters. The MPEM course work includes **six core courses and four technical electives. It also includes a final project presentation to the committee members to complete the degree requirements. This presentation will take place on campus.**

Core Courses (Three credits each)– Required of All Students

MPEM	5010	Economic Feasibility of Projects
MPEM	5020	Project and Engineering Management
MPEM	5030	Legal Issues Related to PE & M
MPEM	5040	Financial Mgmt of Technological Enterprises
MPEM	5050	Management Economics & Accounting
MPEM	5060	Advanced Management Seminar
MPEM	5900	Special Projects

Elective Courses (Three credits each)– Students complete any four courses

MPEM	5100	Pollution Prevention
MPEM	5110	Energy Conversion
MPEM	5120	Application & Design of Industrial Experiments
MPEM	5130	Hazardous Waste Engineering

MPEM	5140	Systems Safety & Management
MPEM	5150	Information Technology for Managers
MPEM	5160	Managerial Communication for Project Managers
MPEM	5900	Special Projects

Admission Requirements:

1. Applicants must have a Bachelor's Degree in any Engineering discipline.
2. Non-engineering students wishing to enroll may have to complete some engineering deficiency courses.
3. Applicants interested in the program should apply to Montana Tech (406) 496-4304.

M.S. TECHNICAL COMMUNICATION

Department Head: Dr. Henrietta Shirk
(406) 496-4297
ENGR 209

Field of study

This program is practice-oriented, emphasizing a problem-solving approach that empowers people in many disciplines to communicate more effectively. Candidates are expected to bridge the complex and isolated worlds of scientific and technical specialties through employment of effective communication strategies.

Degree Program

A 31-credit program of study offered by Montana Tech of the UM and University of Montana-Missoula is required, as is a six-credit thesis or major project. For the project option, a student may pursue interests in a specific profession or an academic discipline and demonstrate that interest creatively in a state-of-the-art format. Smaller portions of the major project may serve as components of assignments in course work. The project topic will be discussed, refined, and approved by each student's major advisor and a graduate committee.

Examinations

Candidates for a Master's Degree in Technical Communication must present their major projects orally and lead the discussion resulting from the demonstration. Within this context, the successful candidate will also demonstrate the integration of course work as it relates to the major project and to identified professional goals.

MSTC Curriculum

Some prerequisites to graduate studies may be required. MSTC faculty determine deficiencies and note them in acceptance letters. You must maintain a 3.0 GPA when completing deficiencies, and courses taken as prerequisites do not count toward graduate credit.

Fall Semester

T.C.	5016	Professional Presentations	1
T.C.	5376	Ethics	1
T.C.	5476	Print Production	3
T.C.	5506	Intercultural Communication	3
T.C.	5616	Research Methods	3
T.C.	5946	Graduate Seminar	1
T.C.	5996	Graduate Research	3
		Total	15

Spring Semester

T.C.	5056	Technical Writing & Editing	3
T.C.	5416	Rhetorical Theories & Pro	3
T.C.	5486	Multimedia Production	3
T.C.	5946	Graduate Seminar	1
T.C.	5996	Graduate Research	3
		Electives	3
		Total	16

Reference Information

Minors & Post-Baccalaureate Certificate
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LIST OF AVAILABLE ACADEMIC MINORS

***For additional information refer back to individual degree descriptions and academic minor section.**

Minors are available in the following areas: *Biology, Business Administration (Finance or Accounting), Chemistry, Computer Science, Extractive Metallurgy, Geoscience, Geophysics, Hydrogeology, Liberal Studies, Mathematics, Mineral Processing Engineering, Occupational Safety & Health, Physics, and Professional & Technical Communication.* Courses completed to satisfy the requirements of a minor also may be applied toward the General Education Requirements if they appear on the list of approved courses at the time they are taken.

Minor in Addiction Treatment Services (UN-Reno)

Course Requirements			Credits
HCS 3006		Problems of Substance Abuse and Addiction	3
HCS 3016		Bio/Psycho/Social Factors in Addiction	3
HCS 3026		Substance Abuse Prevention	3
HCS 3540		Addiction Treatment I	3
HCS 3550		Individual and Group Treatment of Addiction	3
HCS 4540		Addiction Treatment II	3
18 credits required for Addiction Treatment Services Minor			
Plus			
HCS 4916		Internship in Addiction Treatment and Prevention	3
21 credits required for Addiction Treatment Services Certificate			

Minor in Biology

Required			(4 credits)
BIOL	1086	Introduction to Ecology	2
BIOL	1096	Introduction to Biodiversity	2
BIOL	1116	Cell Biology	4
			(7 - 8 credits)
BIOL	1236	Southwest Flora	3
BIOL	3326	Zoology	4
BIOL	2106	Microbiology	4
BIOL	2516	Human Anat. & Phys. I	4
BIOL	2526	Human Anat. & Phys. II	4
BIOL	xxxx	_____	
BIOL	xxxx	_____	
			(10 credits)
BIOL	2746	Evolution and Man	3
BIOL	3016	Genetics	3
BIOL	3116	Plant Ecology	4
	OR		
BIOL	3126	Animal Ecology	4

Additional Courses			(0- 4 credits)
CHEM	4216	Biochemistry	3
BIOL	2956	Special Topics	1-4
BIOL	4956	Special Topics	1-4
BIOL	3976	Special Problems	1-4
BIOL	3206	Environmental Microbiology	4

A minimum of 21 credits required for Biology Minor

Minor in Business Administration

The mining, minerals and energy industries, as well as other production/engineering oriented industries, have clearly indicated the need to obtain graduates who are trained in business concepts as well as in the fundamentals of their respective disciplines. Students who elect to pursue a minor in business must be currently enrolled in an approved major area of study at Montana Tech. **BIT students are not eligible to earn the business minors.**

Accounting Track	(18 credits)
ACTG 201 & 202	6
BUS 3516	3
ACTG 321	3
Electives: 6 credits from one of:	
ACTG 410, 420, 301, 302, 401, 411	6

Management Track	(18 credits)
ACTG 201	3
BUS 3516	3
BUS 3616W	3
Electives: 3 credits from one of:	
BUS 3616W, 4580	3
Electives: 3 credits from one of:	
BUS 3626, 3636, 3646, 3656	3
Electives: 3 credits from one of:	
ACTG 202, 410, BUS 3416, 3666, 4516, 4566, 4460	3

18 Total credits required for Business Administration Minor.

Minor in Chemistry

The Minor in Chemistry described below has been approved by the Board of Regents. This minor should be particularly attractive for some engineering majors, who will be able to satisfy the requirements outlined below by taking only 2-3 additional courses beyond those already required by their major.

Fall Semester		**Spring Semester**
Year One		
CHMY 141		CHMY 143
CHMY 142		CHMY 144
Year Two		
CHEM 311		
CHEM 321	**OR**	CHEM 210
Year Three		
CHMY 371		

Year Four
One course chosen from among the following:
CHMY 422, 323, 322, 373, 372, 401, 442, 430, or 440

While the order suggested above is probably the most logical, courses can be taken in any order as long as course prerequisites are met.

CHMY 312 has a CHMY 143 prerequisite and can be taken any fall semester after the freshman year. This course will probably be the most difficult for students to schedule.

Meeting the prerequisites for some of the possible fourth year courses requires particular course selections during the first three years of the minor. For example, taking CHMY 323, Organic Chemistry II, requires that the student choose CHMY 321, Organic Chemistry I, rather than CHMY 210, Survey of Organic Chemistry.

19-22 Total Credits required for Chemistry Minor

Minor in Computer Science

The minor in Computer Science offers programming skills in several languages as well as courses in computer hardware and software to support students' major field of study. Software Engineering majors may not earn a Computer Science minor.

Core Requirements		**(Choose 1 Sequence) (6 Credits)**	
C.S.	2106	Intro.. to Computer Science I	3
C.S.	2116	Intro.. to Computer Science II	3
C.S.	2136	Matlab Program for Eng & Scientists	3
C.S.	2146	C Program for Engineers & Scientists	3
		*C.S. 2116 may be substituted for either 2136 or 2146	
C.S.	2126	Applications Programming	3
C.S.	3126	Adv Applications Programming	3

C.S. Electives **(12 Credits)**
Select 12 credits from the following; 6 of these credits must be upper division (3000 and above):

C.S.	2156	Embedded Systems Development	3
C.S.	2546	Object-Oriented Programming	3
C.S.	2656	Database Management	3
C.S.	3166	Discrete Structures	3
C.S.	3316	Data Structures and Algorithms I	3
C.S.	3326	Data Structures and Algorithms II	3
C.S.	3356	Programming Languages	3
C.S.	3406	Operating Systems	3
C.S.	4206	Decision Support Systems	3
C.S.	4386	Theory of Computation	3
C.S.	4406	Computer Architecture	3
C.S.	4516	Data Commun Systems & Networks	3
C.S.	4616	Systems Design Process	3
S.E.	3250	Software Engineering I	3
S.E.	3260W	Software Engineering II	2

18 Total Credits required for Computer Science Minor

Minor in Extractive Metallurgy

METE	2320	Processing of Particulate Systems	2
METE	2340	Particulate Systems Processing Lab I	1
METE	3220	Met. & Mat. Thermodynamics	3
METE	4010	Processing of Aqueous Systems	3
M&ME	4020	Processing of Elevated Temp. Sys.	3
METE	4050	Aqueous & Elevated Temp Proc Lab	1
Two of the Following:			
M&ME	4230	Multi-Component Phase Diagrams	3
M&ME	4410	Met. & Mat. Flowsheet Design	3
METE	5250	Computer Appl. for Process Engineers	3
METE	5260	Thermodyn. Model. of Aqueous Sys.	3

19 Total credits required for Extractive Metallurgy Minor.

Minor in Geophysics

Course Requirements			**Credits**
GEOP	225	Physics of the Earth	3
GEOP	302	Elements of Geophysics	3
PHYS	1046	General Physics-Mechanics	3
PHYS	2076	Gen. Phys.-H, S, & O	3
PHYS	2086	Gen. Phys.-E, M, &W	3
PHYS	2096	Physics Laboratory	1
PHYS	2106	Physics Laboratory	1
Choose 1 course from			
GEOE 409, GEOP 401, 408, 410, 412, 446, or 450			3 or 6
Total		*20 or 23 if GEOE 409 is chosen*	

Minor in Hydrogeology

Course Requirements			**Credits**
ENVE	4300 or 5300	Subsurface Remediation	3
GEO	101	Intro. to Physical Geology	3
GEOE	420	Hydrogeology	3
GEOE	422	Groundwater Flow Modeling	3
GEOE	429	Field Hydrogeology	3
GEOE	528	Contaminant Transport	3

18 Total Credits required for a Hydrogeology Minor

Minor in Liberal Studies

Literature (3-6 credits)

LIT 223, 224	British Literature
LIT 210, 211	American Literature
LIT 231, 232	World Literature
FRCH 401, 402	French Literature

or any upper division or Special Topics Literature course

History (3-6 credits)

HSTR 101, 102	Western Civilization
HSTA 101, 102	American History
HSTR 201, 202	The World in the 20th Century

or any upper division or Special Topics History course

Social Science (3-6 credits)
ECNS 203, SOCI 101, GPHY 121, SOCI 201, PCSI 210, PSCI 260, PSCI 341, PSCI 465, PSCI 438

Speech Communications (2-6 credits)
COMM 1216, COMM 1226, COMM 3226, COMM 3246, COMM 3276, COMM 4216

18 Total Credits required for a Liberal Studies Minor

Minor in Mathematics

Course Requirements			**(19 Credits)**
M	171	Calculus I	3
M	172	Calculus II	3
M	273	Multivariable calculus	4
M	274	Intro. to Differential Equations	3
STAT	332	Stats for Scientists & Engineers	OR
M	333	Linear Algebra	3
M	4xxx	4000 level Mathematics course	3

19 Total Credits required for a Mathematics minor

Minor in Mineral Processing Engineering

METE	2020	Introduction Met. & Mat. Engr.	3
METE	2320	Processing of Particulate Systems	2
METE	2330	Design of Particulate Systems	2
METE	2340	Mineral Processing Lab I	1
METE	2350	Mineral Processing Lab II	1
METE	4010	Processing of Aqueous Systems	3
Two of the Following:			
METE	5110	Mat. Handling Design	3
METE	5340	Process of Primary & Second. Resour.	3
METE	5820	Process of Energy Resources	3
METE	5830	Process of Precious Metal Resources	3
MIN	4300	Aggregate Mine Design	3

18 Total credits required for Mineral Processing Minor.

Minor in Network Technology

The minor in Network Technology is designed for students who have completed courses in the Cisco Networking Academy during their secondary or post-secondary education. This minor may be of particular interest for students who are pursuing a degree at Montana Tech besides Network Technology and wish to continue, and be recognized for, course work in the Cisco Networking Academy.

Course Requirements (22 credits)			**Credits**
I.T.	130/1306	Intro. to Windows Server	3
I.T.	0115/1156	Network Design & Documentation	3
I.T.	3016	Advanced Routing (CCNP 1)	4
I.T.	3026	Remote Access Networks (CCNP 2)	4
I.T.	4016	Multilayer Switching (CCNP 3)	4
I.T.	4026W	Network Troubleshooting (CCNP 4)	4

22 Total Credits required for a Network Technology Minor

Minor in Occupational Safety and Health

Course Requirements (12 credits)			**Credits**
OSH	2246	Safety Administration & Programs	3
OSH	2266	Safety Eng. & Tech.	3
OSH	4216	Industrial Hygiene Fundamentals	3
OSH	4226	Industrial Hygiene Controls	3
(Choose 6 credits from the following courses)			
OSH	3226	Haz Material Management	3
OSH	3236	Fire Protection	3
OSH	3246	Construction Safety	3
OSH	4066	Small Particle Technology	3
OSH	4276	Mining Safety	3
OSH	4296	Sampling & Eval. of Hlth. Haz.	3
OSH	4546	Ergonomics	3

18 Total Credits required for a Occupational Safety & Health Minor

Minor in Physics

Course Requirements			**Credits**
PHYS	1046	General Physics-Mechanics	3
PHYS	2076	Gen. Phys.-H, S, & O	3
PHYS	2086	Gen. Phys.-E, M, &W	3
PHYS	2096	Physics Laboratory	1
PHYS	2106	Physics Laboratory	1
PHYS	3036	Elementary Electronics	3
PHYS	4056	Electricity & Magnetism	3
PHYS	4536	Methods of Theoretical Physics	3
		Total	*20*

Minor in Professional & Technical Communication

Required (2 credits)		
COMM	2016	Presenting Technical Information
Writing		**(5-6 credits)**
JOUR	2706	Reporting
WRIT	321	Advanced Technical Writing
WRIT	325	Writing in the Sciences
WRIT	322	Advanced Business Writing
WRIT	350	Technical Editing
PTC	4126W	Advanced Writing
Production		**(6 credits)**
PTC	1146	Publication Design
PTC	2506	Web Page Design
PTC	2886	Digital Imaging
PTC	3406W	New Media I
PTC	3476W	Intro. to Desktop Publishing
Cultural Context		**(6 credits)**
PTC	4426W	Technology, Communication & Culture
PSYX	360	Social Psychology
PSYX	361	Industrial & Organizational Psychology
STS	2016	Technology and Society
STS	3596W	Politics of Technical Decisions
Ethics		**(3 credits)**
HUMN	3016W	Professional Ethics
BUS	3636	Business Ethics
BIOL	2706	Bioethics

Portfolio Requirement: One semester prior to graduation, students earning a minor must submit a portfolio to the Head. Each portfolio must include the following:

1. A metadocument of one page briefly stating who you are and summarizing the items in your portfolio.
2. One document demonstrating your ability to communicate a complex scientific or technical subject to a general audience.
3. One item demonstrating your layout and design and/or desktop publishing knowledge.
4. One item demonstrating your multimedia presentation and/or digital manipulation knowledge.

23 Total Credits required for a Professional & Technical Communication Minor

Minor in Statistics

Option 1:

Course Requirements			**(19 Credits)**
M	171	Calculus I	3
M	172	Calculus II	3
M	273	Multivariable Calculus	4
M	274	Intro. to Differential Equations	3
STAT	332	Stats for Scientists & Engineers	3
STAT	4xx	400 Level Stats course	3

Option 2:

Course Requirements			
M	171	Calculus I	3
M	172	Calculus II	3
STAT	131	Intro. to Biostatistics	OR
STAT	332	Stats for Scientists & Engineers	3
STAT	432	Regression & Model Building	3
STAT	435	Statistical Computing & EDA	3
STAT	441	Experimental Design	3

19 credits required for a Statistics Minor

Post-Baccalaureate Certificate in the Practice of Technical Communication

Course requirements: (13 credits)

The certificate program is designed for those required to write and present technical documentation in their work settings who want to update their writing and production skills. Applicants must have a recognized baccalaureate degree and are admitted as "special or non-degree" students. In addition, certificate-seeking students must demonstrate academic or professional experience in writing, editing, and computer usage by presenting a professional portfolio to the faculty of the program prior to acceptance. The program requires a total of 13 hours, including technical writing and editing (3 credits) and technical communication production (4 credits). Elective courses (4000- or 5000-level) based on student needs are selected in consultation with an academic advisor.

Required courses:		
T.C.	5056	Technical Writing and Editing,
T.C.	5476	Print Production,
T.C.	5486	Multimedia Production
Potential elective courses (not limited to these choices):		
BUS	4616	Advanced Management Seminar,
ENVE	4156	Environmental Laws & Regulations,
PTC	3256W	Scientific Report Writing,
PTC	4126W	Advanced Writing,
T.C.	5956	Special Topics in Technical Communication,
T.C.	5506	Intercultural Technical Communication,
T.C.	5916	Internship in Technical Communication

Pre-Professional and Transfer Programs

Students may prepare for entry into professional schools of law and health (including medicine, dentistry, veterinary medicine, optometry, podiatry, etc.) by completing a Bachelor's degree at Montana Tech, provided the necessary prerequisite courses are included. Students may also attend Montana Tech for one or two years to prepare for transfer to other institutions to complete undergraduate professional or liberal arts degrees. In all cases, students are urged to work closely with the appropriate advisor at Montana Tech, to consult catalogs, and whenever possible, advisors at the institution to which they plan to transfer. The information below is the best available at the time of publication, but **students should realize that transfer information is subject to change as the result of action by other institutions.**

Pre Professional Health

John Amtmann	496-4346	Physical Therapy, Physicians Assistant, Occupational Therapy
Douglas Cameron	496-4247	Pharmacy
Rick Douglass	496-4450	Veterinary Medicine
Douglas Cameron	496-4247	Medicine, Dentistry, Chiropractic, Optometry, and anything else

Students interested in a professional health career need to explore the health care industry. This exploration is assisted through the following Pre-Professional Health (PPH) courses.

PPH 1006 Freshman Preprofessional Seminar
PPH 1946 Current Topics in Health Care
PPH 2916 Internship
PPH 2946 Current Topics in Health Care
PPH 3006 Professional Health Entrance Exam Preparation
PPH 3946 Current Topics in Health Care
PPH 4916 Internship
PPH 4946 Current Topics in Health Care

Pre-Medicine, Pre-Veterinary, & Pre-Dentistry

At Montana Tech the most common programs for preparing students for medical school are the Pre-professional option in the Biological Sciences, the Bio-Chemistry option in the Chemistry program and the Applied Health Science option in Occupational Safety and Health. Although in principle any Bachelor's degree can be taken in preparation for medical school, students should be aware that to meet degree requirements and medical school requirements it may take longer than four academic years.

All first-year students interested in a career in any of the health sciences should contact Dr. Doug Cameron, Chair of the Pre-professional Health Sciences Advising Committee and should enroll in PPH 1006 *Freshman Pre-professional Health Seminar*.

Although there is wide variation, most medical schools require or recommend the following basic preparation: Biology (two years); Calculus; English; General Physics; General Inorganic & Organic Chemistry

These sciences must include laboratory experience. While additional electives in biology and chemistry are desirable, medical schools also desire a strong background in the humanities and social sciences. It is not necessary to major in pre-medicine, or even in science, to enter medical school, but a major containing substantial course work in biology and chemistry is the norm. A nationally-administered standardized test of all applicants is required for professional training in medicine. Further information can be obtained from the pre-medical advisor or the professional school. Montana residents are eligible for both the **WICHE** and **WAMI** programs, which provide access to out-of-state professional schools at in-state tuition rates. Further information can be obtained from the pre-medical advisor.

Pre-Medicine

The student is referred to guides such as the "Admission Requirements of American Medical Colleges," published annually by the Association of American Medical Colleges, One Dupont Circle, Washington, D .C. 20036 and Osteopathic Medicine College Information Book published annually by the American Association of Colleges of Osteopathic Medicine, 5550 Friendship Boulevard, Suite 310, Chevy Chase, Maryland 20815-7231.

Pre-Veterinary

The student is referred to the guide "Veterinary Medical School Admission Requirements" published annually by the Association of American Veterinary Medical Colleges by Williams-Wilkins, 1400 North Providence RD, Medin, PA 19063.

Pre-Dentistry

the student is referred to the guide "Admission Requirements of U.S. and the Canadian Dental Schools" published annually by American Association of Dental Schools, 1625 Massachusetts Ave, NW, Washington, D.C. 20036.

Pre-Pharmacy

Students at Montana Tech can complete the 1st two years of a pre-pharmacy program and then transfer to another school to complete the program. The program described below is designed to meet the requirements of The University of Montana - Missoula pre-pharmacy program:

Fall Semester			**Spring Semester**		
1st Year					
CHMY	141	3	BIOL	1116	4
CHMY	142	1	BIOL	2706	3
*ECNS	2xx6	3	CHMY	143	1
WRIT	101	3	CHEM	144	3
PPH	1006	1	COMM	1226	2
Humanities Elective		3	STAT	131	3
Social Sci Elective		3		Total 16	
	Total 17				
2nd Year					
BIOL	2516	4	BIOL	2106	4
CHMY	321	3	CHMY	323	3
CHMY	322	2	CHMY	324	3
M	1516 or 171	4/3	M	172	3
PHYS	1026	4	PHYS	1036	4
	Total 16/17			Total 17	

Electives should be carefully chosen in consultation with the student's advisor to insure that they meet the requirements of the Montana Tech core curriculum and in particular should be chosen to insure that 6 credits are from the Humanities Core and 6 credits are from the Social Sciences Core.

The courses listed in **bold** are not required in the pre-pharmacy curriculum, but, if taken, will insure that the student is also successfully completing most of the 1st two years of the Biochemistry curriculum at Montana Tech.

*ECNS 201, 202, or 203 can satisfy the economics requirement.

It is strongly recommended that students take BIOL 2516 and 2526, Anatomy & Physiology.

While you are at Montana Tech and in the pre-pharmacy program, you should register as a Chemistry major and be assigned an advisor in this department who specializes in pre-pharmacy advising. In the 2nd year of this pre-pharmacy program you should take the PCAT test and apply for admission to the pharmacy school of your choice. Pharmacy is a popular degree and admission is selective and is based on the successful completion of a pre-pharmacy curriculum, GPA, PCAT scores, a successful internship, and letters of recommendation. Montana Tech has had a long history of placing students in pharmacy programs who were well prepared academically by our pre-pharmacy program and are now practicing pharmacists.

Medical Technology

Students can prepare for certification as a medical technologist by completing the Pre-Professional option of the Chemistry degree and then entering an approved hospital training school for a one-year internship. An alternative route is to follow the Biological Sciences Transfer Program (below) and then transfer to an undergraduate program in medical technology at another institution.

Physical Therapy

At the present time, the first professional degree in physical therapy is the Bachelor's degree. Students can prepare for transfer to a school of physical therapy by following either the Biological Sciences Transfer Program or by following the first two years of the Applied Health Science option in Occupational Safety

and Health. Students should be aware that a move is underway to change the first professional degree in physical therapy to the Doctoral level. When this occurs, the section on pre-medicine will be applicable to physical therapy. At that time, a Bachelor's degree in physical therapy will not be required to enter a Doctoral-level program. Students should consult with schools of physical therapy to verify admission requirements at the time they plan to enter.

Pre-Law

Admission to a school of law does not require any formal course of study or any specific degree, although a Bachelor's degree is required for entrance to all accredited law schools. Since most law schools have specific entrance requirements, students planning to pursue a law degree should consult with the pre-law advisor. Information about preparation for law school is available in an annual publication, "Pre-Law Handbook," prepared by the Association of American Law Schools and the Law School Admission Test Council, Educational Testing Service, Box 994, Princeton, New Jersey 08540. Information about the Law School Admission Test, which is required by almost all law schools, can also be obtained from this address.

The Association of American Law Schools sets forth the following objectives for pre-law education:

1. Education for comprehension and expression in words.
2. Education for critical understanding of human institutions and values.
3. Education for creative power in thinking.

With careful selection of electives, any degree program at Montana Tech can meet the above objectives and serve as preparation for law school

Engineering

Because Montana Tech has strong programs in engineering, a student interested in an engineering field not offered at Montana Tech may spend the first two years at Montana Tech in preparation for transfer to another college of engineering. The academic program will generally follow the first two years of the Montana Tech program, with some variations and choice of electives depending upon the field of engineering the student intends to pursue. Further information and advising may be obtained from the faculty in the School of Mines and Engineering. Contact the Dean's offices for assistance (406) 496-4395.

Humanities and Social Science

Students interested in the field of liberal arts, may spend the first two years at Montana Tech in preparation for transfer to specific degree programs at other institutions. Advisors in the College of Letters, Sciences, and Professional Studies will assist the student in planning a program to meet student objectives and satisfy transfer requirements. Contact the Liberal Studies department at ***(406) 496-4275*** or the Professional and Technical Communication department at ***(406) 496-4PTC* (4782)** for assistance.

Psychology Transfer Program

The following program is a one-year program designed to prepare students to transfer into a four-year psychology degree program. Students participating in this program will be assigned as advisees to psychology faculty members for assistance in placement in programs relevant to their intended career.

CHEM	121	Introduction to General Chemistry	3
CHEM	123	Intro. to Organic & Biochemistry	3
CHEM	142	College Chemistry Lab I	1
WRIT	101	College Writing I	3
LIT	112	Introduction to Fiction	3
HSTR	101	Western Civilization I	3
HSTR	102	Western Civilization II	3
COMM	1216	Principles of Speaking	2
M	121	College Algebra	3
MATH	141	Math for Business & Social Sciences	3
PSYX	100	Intro. Psychology	3

Department of Military Science - University of Montana (UM)

Reserve Officers Training Corps - University of Montana
Colonel, Michael L. Hedegaard, Chair
ROTC Branch - Montana Tech
Major, Dean Roberts, Officer-in-Charge
(406) 243-4400
dean.roberts@mso.umt.edu

Army ROTC (Reserve Officers' Training Corps) offers college students the opportunity to serve as commissioned officers in the U.S. Army, the Army National Guard, or the U.S. Army Reserve upon graduation. ROTC enhances a student's education by providing unique leadership and management training, along with practical leadership experience. Students develop many of the qualities basic to success while earning a college degree and an officer's commission at the same time.

Army ROTC Scholarship. Students receiving Army ROTC scholarships and enrolling in Basic Course classes must sign an oath of loyalty to the U.S. Constitution, as directed by the Congress of the United States, and will be required to complete enrollment forms specified by the Department of the Army.

Advanced Course. The Advanced Course is usually taken during the final two years of college. Instruction includes organization and management, tactics, ethics, professionalism, and further leadership development. Uniforms and equipment in the Advanced Course are furnished to students at no cost. Advanced Course students are required to purchase all textbooks (ROTC scholarship cadets are provided a book stipend each semester). During the summer between their junior and senior years of college, Advanced Course cadets attend the Leadership Development Assessment Course (LDAC), a fully paid five week leadership practicum. LDAC gives cadets the chance to practice what they have learned in the classroom and introduces them to Army life in the field. Completion of the Advanced Course requires two years of study. Each cadet in the Advanced Course receives a subsistence allowance of up to $4,000 for each year of attendance.

Two-Year Program. The two-year program is for rising juniors and community college graduates, students at four-year colleges who did not take ROTC during his or her first two years of school, and students entering a two-year postgraduate course of study. To enter the two year program, students must attend a fully paid four week Leadership Training Course (LTC), normally held during the summer between their sophomore and junior years of college. At LTC, students learn to challenge themselves physically and mentally, and to build their confidence and self respect. After they have successfully completed LTC, students who meet all the necessary enrollment requirements may enroll in the Advanced Course.

Financial Assistance. Subsistence allowance of up to $4,000 for every year.

Veterans. Veterans may apply their military experience as credit toward the ROTC Basic Course. If credit is granted, a veteran may omit the freshman and sophomore years of the program and enroll directly in the Advanced Course, when eligible. Simultaneous Membership Program. This program allows students to be members of the Army National Guard or the Army Reserve and to enroll in Army ROTC at the same time.

Veterans' Upward Bound

Providing Educational and Support Services to Montana's Veterans

Educational Services:

In-class, on campus college preparatory instruction:

- College Transition Assistance Program (CTAP) – Billings
- Cohort Program – Bozeman, Butte, Great Falls, Helena, Kalispell & Missoula

Tuition Assistance:

- Tribal College Academic Bridge (TCAB) – Available at all Montana Tribal Colleges

Online, self-pace instruction:

- Distance Learning Program
  - Curriculum outline available on our webpage at: www.vubmt.com

Customized training for Reserve and Guard members:

- Reserve Program
  - List of workshops available enclosed

Support Services:

- College Transition: *These services can be provided as a class or on an individual basis. Instruction and assistance provided in the steps necessary to enroll in college.*
  - *Applying for federal financial aid*
  - *Applying for college admissions*
  - *Exploring local and state educational opportunities*
  - *Degree and career exploration*
  - *Assistance with understanding and starting your GI Bill education benefits*
  - *Referral to campus support organizations: SOS, EOC, New Student Services, Campus Veterans' Representatives*
- Referral to Veteran Service providers:
  Including but not limited to:
  - *Montana Dept.. of Veterans Affairs*
  - *VA Vocational Rehabilitation & Employment*
  - *Veteran Representative (DVOP) at Job Service*
  - *Local VA Outpatient Services*
  - *TRiO Programs (Educational Opportunity Centers and Campus Student Support Services)*

Elementary Education Certification in Conjunction with the University of Montana - Western

UM-Western/Montana Tech
Program Coordinator
Mrs. Kathy Shipman
ELC 314 (MT Tech campus)
(406) 496-4852
k_shipman@umwestern.edu

The University of Montana - Western (UMW) and Montana Tech (MT) are collaborating to offer a Bachelor's in Elementary Education Program to UMW students. Through UMW, students can complete required education course work at the MT campus and/or online to obtain a Bachelor's Degree in Elementary Education from UMW. Through MT, students can complete the general education course work on the MT campus or a combination of on-campus and online courses to satisfy general education requirements for the UMW Elementary Education Bachelor's Degree. This program is designed to meet the needs of a population of full-time employed students in the Butte and surrounding areas who need courses offered at night, on weekends or online. School-based field experiences and student teaching will occur during day hours. UMW and MT course work will be offered during fall, spring and summer semesters and will be offered based upon an agreed upon 4-year UMW and MT course schedule.

GENERAL NOTES FOR STUDENTS SIMULTANEOUSLY TAKING COURSES FROM BOTH MONTANA TECH (MT) & UM-WESTERN (UMW)

Admissions:
Students must be formally admitted to UMW and must complete an *Application for Admission Short Form* for MT.

Registration:
Students must register with the campus that the course belongs to (e.g., Psyx 100 – register with MT and Ed 120 register with UMW).

Financial Aid:
If receiving financial aid, students must contact the Financial Aid Office at UMW and complete a *Consortium Agreement Form* for MT and fill out a *Dual Enrollment* form.

Fee Payment:

a. Students will receive separate bills from each institution's Business Office.
b. Students enrolled in classes on more than one campus should request a refund of excess fees paid, using the *Request of Refund of Excess Fees Paid Form,* available from the Business Office.

General Information:

a. Students must apply and interview for admission to the Teacher Education Program and meet all Education program requirements as outlined in the UMW Education Student Handbook available at the UMW Bookstore.
b. Students must receive at least a B- in all education courses and a C- in all general education courses required for the Elementary Education Program. Students must have a GPA of 2.5 to enter into the Teacher Education Program and to be eligible for student teaching.

The University of Montana - Western
In Partnership With Montana Tech

Butte Elementary Education Program Requirements:
Preferred Sequence Tentative Schedule

Tentative Course Schedule

Montana Tech Completing Secondary Education Certification Classes
Through the University of Montana Western

Secondary Education Certification Classes can be pursued by students completing Montana Tech Bachelor's in Biological Sciences, General Sciences, Mathematical Sciences and Business and Information Technology

Tentative Schedule for UMW's Professional Education Courses @Montana Tech

Course	*Every Fall*	*Spring Even Years (may be offered odd years contingent upon enrollment)*	*Spring (as needed)*	*Summer (odd)*
HHP 241 Pers/Comm Health (Online with Western) **OR**				X
AHS 2176 Human Sexuality (a MT Tech course)			X	
ED 120 Becoming a Prof Ed	X			
ED 253 Found Psy Dev	X			X
Ed 328/9 Curr, Inst		X		
ED 341 Exceptional Learner				X
ED 425/6 Multi Cultural				X
ED 355 Science Mthds **OR**			X	
MATH 351 Math Mthds **OR**			X	
BUS 351 Bus Mthds and COMS 352 Mthds of Comp App			X	
ED 473 Student Teaching	Fall or Spring arranged through UMW's Director of Field Experiences			
ED 499 Inq, Tchg, Lrng	Course completed following student teaching			

Additional courses required of Montana Tech Business and Information Technology Students

COMS 232—Advanced Word Course (On-line through Western) Summer Course
IT 0135 -Computer Maintenance & Repair I (Montana Tech course) Fall and Spring Course
BUS 3446 – Entrepreneurship & Small Bus Management (Montana Tech) Fall

Students will also need to complete all UMW Teacher Education Program Requirements.
Portfolio requirements
Teacher Education Program interviews.
Certificate of CPR and First and Safety(must be current during your student teaching)
Background Checks

Junior Year
Fall Semester

**PSCI 210 Intro. to American Government Fulfills POLS 121 American Natl and State Government requirement	3
**GPHY 121 Human Geography Fulfills *GEOG 102 Human Geography requirement	3
*HHP 374 Elementary School Health and PE	3
*ED 379 Music for Elementary Teachers	3
*ED 376 Arts Methods for Elementary Teachers	2

Spring Semester

**GEO 101 Intro. Physical Geology (includes a lab component) Fulfills *GEOL 101 Introduction to Geology requirement	3
*ED 381/2 Intro. to Literacy, Assessment & Mgt and Practicum	3, 1
*ED 370/1 Teaching Language Arts/Reading with Children's Lit and Practicum	3, 1
*ED 377/378 Teaching Math in Elementary School and Practicum	3, 1

Summer Semester

*ED 425/6 Multicultural Global Education and Practicum	3, 1
Electives	3-4

Senior Year
Fall Semester

Teacher Education Program Phase II Interview

*ED 332/3 Teaching Science Through Inquiry/Elementary School and Practicum	3, 1
*ED 334/4 Teaching Social Studies/Elem School and Practicum	3, 1
Electives	3-4

Spring Semester

*ED 472 Student Teaching - Elementary	12

Teacher Education Program Phase III Interview

*ED 499 Inquiry, Teaching, & Learning	2

***UM-Western Courses offered at Tech**
****Tech Courses that will count toward UM-W Bachelor's in Elementary Education**

A certificate of first aid and safety is required or all Elementary majors prior to student teaching.
Capstone course is taken upon completion of all requirements of student teaching.

BS: Elementary Education Total Credits: 128

Secondary Education Certification in Conjunction with the University of Montana - Western

GENERAL NOTES FOR STUDENTS SIMULTANEOUSLY TAKING COURSES FROM BOTH MONTANA TECH (MT) & UM-WESTERN (UMW)

Admission:
Students must be formally admitted to the institution from which they are taking the majority of credits in that semester, and also must complete an *Application for Admission Short Form* for the other institution.

Registration:
Students must register with the campus that the course belongs to (e.g., PSYX 100 - register with MT and Ed 120 register with UMW).

Financial Aid:
If receiving financial aid, students must contact the Financial Aid Office of the institution where they are taking the majority of credits and complete a *Consortium Agreement Form* to insure that they are receiving all the financial aid for which they are eligible.

Fee Payment:

a. Students will receive separate bills from each institutions Business Office.

b. Students enrolled in classes on more than one campus, should request a refund of excess fees paid, using the *Request of Refund of Excess Fees Paid Form*, available from the Business Office.

General Information:

a. Students planning on entering the Teacher Education Program at UMW should apply and interview for admission to the Teacher Education Program at UMW after having completed the first two years of any of the following curricula and after having completed the pre-education courses in these curricla. Upon acceptance into the Teacher Education program, UMW will assign these students an advisor.

b. The definition of what constitutes a full-time student will likely depend on the context (academic eligibility, athletic eligibility, financial aid eligibility, etc.) in which this definition is required.

c. **Students must maintain a 3.0 GPA in education courses taken from UMW (one C is allowed, but must be offset by an equivalent number of credits of A) .** Students will be required to meet the appropriate academic eligibility requirements of each institution in which they are enrolled. For example, students must have a GPA of 2.0 at the time of graduation.

d. Advisors for the following curricula are:

Biological Sciences	Dr. Rick Douglass	(406) 496-4450
Business & Information Technology	Dr. Tim Kober	(406) 496-4457
General Sciences	Dr. Doug Coe	(406) 496-4207
Liberal Studies	Dr. Jack Crowley	(406) 496-4462

FOOTNOTES PERTAINING TO THE FOLLOWING CURRICULA

1. These courses are required for secondary certification.
2. The 25 credits of chemistry in this curriculum satisfy the requirements for a Chemistry Minor at MT. (**General Science Major**)
3. The 21 credits of biology in this curriculum satisfy the requirements for a Biology Minor at MT (CHEM 4216, Biochemistry is being used to satisfy part of the Biology Minor). (**General Science Major**)
4. At least one of the two General Education Science Core electives must include a lab. (**Mathematical Sciences Major**)

Biological Science Major (MT) & Biology Secondary Education Certificate (UMW)

Students at Montana Tech of the University of Montana completing the first four years of the curriculum outlined below will meet:

- The requirements for the B.S. degree in Biological Sciences from Montana Tech of The University of Montana
- Montana Tech's and hence the MUS General Education core requirement.
- Please refer to pages 46-47 for further information pertaining to the Biological Sciences.
- Advisor: Dr. Rick Douglass (406) 496-4450

Students who are accepted for admission to and successfully complete the Teacher Education Program at The University of Montana-Western, after successfully completing the 5th year, as outlined below, will be in a position to receive:

- Montana Secondary Education Certification in Biology.

Montana Tech of The University of Montana

BIOLOGICAL SCIENCES

Freshman Fall Semester				**Sophomore**		**Fall Semester**	
BIOL	1086	Intro.. to Ecology	2	BIOL	2516	Anatomy & Physiology I	4
BIOL	1096	Intro.. to Biodiversity	2	BIOL	2946	Sophomore Seminar	1
BIOL	1946	Freshman Seminar	1	BIOL	3216	Botany	4
CHMY	141	College Chemistry I	3	HUMN	xxxx	Humanities Elective	3
CHMY	142	College Chemistry Lab I	1	CAPP	156	MS Excel	
WRIT	101	College Writing I	3			- OR -	
M	171	Calculus I	3	CAPP	158	MS Access	3
ED	120	Becoming a Professional Educator	3				
		Total 18				Total 15	

Freshman Spring Semester				**Sophomore**		**Spring Semester**	
AHS	2176	Human Sexuality	2	BIOL	2106	Microbiology	4
BIOL	1116	Cell Biology	4	BIOL	2526	Anatomy & Physiology II	4
CHMY	143	College Chemistry II	3	BIOL	3056	Nat. Hist. of Vertebrates	4
CHMY	144	College Chemistry Lab II	1	CHMY	210	Survey of Organic Chemistry	3
COMM	1216	Principles of Speaking		STAT	216	Intro. to Stats.	
		- OR -				- OR -	
COMM	1226	Public Speaking	3	STAT	332	Stats for Scientists & Engineers	3
M	172	Calculus II	3				
		Total 16				Total 18	

Junior		**Fall Semester**		**Senior**		**Fall Semester**	
BIOL	3946	Junior Seminar	1	BIOL	4106	Basics of Evolution	2
STAT	441	Experimental Design	3	HUMN	xxxx	Humanities Elective	3
PHYS	1026	College Physics	4		xxxx	Biology Elective	3
BIOL	xxxx	Biology Elective	3	BIOL	3116	Plant Ecology	4
CHMY	xxxx	Cellular/Organismal Track	3		xxxx	Cellular Track	3
ED	253	Psychological Foundations of Teach..	4				
		Total 18				Total 15	

Junior		**Spring Semester**		**Senior**		**Spring Semester**	
BIOL	3016	Genetics	4	BIOL	4996W	Senior Thesis	3
BIOL	xxxx	Biology Elective	3	BIOL	xxxx	Biology	3
WRIT	322	Advanced Business Writing		BIOL	xxxx	Biology	3
		- OR -		BIOL	3126	Cellular/Organismal Track	4
WRIT	321	Advanced Technical Writing	3		xxxx	Social Science Elective	3
PHYS	1036	College Physics	4				
		Total 14				Total 16	

Total (Montana Tech of the University of Montana) 123 + 6 (UM-Western) = 130 cr..

Additional Course required for the Physical Science Endorsement (this course can be taken while obtaining the Biological Sciences degree):

AHS	1156	Intro.. To Applied Health Science	3
		Total	3

The University of Montana - Western Courses

Fifth Year Fall Semester				**Spring Semester**			
ED	328/329	Curric., Instr, Mgmt & Assessment	4	ED	472	Student Teaching-Secondary Ed	10-12
ED	341	Exceptional Learner	3	ED	499	Inq, Tchg, Lrng	2
ED	355	Methods & Materials in Science	4			Total 12-14	
ED	425/426	Culture, Schools & Communities	4				
		Total 15					
		Total (The University of Montana - Western				27-29 Cr.	

General Science Major (MT) & Broadfield Science Secondary Education Certification (UMW)

Students at Montana Tech completing the curriculum outlined below will:

- Meet the requirements for a B.S. degree in General Science with minors in Biology and Chemistry from Montana Tech.
- Montana Tech's and hence the MUS General Education Core.
- Meet UM-Western's Teacher Education Program (TEP) general education requirements.
- Need to apply for admittance to UM-Western's Teacher Education Program professional block of education courses.
- Need to complete a student teaching experience supervised by UM-Western.
- Advisor: Dr. Doug Coe (406) 496-4207

Students who are accepted for admission to and successfully complete the Teacher Education Program at The University of Montana-Western, after successfully completing a supervised student teaching experience will be in a position to receive Montana Secondary Education Major Endorsement in Broadfield Science.

Freshman		Fall Semester	Credits	Sophomore		Fall Semester	Credits
CHMY	141	College Chemistry I	3	WRIT	101	College Writing I	3
CHMY	142	College Chemistry I Lab	1	GEOE	2080[1]	Earth System History	4
GEO	101	Intro. Physical Geology	3	CAPP	156	MS Excel	3
M	151	Precalculus	4	M	171	Calculus I	3
ED(UMW)	120	Becoming a Professional Educator	3	PHYS	1026	College Physics I	4
ED(UMW)	253	Found. of Psyc. Develop. & Learn.	4			Total 17	
		Total 18					

Freshman Spring Semester			Credits	Sophomore		Spring Semester	Credits
BIOL	1116	Cell Biology	4	ECNS	203	Principles of Economics	3
CHMY	143	College Chemistry II	3	GEO	204	Intro. to Mineralogy & Petrology w/lab	3
CHMY	144	College Chemistry II Lab	1	M	172	Calculus II	3
SOCS	2486	General Anthropology	3	STAT	131	Intro. to Biostatistics	**OR**
CAPP	131	Basic MS Office	3	STAT	332	Stats for Scientists & Engineers	3
xxxx	xxxx	Free Electives	2	PHYS	1036	College Physics II	4
		Total 16				Total 16	

Junior		Fall Semester	Credits	Senior		Fall Semester	Credits
BIOL	2746	Evolution of Man	3	CHMY	311	Analytical Chemistry -quantiative analys.	4
ENVE	2040	Introduction to Enve Engineer	3	CHMY	371	Physical Chm. quantum chem	3
CHMY	321	Organic Chemistry I	3	WRIT	321	Advanced Technical Writing	**OR**
CHMY	322	Organic Chemistry I Lab	2	WRIT	322	Advanced Business Writing	3
STAT	441	Experimental Design	3	STAT	432	Regression & model Building	3
STS	2016	Society & Technology	3	HUMN	xxxx	Humanities Elective	3
		Total 17				Total 16	

Junior		Spring Semester	Credits	Senior		Spring Semester	Credits
BIOL	3116	Plant Ecology	**OR**	AHS	2156	First Responder	3
BIOL	3126	Animal Ecology	4	AHS	2176	Human Sexuality	2
BIOL	3216	Botany	4	BIOL	3016	Genetics	3
CHMY	323	Organic Chemistry II	3	BIOL	3226	Zoology	4
PHYS	1XX6	Introduction to Astronomy	3	HUMN	xxxx	Humanities Elective	3
		Total 14			xxxx	Free Elective	2
						Total 17	

Total (Montana Tech of the University of Montana) 124 + 6 (UM-Western) = 130cr.

The University of Montana - Western Courses

Fifth Year	Fall Semester				Spring Semester		
ED	328/329	Curric., Instr, Mgmt & Assessment	4	ED	472	Student Teaching-Secondary Ed	10-12
ED	341	Exceptional Learner	3	ED	499	Inq, Tchg, Lrng	2
ED	355	Methods & Materials in Science	4			Total 12-14	
ED	425/426	Culture, Schools & Communities	4				
		Total 15					
		Total (The University of Montana - Western				27-30 Cr.	

Please refer to footnotes on page 144.

Mathematical Sciences Major (MT) & Mathematics Secondary Education Certificate (UMW)

Students at Montana Tech of the University of Montana completing the first four years of the curriculum outlined below will meet:

- The requirements for the B.S. degree in Mathematics from Montana Tech of The University of Montana
- Montana Tech's and hence the MUS system's General Education core requirement.
- Please refer to pages 35-36 for further information pertaining to the Biological Sciences.
- Advisor:

Students who are accepted for admission to and successfully complete the Teacher Education Program at The University of Montana-Western, after successfully completing the 5th year, as outlined below, will be in a position to receive:

- Montana Secondary Education Major Certification in Mathematics

Montana Tech of The University of Montana

Freshman		**Fall Semester**	
ED	120***	Intro.. to Education	2
ED	253***	Foundation of Psychological Dev Learn	4
WRIT	101	College Writing I	3
M	171[1]	Calculus I	3
PSYX	100[2]	Intro. to Psychology	3
M	194	Freshman Seminar	1
		Total 16	

Sophomore		**Fall Semester**	
M	242	Methods of Proof	3
M	273	Mulitvariable calculus	4
M	333	Linear Algebra	3
	xxxx[5]	Science General Ed. Core Elective	3
BIOL	2746	Evolution of Man	3
		Total 16	

Freshman		**Spring Semester**	
AHS	2176	Human Sexuality	2
COMM	1216	Principles of Speaking	OR
COMM	1226	Public Speaking	3
STAT	216	Introduction to Stats	3
M	172	Calculus II	3
	xxxx[5]	Science Gen Ed. Core Elective w/Lab	4
		Total 15	

Sophomore		**Spring Semester**	
ED	328***	Curriculum Instruct, Assess, & MGMT	3
ED	329***	Management Practicum	1
M	274	Intro. to Differential Equations	3
M	323	Methods of Proof II	3
STAT	332	Stats for Scientists & Engineers	3
HUMN	XXXX	Humanities Elective	3
		Total 16	

Sophomore		**Summer Semester**	
ED	341***	Exceptional Learner	3
ED	425***	Multicultural/Global Education	3
ED	426***	Multicultural/Global Education Practicum	1
		Total 7	

Junior		**Fall Semester**	
M	351	Algebraic Structures I	3
M	330***	History of Mathematics	3
M	4xxx	Math Elective	3
Elect	XXXX	_____	3
Elect	XXXX	_____	3
		Total 15	

Senior		**Fall Semester**	
M	435	Advanced Calculus I	3
M	4xxx	Math Elective	3
M	4xxx	Math Elective	3
Elect	XXXX	_____	3
Elect	XXXX	_____	3
		Total 15	

Junior		**Spring Semester**	
M	329***	Modern Geometry	3
M	352	Algebraic Structures II	3
M	4xxx	Math Elective	3
HUMN	XXXX	Humanities Elective	3
Elect	XXXX	_____	3
		Total 15	

Senior		**Spring Semester**	
AHS	2156***	First Responder	3
M	436	Advanced Calculus II	3
MATH	4xxx	Math Elective	3
Elect	XXXX	_____	3
Elect	XXXX	_____	3
		Total 15	

Total (Montana Tech of the University of Montana) 109 + 21 (UM-Western) = 130 cr..

The University of Montana - Western Courses

Fifth Year			
ED	473	Student Teaching - Secondary Ed.	12
ED	499	Inquiry, teaching & Learning	2
		Total 14	

Total (The University of Montana - Western) 24-26 Cr..

*Students planning on entering the Teacher Education Program at The University of Montana-Western should apply and interview for admission to the Teacher Education Program at The University of Montana-Western in the Fall Semester of their 4th year. Upon acceptance into the Teacher Education program, Western will assign these students an advisor.

***These courses are required for secondary certification.

****At least one of the two General Education Science Core Electives must include a lab.

Course Descriptions

All resident courses offered at Montana Tech at the date of catalog publication are listed in this section. Credits for each course are given in semester-hours.

Please note: The college reserves the right to cancel any scheduled course at any time through the first meeting of the class. All published class schedules are tentative and are not contractual in nature. The college reserves the right to cancel or discontinue any course because of small enrollment or for other reasons. In order to assure quality education, the college reserves the right to limit further registrations when the maximum number set by the department has been reached. The college reserves the right to make changes in schedules and/or faculty when necessary.

Key:
(1st) - Course normally offered only during the first semester.
(2nd) - Course normally offered only during the second semester.
(1st, 2nd) - Course normally offered during both the first and second semesters.
(Sum) - Course normally offered during summer session(s).
(Alt.) - Course normally offered on an alternate-year basis.
(On Dem.) - Course offered on demand only.
(R) - Certain activity courses designated with a (**R**), including band, chorus and intercollegiate athletics, may be repeated for credit and grade. (See additional restrictions regarding HPER classes under "academic regulations" in this catalog). However, these courses may not count toward graduation in certain degree programs. Students should consult with their advisor and/or department head for applicability of these courses toward their degree. **A maximum of 10 credits of HPER classes can be counted in a student's grade point average**.
(W) - Courses with a "W" following the course number meet upper division writing requirements.
(Hc) - Honors Component. This course has an optional Honors component that is open to all students meeting the prerequisites established by the instructor and students in the Honors Program. The Honors component is meant to enhance the breadth and depth of the normal course material.

Credit - Contact Hour Distribution
The total credits and weekly contact hours are shown for each course of instruction. To illustrate, a course of instruction shown as: 4 Cr.. (Hrs.:.: 3 Lec. 3 Lab) is a 4 semester-credit course which requires 3 weekly contact hours of lecture and 3 weekly contact hours of laboratory.

Prerequisites & Corequisites
Before enrolling in a course, all specified prerequisites must be completed with passing grades. Corequisites, if not completed prior to registration in the course, must be taken and successfully carried at the same time. Each instructor has the authority to enforce the printed prerequisites listed for his or her courses. This must be done within the first ten days of classes of the semester.

Withdrawal from the corequisites necessitates withdrawal from the course for which it is required. **Students who fail a course that is a prerequisite for a course in which they are currently registered must drop the second course and not register for that course until the prerequisite is completed.**

General Education Requirements
Courses meeting the communications, humanities or social sciences General Education Core Requirements are listed in the *General Education Section*, and are also denoted at the end of the individual course descriptions on the following pages.
Key: (C) : Communications Core. (H) Humanities Core. (SS) Social Sciences Core

Common Course Numbering for University of Montana Campuses
During the summer of 1999, the four units comprising the University of Montana began discussions regarding the implementation of a common course numbering system for the University. Montana Tech has implemented the first phase of this process by initiating four-digit course numbering, and by adopting certain University of Montana-Missoula course numbering standards. These changes provide for the designation of courses that are common between campuses or unique to a campus, as well as assuring that certain types of courses are numbered in a common fashion across all UM campuses. The timeline for implementation at other UM campuses is unknown at this time.

Most courses numbered below 1000 are not applicable toward Associate of Science or Baccalaureate degrees. (Note: see department head) Undergraduates can enroll in 5000-level courses to complete a B. S. Degree with their advisor's approval. Also, 4000-level courses may be taken for graduate credit with the approval of the student's advisor and the director of the graduate school. Following the course description, the semester(s) in which the course is normally offered is indicated:

University of Montana Common Course Numbering Conventions:
Course Numbering:
0001-0099 Remedial course work (credit cannot be applied to any degree)
0100-0999 Technical course work through College of Technology
1000-2999 Undergraduate Lower Division (1st & 2nd year) course work
3000-4999 Undergraduate Upper Division (3rd & 4th year) course work
5000-6999 Graduate course work

Second and Third Digit Designation:
X**91**X Internship (e.g., MetE 4910 – Metallurgy Internship)
X**92**X Research, Development or Design
X**94**X Seminar (e.g., CHEM 5946 – Graduate Geochem Seminar)
X**95**X Special Topics
X**96**X Independent Study
X**97**X Special Problems
X**99**X Thesis Research

Fourth Digit Designation:
XXX**0** Common course at all UM units that offer the class
(e.g., MATH 1520 – Calculus I)
XXX**6** Course is unique to Montana Tech
(e.g., OSH 4116 – Industrial Hygiene I)
XXX**7** Course is unique to University of Montana - Western
XXX**8** Course is unique to University of Montana - Helena College of Technology
XXX**9** Course is unique to University of Montana - Missoula

MUS Transfer Initiative

The Office of the Commissioner of Higher Education (OCHE) has been working with the campuses of the Montana University System to develop a set of Common Course Numbers (CCN) to be used universally across the campuses to make it easier to transfer between campuses. The first 14 disciplines have been converted effective summer semester 2009. This is only the first iteration of changes. The CCN project is on-going; however, most courses should be converted by summer semester 2010.

The fourteen disciplines that have been converted are:
Accounting (ACTG)
Chemistry (CHMY)
Computer Applications (CAPP)
Economics (ECNS)
Geosciences (GEO)
History (HSTA and HSTR)
Languages (FRCH, ARAB, GRMN, SPNS)
Literature (LIT)
Mathematics (M)
Political Science (PSCI)
Psychology (PSYX)
Sociology (SOCI)
Statistics (STAT)
Writing (WRIT)

APPLIED HEALTH SCIENCE

AHS 1156 Intro. to Applied Health Science

3 Cr.. (Hrs.:3 Lec.)

An introductory survey emphasizing the application of current knowledge in science and technology to the fitness requirements of today's lifestyles. Several topics are included that incorporate the health sciences and contemporary trends in health as they relate to the human body. General background information on occupational health and safety, on the magnitude and variety of health and safety problems worldwide, and the role of the health and safety professional will also be discussed. (1st)

AHS 2156 First Responder

3 Cr.. (Hrs.:3 Lec.)

Covers techniques in handling accidents and sudden illnesses and develops safety consciousness and civic responsibility. Basic First Aid materials are reviewed and advanced techniques are taught. Course is taught by a certified Instructor and students completing the course will receive a Certificate recognized by the National Safety Council using the American Heart Standards. **(1st, 2nd)**

AHS 2176 Human Sexuality

2 Cr.. (Hrs.:2 Lec.)

Provides an understanding of individual sexuality and covers such areas as sexual anatomy of the male and female, the chemistry of human sexuality, childbirth, contraception, human sexual response and behavior. **(2nd)**

AHS 2256 Prevention & Care of Athletic Injury

3 Cr.. (Hrs.:3 Lec.)

Studies the prevention and care of common athletic injuries. Also includes basic evaluation and rehabilitation techniques as well as practical experience in taping and bandaging. **Prerequisite:** AHS 2156

AHS 2806 Planning Fitness Facilities

2 Cr.. (Hrs.:2 Lec.)

An introduction to facility design from idea to reality. Covers the history of both public and private fitness facilities, technological advances and trends in design, and the planning stages necessary for development of these facilities. **(1st)**

AHS 3076 Trends in Applied Health Science

2 Cr.. (Hrs.:2 Lec.)

Discusses current and controversial policies, traditions and issues in the field. **(2nd)**

AHS 3166 Sports Psychology

3 Cr.. (Hrs.:3 Lec.)

This course is designed to examine and apply the psychological effects of sports on human behavior. This is accomplished by investigations of various concepts and theories which analyze sports, exercise, and physical activity. Topics of discussion include: anxiety, arousal, attention, personality structures, motivation and intervention strategies.

It will also introduce the student to skill development; the coach-parent-player relationship; coaching effectiveness; stress regulation (relaxation and energizing methods); goal-setting; concentration and attention training; use of imagery and visualization; staleness and burnout; and characteristics of peak performers. **(1st)**

AHS 3636 Physiology of Exercise

3 Cr.. (Hrs.:2 Lec., 2 Lab)

The study of human physiological response to exercise. A systems approach is taken and adaptation from both acute and long-term perspectives is studies. **Prerequisite:** BIOL 2516 & 2526. **(1st)**

AHS 3646 Anatomical Kinesiology

4 Cr.. (Hrs.:2 Lec., 3 Lab)

A functional study of musculoskeletal anatomy and its relationship to human movement giving consideration to both normal and pathological conditions. **Prerequisite:** BIOL 2516 & 2526. **(1st)**

AHS 3656 Human Performance Laboratory Techniques

2 Cr.. (Hrs.:1 Lec.,2 Lab)

Covers laboratory evaluation of physical fitness including both diagnostic and functional stress testing protocols. Electrocardiography, body composition, determination of aerobic capacity, and ergometry are examined in depth. **Prerequisite:** AHS 3636 or Consent of Instructor. **(1st)**

AHS 3956 Special Topics

(2 - 4 crs.)

Presents topics not covered in any curriculum for which there is a particular need, or given on a trial basis to determine demand. Directed studies, special clinics, coaching schools, and workshops as scheduled. Study proposals must have prior departmental approval. May be repeated for maximum of 6 credits. Prerequisite: Consent of Instructor. **(On Dem.)**

AHS 4356 Strength & Conditioning: Theory and Application

3 Cr.. (Hrs.:3 Lec.)

Examines the physiological responses to exercise in general, and focuses on those responses to strength training specifically. Additionally, allows an in-depth examination of individual differences and their implications, performance enhancing substances, nutritional factors in performance and health, and weight gain and weight loss. **Prerequisites:** BIOL 2516, BIOL 2526, AHS 3646. **(1st)**

AHS 4366 Health/Fitness Instructor Workshop

3 Cr.. (Hrs.:3 Lec.)

Presents principles and techniques for prescription of safe and effective conditioning programs, focusing on the development of strength for health and performance enhancement. **Prerequisites:** BIOL 2516, BIOL 2526, AHS 3646 & 4356. **(2nd)**

AHS 4606 Electrocardiography

3 Cr.. (Hrs.:3 Lec.)

A study of 12-lead Electrocardiography including proper placement of electrodes, recognition and interpretation of arrhythmia, diagnostic and functional stress testing as related to the electrical activity of the heart. **Prerequisites:** BIOL 2516 & BIOL 2526. **(2nd)**

AHS 4636 Advanced Physiology of Exercise

3 Cr.. (Hrs.:2 Lec., 2 Lab)

A continuation of AHS 3636. Addresses current and controversial topics in the general area of sports medicine. **Prerequisite:** AHS 3636. **(1st)**

AHS 4646 Biomechanics

3 Cr.. (Hrs.:3 Lec.)

This course will deal with the mechanical principles and concepts derived from physics that allow us to describe motion as it pertains to inanimate objects as well as the human body and its movements. The Course also includes the application of these concepts and principles to a variety of sports and physical activities. **Prerequisite:** AHS 3646. **(1st)**

AHS 4656W Exercise Testing & Prescription

3 Cr. (Hrs.:2 Lec., 2 Lab)

Surveys diagnostic and functional stress testing protocols that relate to the assessment of cardiovascular fitness and examines appropriate exercise prescriptions based on the results of fitness assessment in clinical and non-clinical environments. **Prerequisites:** AHS 3636 & 4636. **(2nd)**

AHS 4806 Health Promotion Programs

3 Cr..(Hrs.:3 Lec.)

Emphasizes the scientific approach to health promotion, health/fitness assessment, and exercise prescription in the corporate, clinical and educational sectors. Provides instruction in program development, motivation and counseling techniques, management, public relations, legal considerations, and program evaluation. **(2nd)**

AHS 4856 Fieldwork

2 Credits

Practical experience in a health science-related area. **Prerequisite:** Departmental approval.

AHS 4916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Applied Health Science degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experience and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

AHS 4946 Senior Seminar

2 Cr.. (Hrs.:2 Lec.)

Examines current and controversial issues in health science. **Prerequisite:** Departmental approval.

AHS 4966 Independent Study

1 to 3 Credits

Academic endeavor in an area of health science not available through general course offerings. **Prerequisite:** Departmental approval.

AUTOMOTIVE TECHNOLOGY

AT 0100 Intro. to Automotive

2Cr (2 Hrs.:: Lec) 15 weeks

This class will provide the students with the theory and hands on experience on live vehicles as a foundation for advanced automotive courses including: Shop Safety, common hand tools, basic shop equipment, basic diagnostic equipment, measuring systems and tools, fasteners, service information, preventive maintenance, tire and wheel assembly service, sell-up theory, basic theory's and math, common automotive industry terms and industry standards

A.T. 0 103 Electrical Systems

3 Cr.. (Hrs.:.:6 Lec.) 8 weeks

This course covers electrical theory, theory of storage batteries and service, and electrical accessories to include solid state technology. All service and repair techniques and safe working habits are taught.

A.T. 0104 Electrical Systems (Lab)

4 Cr.. (Hrs.:.: 17 Lab) 8 weeks

A.T. 0107 Brakes (Lec)

3 Cr.. (Hrs.:.:3 Lec.)

A.T. 0108 Brakes (Lab)

3 Cr.. (Hrs.:.: 20 Lab) 7 weeks

A.T. 0112 Engine Performance (Lec)

2 Cr.. (Hrs.:.:2 Lec.)

This course covers the fundamentals of fuel system operation, carburetor theory, service and repair including all high tech, closed loop fuel systems. Emission control functions, operations, and repair are taught along with electrical emission control systems. Also the study of a variety of ignition systems as well as point type, solid state, and electronic. Computer controlled systems are presented in great detail. Safety practices are taught throughout this course.

A.T. 0113 Engine Performance (Lab)

4 Cr.. (Hrs.:.: 3 Lab)

A.T. 117 Suspension & Steering

3Cr. (Hrs.:.: 3 Lec.) 7 weeks

The students will work on the correct methods of disassembly, assembly and function of the major components of current cars and light truck front & rear suspension systems, four wheel computerized alignment is covered in this course. Diagnostics and repair of late model computer controlled suspension & steering systems are also covered.

A.T. 0118 Suspension & Steering (Lab)

3 Cr.. (Hrs.:.: 20 Lab) 7 weeks

A.T. 0916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Automotive degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

BIOLOGICAL SCIENCES

BIOL 1016 Biology & Man

3 Cr.. (Hrs.:.:3 Lec.)

A survey of biological concepts for the non-science major relating to man's past and present activities. Includes discussions of metabolism, reproduction and ecosystems. **(1st)**

BIOL 1026 Biology & Man with Lab

4 Cr.. (Hr.:3 Lec.:3 Lab)

A survey of biological concepts for the non-science major relating to man's past and present activities. Includes discussions of metabolism, reproduction and ecosystems. The laboratory portion of this class will be used to illustrate concepts addressed in lecture; and to acquaint students with the scientific method and common laboratory techniques plus drawing conclusions from laboratory obtained data. **(1st)**

BIOL 1086 Introduction to Ecology

2 Cr.. (Hr.:3 Lec.:3 Lab)

This course introduces basic concepts of evolution and ecology including behavior, population dynamics, community ecology and ecosystems. **(1st half of 1st semester)**

BIOL 1096 Introduction to Biodiversity

2 Cr.. (Hr.:3 Lec.:3 Lab)

This course is a brief survey of the diversity of life including examples from all kingdoms. **(2nd half of 1st semester)**

BIOL 1116 Cell Biology

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

An introductory study of cell activities emphasizing chemistry, structure and functions common to cells. Topics include organelles, cell division, water relationships, nutrients, respiration, photosynthesis, genetics, and protein synthesis. The laboratory portion of this class will be used to illustrate concepts addressed in lecture; and to acquaint students with the scientific method and common laboratory techniques plus drawing conclusions from laboratory obtained data. **(2nd)**

BIOL 1236 Southwestern Montana Flora

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This field oriented course will acquaint students with the principles, and methods used to classify and identify trees, shrubs and herbaceous seed plants. Also, students will learn the elements of nomenclature, plant collection and herbarium specimen preparation. Students are expected to make a plant collection and to become familiar with characteristics of common plant families. **(On Dem.)**

BIOL 1826 Environmental Issues

3 Cr.. (Hrs.:.:3 Lec.)

A course utilizing basic scientific principles to examine environmental issues related to increasing world population and diminishing resources. **(2nd)**

BIOL 1946 Freshman Seminar

1 Cr.. (Hrs.:.:1 Lec)

Invited speakers will present seminars on their current research. **(1st)**

BIOL 2016 Anatomy & Physiology I

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

The first half of a two semester course deigned for students pursuing a career in the clinical sciences. The course is developed as a systems approach to structure (anatomy) and function (physiology) of the human body and will present subject matter as it relates to homeostasis and disease processes. Topics include an overview of chemistry, cell biology and histology followed by discussion of the organ systems involved in covering, support and movement of the human body. **(1st)**

BIOL 2026 Anatomy & Physiology II

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

The second half of a two semester course deigned for students pursuing a career in the clinical sciences. The course is developed as a systems approach to structure (anatomy) and function (physiology) of the human body and will present subject matter as it relates to homeostasis and disease processes. Course focuses on organ systems involved with maintenance of health. Topics covered include: the nervous system, cardiovascular, endocrine, immune, respiratory, digestive, urinary and reproductive systems. **Prerequisite:** BIOL 2016 or Consent of Instructor **(2nd)**

BIOL 2106 Microbiology

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

An introduction to the study of bacteria. In the laboratory students are exposed to methods used to grow, classify and study bacteria. Lecture topics include the bacterial cell, growth, classification, genetics, basic physiology, immunology, and bacterial relations with water, food and milk. **Prerequisite:** BIOL 1116 or 3216 or 3326 or 2016 or 2026 or 2516 or 2526. **(2nd)**

BIOL 2126 Microbiology for Nursing & Allied Health

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

Microbiology of prokaryotic and eukaryotic microbes of medical significance with emphasis on knowledge of the biology of infectious disease as is appropriate for nursing and allied health care students. **Prerequisite:** BIOL 2016 or 2026. **(1st)**

BIOL 2136 Natural History of the Vertebrates

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

This course is an overview of vertebrates of Montana, including methods of identification of these animals in the field and specimens in the lab. Lectures will cover all the vertebrate classes, with information on physical description, life histories, habitat use, abundance, conservation issues, common methods of identification, and common field methods for studying these animals. The course will be team taught, with occasional guest lectures on special topics. Some of the lab experiences will be day field trips, some will be overnight field trips and some will be in the lab with specimens. In addition, each student will prepare a library research paper and keep appropriate field notes. Prerequisite**:** BIOL 1086, 1096, or Consent of Instructor. (4 labs = 2 overnight field trips) **(2nd)**

BIOL 2516 Human Anatomy & Physiology I

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

Principles of energy flow, homeostasis and integration of integumentary, digestive, circulatory, respiratory and excretory systems are examined from a basic point of view. **Prerequisites:** BIOL 1116; CHMY 121 or 123 or 141 or Consent of Instructor. **(1st)**

BIOL 2526 Human Anatomy & Physiology II

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

An examination of skeletal and muscular systems integration relating to movement of the human body. Principles of homeostasis of nervous, endocrine and reproductive systems are presented. **Prerequisites:** BIOL 1116; CHMY 121 or 123 or 141 or Consent of Instructor. **(2nd)**

BIOL 2586 Basic Nutrition

2 Cr.. (Hrs.:.:2 Lec.)

A discussion of basic concepts of nutrition considering carbohydrates, lipids, proteins, vitamins and minerals in food exchanges in relation to digestion, absorption and metabolism at various life stages. **Prerequisites:** CHMY 121 and 123 or Consent of Instructor. **(1st)**

BIOL 2706 Bioethics

3 Cr.. (Hrs.:.:3 Lec.)

Topics selected from the following: ethical principles, genetic screening, genetic engineering, procreation, abortion, death and dying, human experimentation, and informed consent. **Prerequisites:** A biology course and a psychology or sociology or philosophy course. **(2nd)**

BIOL 2746 Evolution of Man

3 Cr.. (Hrs.:.:3 Lec.)

A study of the mechanisms of evolution, including population genetics, sociobiology, and fossil evidence for the descent of man. **Prerequisites:** BIOL 1016 or 1116 or permission of the instructor. **(1st)**

BIOL 2916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Biology degree programs. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

BIOL 2946 Sophomore Seminar

1 Cr.. (Hrs.:.:1 Lec)

Students will prepare and present seminars on selected topics. **(1st)**

BIOL 2956 Special Topics

1-4 Cr.. (Variable)

(Course title depends on topic.) Any special topics not specifically designated under other course titles may be included under this number. This course may be repeated as often as desirable. Credits by previous arrangement.

BIOL 2976 Biological Illustration

2 Cr.. (Hrs.:.:2 Lec)

General discussions on scientific publishing, illustration labeling, color techniques and printing processes will be presented. Biological Illustration gives the interested scientist, science student, or art student a chance to study the field of scientific illustration as well as learn several specific illustration techniques. The goal of the course is to have the student develop two or more professional quality pieces of art suitable for publication. **(On Dem.)**

BIOL 3016 Genetics

4 Cr.. (Hrs.:.:4 Lec.;1 Lab)

This course addresses classic Mendelian genetics, gene function, gene mutation, population genetics as well as recombinant DNA, PCR, and DNA fingerprinting. The laboratory component involves problem solving, demonstrating concepts of classical genetics and molecular genetics. There is a research component. **Prerequisites:** BIOL 1116. **(2nd)**

BIOL 3026 Microbiology of Wine making

1 Cr.. (Hrs.:.:1 Lec)

This weekend workshop teaches the basics of wine making from mashing the fruit to bottling. It also includes a study of the microorganisms involved in the wine making process and their biochemical reactions. The course will conclude with a tasting of homemade wines. **No Prerequisites**. **(On Dem.)**

BIOL 3036 Identification of Algae

1 Cr.. (Hrs.:.:1 Lec)

This short course is designed to introduce students to "hands-on" methods of algal identification of samples collected from the environment. Conventional taxonomy keys (books) and computer assisted algal recognition software will be used. This course includes a Saturday field trip to a local site. **No Prerequisites**. **(On Dem.)**

BIOL 3116 Plant Ecology

4 Cr.. (Hrs.:.:3 Lec.: 3 Lab.)

This class addresses ecological concepts involved with the plant community, roles of plants in succession, biomes, and ecosystems. The roles of climate, soils, and topography will be explored along with the concept of ecotypes. The laboratory will be used to illustrate these concepts, demonstrate field techniques and allow students to work on ecologically related projects. **Prerequisite:** BIOL 1116/1216/1326 *or* 2106. **(1st)**

BIOL 3126 Animal Ecology

4 Cr.. (Hrs.:.:3 Lec.: 3 Lab)

A study designed to foster appreciation and understanding of the interaction among animals and their physical environment, emphasizes ecosystems and communities. Sampling techniques are stressed in the laboratory. **Prerequisite:** BIOL 1116 or Consent of Instructor. **(2nd)**

BIOL 3136 Plant Physiology

4 Cr.. (Hrs.:.:3 Lec.: 3 Lab)

Considerations of various aspects of plant physiology such as photosynthesis, water potential, cell walls and membranes, nutrient uptake, symbioses, molecular regulation of growth, development and flowering, secondary metabolites, and physiological responses of plants to stress will be placed in the contexts of struc-

ture-function relationships and ecophysiological interactions with the environment. **Prerequisite:** BIOL 3216 or Consent of Instructor. **(2nd)**

BIOL 3216 General Botany

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

An introductory examination of the structure and function of plants. Emphasizes anatomy, function and reproduction. **Prerequisite:** BIOL 1086, 1096, & 1116. **(1st)**

BIOL 3326 General Zoology

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

An introductory study stressing physiology, morphology and development. Relates physiological function to organic form. Prerequisite**:** BIOL 1086, 1096, & 1116. **(2nd)**

BIOL 3586 Clinical Nutrition

2 Cr.. (Hrs.:.:2 Lec.)

An overview of nutritional care of clients: assessing nutritional status and needs, choosing feeding methods and routes, planning and describing therapeutic diets for various disorders, nutritional consideration in trauma and cancer. **Prerequisites:** BIOL 2586 and college chemistry. **(On Dem.)**

BIOL 3946 Junior Seminar

1 Cr.. (Hrs.:.:1 Lec)

Students will prepare seminars on topics related to their senior thesis. **(2nd)**

BIOL 3976 Special Problems

1-4 Cr.. (Variable)

An independent investigation of a biological problem. **Prerequisite:** By invitation only. **(1st, 2nd)**

BIOL 4106 Basics of Evolution

3 Cr.. (Hrs.:.:3 Lec.)

This is a capstone course designed to integrate the student's general training in biology into a basic understanding of the theory of evolution. The theory of evolution is the underpinning of modern biology and a thorough understanding of the theory is required of all biologists.

The course will include the following topics: Heritable variation, mutation, genetic equilibrium, concepts of selection, selection in action, balanced polymorphism, genetic drift and gene flow, races and species, micro-evolution & macro-evolution, punctuated equilibrium, and the major radiations with emphasis on vertebrates. **Prerequisite:** BIOL 3016. **(1st)**

BIOL 4156 Alpine Ecology

2 Cr.. (Hrs.:.: 1 Lab)

A field course designed to give students experience in performing ecological studies. **Prerequisite:** BIOL 1086 or Consent of Instructor. **(1st)**

BIOL 4196 Winter Ecology

1 Cr.. (Hrs.:.: 1 Lab)

Examines winter ecology of large animals. **Prerequisite:** BIOL 1086 or Consent of Instructor. **(2nd)**

BIOL 4206 Environmental Microbiology

4 Cr.. (Hrs.:.:3 Lec.: 3 Lab)

An overview of microbiology related to the environment and biotechnological applications. Topics: survey of microorganisms; biofilm, microbial sampling of air, water, and soil with data analyses; biogeochemical cycles; microbial ecology; and Bioremediation. An environmental microbiology project is required. **Prerequisites:** BIOL 2106. **(1st)**

BIOL 4246 Molecular Biology

3 Cr.. (Hrs.:.:3 Lec.)

Topics include, but are not limited to gene structure, expression, duplication, and recombination and the molecular aspects of cell structure, maintenance, and function. **Prerequisite:** BIOL 1116, 3016 and CHMY 143; **Corequisites:** BIOL 2106; or Consent of Instructor **(1st)**

BIOL 4266 Molecular Biology Lab

2 Cr.. (Hrs.:.: 3 Lab)

This course is an introduction to modern experimental molecular biology, utilizing standard and modern molecular biology techniques. Techniques may include gel electrophoresis, PCR, restriction mapping, sequencing, blotting, etc. **Corequisites:** BIOL 4246. **(1st)**

BIOL 4306 Immunology

3 Cr.. (Hrs.:.:3 Lec.)

Fundamentals of cellular and molecular immunology including consideration of structure, genetics and function of immunoglobulins, T-cell receptors and major histocompatibility antigens; regulation of the immune response; transplantation and immunological diseases **Prerequisite:** BIOL 1116 and CHMY 321 **(2nd)**

BIOL 4600 Medical Physiology

4 Cr.. (Hrs.:.:3 Lec.: 3 Lab)

Advanced principles of normal and abnormal physiology. Primarily for students majoring in biology or those who will be applying to professional physical therapy programs. **Prerequisite:** BIOL 2516/2526

BIOL 4916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Business degree programs. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisite:** Junior standing and Consent of Instructor. **(On Dem.)**

BIOL 4946 Senior Seminar

1 Cr.. (Hrs.:.:1 Lec)

Students will work on preparing and presenting their senior thesis. **(2nd)**

BIOL 4956 Special Topics

1-4 Cr.. (Variable)

(Course title depends on topic.) Any special topics not specifically designated under other course titles may be included under this number. This course may be repeated as often as desirable. Credits by previous arrangement.

BIOL 4976 Biological Illustration

2 Cr.. (Hrs.:.:2 Lec)

General discussions on scientific publishing, illustration labeling, color techniques and printing processes will be presented. Biological Illustration gives the interested scientist, science student, or art student a chance to study the field of scientific illustration as well as learn several specific illustration techniques. The goal of the course is to have the student develop two or more professional quality pieces of art suitable for publication. **(On Dem.)**

BIOL 4986 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

BIOL 4996W* Senior Thesis

1-4 Cr.. (Variable)

This course involves an independent investigation of a biological question demonstrating the use of the scientific technique. A report and presentation to peers is required. Faculty serve as mentors during the project. **Prerequisite:** Senior standing.

BUSINESS

BUS 0956 Business Essentials

2cr. (HRS..: 3 Lec)

This course introduces the knowledge, skills, and competencies needed to prepare students for today's competitive workplace. Business careers, principles, and emerging trends in fields such as management, leadership, finance, and accounting are presented.

ACTG 098 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Business Technology degree programs. Students should consult with an advisor on the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

ACTG 101 Accounting Procedures I

3 Cr.. (Hrs.:.: 3 Lec.)

This course focuses on the complete accounting cycle for both service and merchandising businesses. Recording and processing business transactions, adjusting and closing entries, and preparation of financial statements are presented. **ACTG 101 is not equivalent to ACTG 201.**

BUS 0103 Basic Computers/Beginning Keyboarding

2 Cr.. (Hrs.:.: 1 Lec., 3 Lab)

Using word processing software, this class will teach students the proper keystrokes to be used when using a computer keyboard. The students will also be introduced to some basic software features that are used when formatting typed documents. Speed Building and proofreading will also be addressed.

BUS 0112 Quickbooks

1 Cr.. (Hrs.:.: 1 Lec.)

This course provides an opportunity for students to work with a small business accounting package. Quickbooks allows for tracking of accounts receivable, assets, liabilities, equity, and loans. Students also learn how to customize statements and invoices. **Prerequisites:** CAPP 131

BUS 0113 Human Resource Issues

2 Cr.. (Hrs.:.: 2 Lec.)

This course offers a fresh approach to the study of human resource management based on dynamic, "real life" organizational events confronting both human resource managers and those individuals who often work with personnel programs and policies. Topics range from traditional application of personnel theory to the more controversial issues of AIDS, alcohol and drug abuse on the job, new federal legislation on discrimination issues, ADA, sexual harassment, and work and family. All topics are presented in case study format. **(2nd)**

BUS 0114 Beginning Medical Transcription

2 Cr. (Hrs.:.: 2 Lec.)

Course is designed to familiarize users with seven basic medical reports used in a health care facility, related medical terminology, an appropriate format for transcribing the reports, and specialized rules of grammar and punctuation peculiar to dictated medical records. **Prerequisite:** CAPP 131, BUS 0120, HLTH 0103. **(1st)**

BUS 0115 Intro. to Human Resources

3 Cr.. (Hrs.:.: 3 Lec.)

Introduces a general overview of human resource management. This course explores human resources in a globally competitive business environment, the legal context of employment decisions, diversity, securing human resources, developing human resources, compensation, labor-management relations, and protecting and evaluating human resources. **(1st)**

BUS 0116 Basic Medical Records

3 Cr.. (Hrs.:.: 3 Lec.)

This course will introduce the student to the basics of health information technology. It will explore the broad view of the health care industry to the basic elements of health information technology. Students will learn about the various fields available to them in information technology such as coding, transcription, medical record clerk. **(2nd)**

BUS 0120 Keyboarding

3 Cr.. (Hrs.:.: 2 Lec., 3 Lab)

Students will format various types of correspondence including full and modified-block style letters, memos, tables, reports, and special report pages. Development of speed and accuracy will also be stressed. **Prerequisite:** Knowledge of the keyboard reaches; Consent of Instructor.

BUS 0135 Compensation & Benefits

3 Cr.. (Hrs.:.: 3 Lec.)

Examines compensation practices and philosophies, administrative tools used to manage employee compensation, and pay structure development. Explains the major provisions of employee benefit programs including growth in benefit costs, effects of benefits management on cost and work-force quality, and regulatory constraints that affect the way employee benefits are designed and administered. **(2nd)**

ACTG 180 Payroll Accounting

3 Cr.. (Hrs.:.: 3 Lec.)

This course develops a basic understanding of the various methods and procedures used to process and record payrolls, prepare monthly, quarterly, and annual reports to state and federal agencies, and process payments as required. **Prerequisites:** ACTG 101 **(1st)**

ACTG 201 Principles of Financial Accounting

3 Cr.. (Hrs.:.: 3 Lec.)

This course presents accounting for assets and liabilities including accounts receivable and bad debts, notes payable and receivable, merchandise inventory, and capital assets. Accounting cycles for partnerships and corporations are introduced as well as financial reporting and analysis. **Prerequisite:** ACTG 101. **Is not equivalent to ACTG 202.**

ACTG 202 Principles of Managerial Accounting

3 Cr.. (Hrs.:.: 3 Lec.)

Introduces the nature, purpose, and practice of cost accounting including the concepts of cash flow versus work flow, job order cost accounting, process cost accounting, budgeting, standard costs, direct costing, and non-manufacturing costs. **Prerequisite:** ACTG 101 **(2nd)**

ACTG 205 Computerized Accounting

3 Cr.. (Hrs.:.: 3 Lec.)

This course introduces the concepts and components of an automated accounting information system. Students are exposed to several accounting software packages. Computerized accounting practices are designed to give students hands-on experience in entering, editing, and deleting transactions for various applications. **Prerequisites:** ACTG 101, 201, CAPP. 131. **Is not equivalent to ACTG 321. (1st)**

BUS 0207 Medical Coding & Billing I

3 Cr.. (Hrs.:.: 3 Lec.)

Students will learn the differences between the ICD-9-CM and CPT-4 coding systems. They will learn to apply coding guidelines to procedure and diagnosis coding. They will learn terminology related to the coding systems. Proper documentation will be addressed. They will learn what terms to look for when looking up diagnosis codes and procedures codes. They will learn the significant role that coding plays in the medical field and become proficient with use of the coding books. **Prerequisite:** HLTH 0104 **(1st)**

ACTG 211 Income Tax Fundamentals *3 Cr.. (Hrs.:.: 3 Lec.)*

This tax course presents general concepts of the U.S. tax law and the various taxable entities. Tax formulas, filing requirements, components of gross income, and itemized deductions are presented. This course presents the foundation for preparation of various income tax returns and background information for planning and controlling the income tax consequences of future events. **Prerequisite:** ACTG 101. **Is not equivalent to ACTG 401. (1st)**

ACTG 212 Income Tax Fundamentals II

3 Cr.. (Hrs.:.: 3 Lec.)

A continuation of Introduction to Income Tax I. This course focuses on tax laws as they apply to partnerships and corporations. Tax laws specific to Montana are also explored. Preparation of all applicable tax returns is presented. **Prerequisite:** BUS 0205. **Is not equivalent to ACTG 402. (2nd)**

ACTG 215 Foundations of Gov't & Not for Profit Accounting

3 Cr.. (Hrs.:.: 3 Lec.)

This course is designed to introduce students to the basic concepts of financial reporting and accounting for governmental and nonprofit organizations. The basic accounting cycle as well as some of the more complex transactions that are typical in nonprofit accounting is presented. **Prerequisite:** ACTG 101 **(2nd)**

BUS 0217 Medical Transcription

2 Cr. (Hrs.:.: 1 Lec., 3 Lab)

The objective of this class is to provide students with an extensive list of standard and contemporary terms in 15 medical specialties, with realistic dictation. **Prerequisites:** BUS 0114 **(2nd)**

BUS 0230 Medical Office Procedures

2 Cr.. (Hrs.:.: 2 Lec.)

Course introduces students to Medi-Soft, a patient accounting software program used by many medical practitioners. A separate simulation packet is also used which enables the student to produce many of the documents used in medical offices today. **Prerequisite:** CAPP 131, ACTG 101 **(1st)**

BUS 0232 Records Management

3 Cr.. (Hrs.:.: 3 Lec.)

The objective of this course is to acquaint students with a basic knowledge of records management. Students will be provided information about the profession of records management, paperwork management systems, and electronic data management systems. **(1st)**

BUS 0234 Model Office

1 - 5 Cr.. (Hrs.:.: Variable)

A course which offers an internship in government, business, and nonprofit organizations. Students will develop initiative, dependability, skills in organization, and abilities in interpersonal relations. **Prerequisite:** Permission of Instructor, may be repeated for more credit

BUS 0247 Medical Coding & Billing II

3 Cr.. (Hrs.:.: 3 Lec.)

Students will learn how to read reports and assign codes with the use of the ICD-9-CM and CPT-4 coding books. They will apply the coding principles and guidelines to assign codes. They will receive hands on training in auditing for correct coding. Exposure to insurance forms and how to track claims. **Prerequisite:** BUS 0207 **(2nd)**

BUS 0261 Health Service Accounting Software

3 Cr.. (Hrs.:.: 3 Lec.)

This course presents computerized accounting as it applies to health care environments. Instruction includes the application of accounting software for hospitals, doctor's offices, and dentist offices. **(2nd)**

BUS 0265 Business Applications

3 Cr.. (Hrs.:.: 3 Lec.)

Introduces the use of the 10 key adding machine while presenting practical mathematics for business and consumer financing. Topics include computing simple and compound interest, present values, annuities, and amortization. The focus is on linking mathematics with real business practices. **(1st, 2nd)**

BUS 0266 E-Commerce

3 Cr.. (Hrs.:.: 3 Lec.)

An overview of e-commerce discussing the impact of the Internet on business strategies and implementation, public policy issues, privacy and security questions, electronic payment systems, marketing strategies, and legal and ethical issues. **(1st)**

BUS 0267 Electronic Information manager (Outlook)

2 Cr.. (Hrs.:.: 2 Lec.)

The course emphasizes the concepts and terminology necessary to function effectively in the electronic office. Techniques include electronic organizing and scheduling of appointments and tasks and using specialized research processes. The effective and ethical use of electronic distribution and use of mail and files will be discussed. **(1st)**

BUS 1016 Introduction to Business

3 Cr.. (Hrs.:.:3 Lec.)

An introductory course that surveys the nature of business, its functions, as well as its various environments and challenges. Topics covered include basic concepts in the areas of finance, management, ethics, accounting, and marketing. Non-business majors are encouraged to enroll in this course. **(1st, 2nd)**

ACTG 201 Principles of Financial Accounting

3 Cr.. (Hrs.:.:3 Lec.)

The two semesters of accounting are designed to provide an overview of all aspects of the accounting process. Emphasizes recording and processing business transactions, closing books and preparing financial statements. Covers individual proprietorships in service and merchandising industries. **Prerequisite:** M 121 or equivalent. **(1st, 2nd)**

ACTG 202 Principles of Managerial Accounting

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of ACTG 201. Emphasizes corporate transactions. Also provides an introduction to taxation, accounting theory and managerial decision making. **Prerequisite:** ACTG 201. **(1st, 2nd)**

BUS 2916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Business degree programs. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

BUS 2956 Special Topics

1-3 Credits

Special topic is to be determined by the faculty member offering the course and the department. Topic will deal with some aspect of business not covered by existing departmental courses. This course is designed to complement present course offerings. **Prerequisite:** Consent of Instructor. **(On Dem.)**

ACTG 301 Intermediate Accounting I

3 Cr.. (Hrs.:.:3 Lec.)

An in-depth study of the major accounting systems emphasizing revenue recognition, income determination, and asset and liability valuation. **Prerequisite:** ACTG 202. **(1st)**

ACTG 302 Intermediate Accounting II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of ACTG 301. Emphasizes corporate transactions, accounting for bonds and leases, working capital, and the statement of cash flows. **Prerequisites:** ACTG 301. **(2nd)**

BUS 3126 Risk & Insurance

3 Cr.. (Hrs.:.:3 Lec.)

Considers the basic principles of risk and insurance from the viewpoint of the consumer. Comparison of cost and benefit for various types of insurance (life, property, liability). Also included are risk analysis and selection. **Prerequisites:** Junior standing or Consent of Instructor. **(On Dem.)**

ACTG 321 Accounting Information Systems

3 Cr.. (Hrs.:.:3 Lec.)

Explores the primary information flow in modern accounting systems. Students gain hands-on experience with accounting data processing techniques on the personal computer while considering hardware and software decisions and management information requirements. State of the art accounting packages are utilized in practical business applications. **Prerequisites:** ACTG 202 **(2nd)**

BUS 3316W Marketing

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes the functions of marketing management in terms of environment, research, pricing, promotion, distribution and product development. **Prerequisite:** Junior standing is recommended. **(1st, 2nd)**

BUS 3416 Business Law I

3 Cr.. (Hrs.:.:3 Lec.)

A study of the basic concepts of law, including substantive and procedural applications, with emphasis this semester on legal reasoning, business ethics, alternative

dispute resolution, court procedures, constitutional law with emphasis on the First Amendment, torts, agency, corporations/partnerships, personal property, real property, wills and estates. **Prerequisite:** Junior standing is recommended. **(1st)**

BUS 3426 Business Law II

3 Cr.. (Hrs.:.:3 Lec.)

A study of the basic concepts of law including substantive and procedural applications, with emphasis this semester on contracts, Uniform Commercial Code (sales, negotiable instruments, banking system and secured transactions), debtor/creditor relations, bankruptcy, administrative law, professional (accountant) liability. **Prerequisites:** Junior standing is recommended. **(2nd)**

BUS 3446W Entrepreneurship & Small Business Management

3 Cr.. (Hrs.:.:3 Lec.)

Study of new venture creation with emphasis on the highly technical, engineering or mining oriented business. Investigation of securing venture capital, preparation of a business plan, mergers, acquisitions and the new issues market. **Prerequisite:** Junior Standing **(1st)**

BUS 3516 Business Finance

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes the analytical financial management of the firm. Considers financial intermediaries, financial analysis and planning, capital budgeting, cost of capital, and working capital management. **Prerequisites:** ACTG 202; ECNS. 202 & 201 or Consent of Instructor. **(1st, 2nd)**

BUS 3616W Management

3 Cr.. (Hrs.:.:3 Lec.)

A study of the basic principles and functions of management invoked in planning, organizing, influencing, and controlling a business organization. **Prerequisite:** Junior standing is recommended. **(1st)**

BUS 3626 Labor Relations & the Collective Bargaining Process

3 Cr.. (Hrs.:.:3 Lec.)

Analyzes the economics of labor-management relationships with emphasis on the philosophy and practice of collective bargaining. **Prerequisite:** BUS 3616 or Consent of Instructor. **(2nd.)**

BUS 3636 Business Ethics

3 Cr.. (Hrs.:.:3 Lec.)

Seeks to explore value systems as a basis and framework for ethical decisions to develop sensitivity for the numerous ethical issues in the competitive business world. Encourages the evaluation and development of personal value systems and develops an awareness of the value implications of managerial decision. **(1st, 2nd).**

BUS 3646 Human Resource Management

3 Cr.. (Hrs.:.:3 Lec.)

Analyzes practical aspects of personnel management through readings, cases and exercises dealing with the activities of human resource administration. **Prerequisite:** BUS 3616 or Consent of Instructor. **(1st).**

BUS 3656W Organizational Behavior

3 Cr.. (Hrs.:.:3 Lec.)

A study of the behavior, attitudes and performance of workers in an organizational setting; the organization's and group's effects on the worker's perceptions, feelings and actions; the environment's effect on the organization and its human resources and goals; and the effect of the workers on the organization and it's effectiveness. **Prerequisite:** Junior Standing **(1st).**

BUS 3666 Operations & Production Management

3 Cr.. (Hrs.:.:3 Lec.)

Study of approaches to the design of efficient operating systems including output scheduling, inventory control, distribution planning and facilities location. **Prerequisite:** STAT 216, CAPP 156 or Consent of Instructor. **(1st, 2nd)**

BUS 3696 Applied Supervisory Management

3 Cr.. (Hrs.:.:3 Lec.)

An upper level survey of a series of modules designed to provide engineering students and non-business majors with a working knowledge of supervisory skills for professionals. Modules to be presented include management, business ethics, personnel management, organizational behavior and labor relations. **Prerequisite:** Enrolled in an engineering discipline or non-business course. **(On Dem.)**

BUS 3956 Special Topics

1-3 Credits

Special topic is to be determined by the faculty member offering the course and the department. Topic will deal with some aspect of business not covered by existing courses. This course is designed to complement present course offerings. **Prerequisite:** Consent of Instructor. **(On Dem.)**

ACTG 401 Principles of Federal Taxation/ Individuals

3 Cr.. (Hrs.:.:3 Lec.)

Studies the application of federal income tax laws to individuals, including determination of taxable income, exemptions, deductions and credits, **Prerequisite:** ACTG 202 or Consent of Instructor. **(1st)**

ACTG 402 Advanced Income Tax

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of ACTG 401. Studies the tax laws as they apply to partnerships, corporations, Subchapter S corporations, estates and trusts. **Prerequisite:** ACTG 401, or Consent of Instructor. **(2nd)**

ACTG 410 Cost/MGMT Accounting I

3 Cr.. (Hrs.:.:3 Lec.)

Studies development, presentation and interpretation of cost information for management; methods of cost data collection and display, cost-volume-profit relationships, standard costs, budgets and capital budgeting. **Prerequisite:** ACTG 202; M 142. **(1st)**

ACTG 411 Auditing I

3 Cr.. (Hrs.:.:3 Lec.)

An overview of auditing and the fundamentals of auditing standards with emphasis on audit reports, professional ethics, legal liability materiality, risk and internal controls. An in-depth analysis of auditing techniques and objectives as related to the examination of financial statements. **Prerequisite:** ACTG 302, or Consent of Instructor. **(1st)**

ACTG 412 Auditing II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of BUS 4146. An in-depth examination of the audit process with concentration on the major problem areas of auditing, including statistical sampling and auditing of EDP systems. **Prerequisite:** ACTG 411. **(2nd)**

ACTG 436 Advanced Accounting

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes consolidated financial statements. Other topics include partnerships, multinational accounting, and special topics. Please note that ACTG 436 and 415 may be taken in any order. **Prerequisite:** ACTG 302 and BUS 3516. **(1st)**

ACTG 415 Governmental & Not-for-Profit Accounting I

3 Cr.. (Hrs.:.:3 Lec.)

Includes accounting for government units, non-profit organizations, bankruptcies and may include estates and trusts. Please note that ACTG 436 and 415 may be taken in any order. **Prerequisite:** ACTG 302 **(2nd)**

ACTG 420 Cost/MGMT Accounting II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of ACTG 410. Covers methods of cost allocation, specific topics in cost measurement and applied mathematics for cost determination, decision models, cost behavior analysis and regression analysis. **Prerequisites:** ACTG 410. **(2nd)**

ACTG 427 Accounting Theory

3 Cr.. (Hrs.:.:3 Lec.)

A critical analysis of the theoretical foundation of accounting and its application in the development of accounting standards. **Prerequisite:** ACTG 302. **(On Dem.)**

ACTG 428 CPA Review

0 Cr.. (Hrs.:.:3 Lec.)

Comprehensive review of accounting theory, practice and law. Primarily for students preparing to take the uniform CPA examination. All students in BUS 4286

should intend to take the CPA Exam in May. **Prerequisite:** ACTG 420, 302, 402, 412, 436,415, 427 or Consent of Instructor. **(On Dem.)**

BUS 4326 Marketing Strategies & Research

3 Cr.. (Hrs.:.:3 Lec.)

Development of a framework for use in small-scale market research. Explores mathematical modeling to investigate such issues as pricing, competitive strategy and allocation problems. **Prerequisite:** BUS 3316W **(2nd)**

BUS 4516 International Business

3 Cr.. (Hrs.:.:3 Lec.)

Introduces students to the complex challenges of doing business in a global economy. Emphasis is on learning the different approaches to management, finance, and accounting in a global environment. The course will address the topics such as negotiation, theories of international trade, exchange rates, and an introduction to importing and exporting. **Prerequisite:** Senior Standing. **(1st)**

BUS 4566 Financial Markets & Institutions

3 Cr.. (Hrs.:.:3 Lec.)

Analyzes the nature and function of bank and non-bank financial institutions and markets and their relationships and interdependence. **Prerequisite:** BUS 3516, & Senior Standing. **(2nd)**

BUS 4916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Business degree programs. Students should consult with their faculty advisors and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

BUS 4936W Strategic Management

3 Cr.. (Hrs.:.: 3 Lec.)

A capstone course that integrates subject matter from other business courses and disciplines in the discussion and analysis of strategic management, business policy, and organizational problems. Extensive case-study pedagogy is used to integrate and apply concepts and knowledge to real-world problems. **Prerequisites:** BUS 3316, 3516, Senior standing and Consent of Instructor. **(2nd)**

BUS 4946 Advanced Management Seminar

3 Cr.. (Hrs.:.:3 Lec.)

A capstone study of business policy and strategic management facilitated by case presentations and guest lectures. This course is built on three pedagogical pillars; text, cases, and practical insights from senior management practitioners. **Prerequisites:** BUS 3616W, & BUS 3626 or 3646 and Consent of Instructor. **(On Dem.)**

BUS 4956 Special Topics

1-3 Credits

Special topic is to be determined by the faculty member offering the course and the department. Topic will deal with some aspect of business not covered by existing departmental courses. **Prerequisite:** Consent of Instructor. **(On Dem.)**

BUS 4986 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

CARPENTRY

CARP 0120 Carpentry Basics and Rough-in Framing

7 cr..

Introduces the carpentry trade, including history, career opportunities, and requirements. This course covers a variety of building materials, fasteners, and adhesives. It also covers installation procedures for windows and exterior doors. Skills required for framing a simple structure are studied and practiced. **Prerequisite:** CNST 0100 or instructor's approval.

CARP 0130 Exterior Finishing, Stair Construction, and Metal Stud Framing

4 cr..

Introduces students to materials and methods for sheathing, exterior siding, stairs and roofing. Students will layout and build a simple stair system as well as a metal stud wall with door and window openings. **Prerequisite:** CNST 0100 and CARP 120 or instructor's approval.

CARP 0140 Introduction to Site Layout

3 cr..

Explores the process of distance measurement, differential and trigonometric leveling for site layout. It covers the principles, equipment, and methods used to perform the site layout tasks that require making angular measurements. This course is designed to let students apply the blueprint reading skills learned so far to a practical exercise. **Prerequisite:** CNST 0100 or instructor's approval.

CARP 0150 Carpentry Practicum I

3 cr..

Provides hands-on experience in which the student applies, with minimal supervision, the basic skills and knowledge presented thus far in the NCCER Carpentry Program. This course is designed as a practical task-orientated application utilizing the skills covered in CARP 120 as well as in parts of CARP 130. **Prerequisite:** CARP 120 and CNST 0110 or instructor's approval.

CARP 0220 Interior Finishing

4 cr..

Cover interior building materials. This course covers materials and installation techniques for interior trim, counter top, base cabinet, and wall cabinet. It also covers suspended ceiling materials, layout, and installation as well as wood and metal door installation. **Prerequisite:** CARP 120 and CNST 0110 or instructor's approval.

CARP 0230 Advanced Roof, Floor, Wall, and Stair Systems

4 cr..

Covers the installation methods and materials for various roofing systems. It covers a variety of flooring applications as well as interior wall construction for residential and commercial structures. It also covers advanced staircase construction. **Prerequisite:** CARP 0130 and CARP 0150 or instructor's approval.

CARP 0240 Alternative Construction Materials

3 cr..

Review of alternative construction materials, including manufactured lumber and finish materials and other alternative building materials as well as building materials using recycled components. Re-use of salvaged materials and use of non-traditional building materials such as straw bale and rammed earth construction to be covered.

CARP 0250 Carpentry Practicum II

3 cr..

Provides students the opportunity to practice skills they have acquired in the entire carpentry program. It includes task-orientated projects in which students can apply many of the skills and knowledge that have been presented throughout the NCCER Carpentry program. This course is designed as a practical task-orientated exercise utilizing a variety of skills covered in all the NCCER carpentry courses required for the AAS degree. **Prerequisite:** CARP 0130, CARP 0140, CARP 0150 and CARP 0220 or instructor's approval.

CARP 0260 Concrete Forms, Reinforcement & Handling

5 cr..

Introduce building forms for footings and foundations as well as for a variety of concrete structures. It introduces methods for handling, placing, and finishing concrete. It also covers manufactured forms and their applications. **Prerequisite:** CNST 0100 or instructor's approval.

CARP 0270 Building for Solar Energy

3 cr..

Study of the basics of solar energy and design with emphasis on passive solar applications. The elements and design patterns for successful passive solar buildings are covered in detail. Design requirements for solar generated electricity and solar heated water are considered. Also covered are designing new and remodeled building to be solar ready, solar retro-fits, and other applications.

CHEMISTRY

CHMY 121 Introduction to General Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

A survey of general chemistry. Includes electronic structure, stoichiometry, chemical bonding, acids, bases, equilibrium, nuclear chemistry and kinetic theory. The CHMY 121-123 sequence is designed for students preparing for careers in nursing and certain other health sciences. **Prerequisite:** One year of high school algebra or **Corequisites** of M 095 or higher MATH course. **(1st)**

CHMY 122 Intro. to General Chemistry Lab

1 Cr.. (Hrs.:.:1 Lec., 2 Lab.)

This is an experimental laboratory course designed to supplement and enhance understanding of material covered in general chemistry lecture course. The experiments expose students to essential methods of physical measurement, data collection, and analysis that are fundamental to laboratory work in health care fields and demonstrate basic inorganic, organic, and biochemical principles. **Students not majoring in Nursing or Health Care Informatics need the consent of the instructor to enroll in this course. Prerequisite or Corequisites:** CHMY 121 or 141. **(2nd)**

CHMY 123 Intro. to Organic & Biochemistry

3 Cr.. (Hrs.:.:3 Lec.)

A course covering basic organic and biochemistry that includes nomenclature and classification of organic compounds with emphasis on compounds with functional groups important to biological systems and a basic study of their biochemical actions on these systems. **Prerequisite:** CHMY 121 or 141. **(2nd)**

CHMY 141 College Chemistry I

3 Cr.. (Hrs.:.:3 Lec.)

Fundamental principles of chemistry such as stoichiometry, atomic structure, bonding, gas laws, oxidation-reduction reactions, and chemical equilibria are covered. The experimental nature of the science of chemistry and the mathematical treatment of data are emphasized. **Corequisites:** M 151. **(1st, 2nd)**

CHMY 142 College Chemistry Laboratory I

1 Cr.. (Hrs.:.:1 Lec., 2 Lab)

Enhances understanding of lecture material (CHMY 141 or 121) by laboratory experimentation. Experiments cover gravimetric analysis, chemical reactions, acid-base titrations, gas laws, oxidation-reduction titrations, water analysis, colligative properties and pH titrations. **Prerequisites or Corequisites:** CHMY 121 or 141. **(1st)**

CHMY 143 College Chemistry II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of CHMY 141 including topics such as solubility product, chemical thermodynamics, acids and bases, kinetics, electrochemistry, organic compounds, coordination compounds, colligative properties and nuclear chemistry. **Prerequisite:** CHMY 141. **(1st, 2nd)**

CHMY 144 College Chemistry Laboratory II

1 Cr.. (Hrs.:.:1 Lec,. 2 Lab)

Experiments reinforce lecture material covered in CHMY 143. Emphasis is placed on qualitative analysis which includes the systematic separation and identification of cations and anions. **Prerequisites or Corequisites:** CHMY 143. **(2nd)**

CHMY 151 Honors College Chemistry

3 Cr.. (Hrs.:.:3 Lec.))

Fundamental principles of chemistry such as stoichiometry, atomic structure, bonding, gas laws, oxidation-reduction reactions, and chemical equilibria are covered. The experimental nature of the science of chemistry and the mathematical treatment of data are emphasized. **Corequisites:** M 151. **(1st)**

CHMY 210 Survey of Organic Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

An overview of the more important functional groups including nomenclature, physical properties and important type reactions are covered. **Prerequisites:** CHMY 143. **(2nd)**

CHMY 291 Special Topics

Variable Credit

Special topics not specifically designated under other course titles may be included under this number. This course may be repeated as often as desired. Credits by previous arrangement. **(On Dem., 1st & 2nd)**

CHMY 302 Chemistry Literature

2 Cr.. (Hrs.:.:1 Lec., 3 Lab)

Provides practical experience in locating and utilizing scientific and technical literature in the student's field of study. The lecture provides an overview of the purpose and structure of the weekly library assignment. The library assignment is designed to illustrate the main features of a given resource. Includes familiarization with computer search methods. **Prerequisite:** Junior standing or Consent of Instructor. **(1st)**

CHMY 311 Analytical Chemistry - Quantitative Analysis

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

A study of the theory and practice of quantitative methods of analysis. Topics include: introduction to statistics for chemists, sampling, equilibria of solutions and an introduction to electrochemistry. Emphasis will be on the application of these topics to biological systems. **Corequisites:** CHMY 312. **Prerequisite:** CHMY 143 **(1st)**

CHMY 312 Analytical Chemistry - Quantitative Analysis Lab

The lab is the "hands on" experience for developing good laboratory skills for and application of quantitative analysis. **Corequisites:** CHMY 311. (1st)

CHMY 321 Organic Chemistry I

3 Cr.. (Hrs.:.:3 Lec.)

Covers fundamental theories of organic chemistry, nomenclature, structural relationships to reactions, reaction types and mechanisms, synthetic methods, properties and applications of organic compounds. **Prerequisite:** CHMY 143. **(1st)**

CHMY 322 Organic Chemistry Laboratory I

2 Cr.. (Hrs.:.:6 Lab)

Covers standard laboratory Micro-Techniques including instrumental methods of analysis and their applications to representative syntheses and to common analyses. **Prerequisite or corequisites:** CHMY 321. **(1st)**

CHMY 323 Organic Chemistry II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of CHMY 321. Encompasses all major functional groups and reaction types. **Prerequisite:** CHMY 321. **(2nd)**

CHMY 324 Organic Chemistry Laboratory II

2 Cr.. (Hrs.:.:6 Lab)

Utilizes more advanced Micro-Techniques of laboratory practice. Uses literature searches in developing more difficult synthesis problems. **Prerequisite:** CHMY 322. **(2nd)**

CHMY 371 Physical Chemistry - Quantum Chem & Spectroscopy

3 Cr.. (Hrs.:.:3 Lec.)

Introduces chemical thermodynamics, chemical equilibrium, chemical kinetics, and electrochemistry, and transport phenomena. Emphasis will be on the application of these topics to biological systems. **Prerequisite:** CHMY 143 and M 172 **(1st)**

CHMY 372 Physical Chemistry I Laboratory

1 Cr.. (Hrs.:.:3 Lab)

A laboratory course designed to introduce the student to the experimental determinations of the properties of pure and solution phases and to the experimental applications of the laws of thermodynamics. **Prerequisite or corequisites:** CHMY 371. **(1st, 2nd)**

CHMY 373 Physical Chemistry - Kinetics & Thermodynamics

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of CHMY 371 with application to multi-component phase

equilibria, surface chemistry, and other topics. **Prerequisite:** CHMY 371 and M 172. **(2nd)**

CHMY 374 Physical Chemistry II Laboratory

2 Cr.. (Hrs.:.:6 Lab)

Introduces the student to the experimental determinations of the properties of electrolytic solutions, the experimental study of heterogeneous equilibria, spectroscopy, kinetics and surface chemistry. **Prerequisite or corequisites:** CHMY 373. **(2nd)**

CHMY 401 Advanced Inorganic Chemistry I

3 Cr.. (Hrs.:.:3 Lec.)

This course will focus on the molecular structures and properties of inorganic compounds and complexes. We will study concepts in bonding, trends in periodic properties, molecular symmetry, solid-state, reaction mechanisms, coordination chemistry, and the descriptive chemistry of selected elements. **Prerequisite:** CHMY 371 **(1st)**

CHMY 403 Descriptive Inorganic Chemistry

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

The theories introduced in CHMY 401 are applied to the elements and their compounds. The chemical and physical properties of each periodic group are discussed. **Prerequisite:** CHMY 401. **(2nd)**

CHMY 411 Advanced Organic Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

The study of important reaction mechanisms and rate theory in organic reactions and the application of these principles to secondary plant metabolism. **Prerequisite:** CHMY 323; **Corequisites:** CHMY 371. **(2nd, alternate years)**

CHMY 421 Advanced Instrument Analysis

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

A study of the theory and applications of modern methods of analysis. Topics include absorption, emission and fluorescent spectroscopy, NMR and mass spectroscopy, and chromatography methods of analysis. **Prerequisite:** CHMY 311 and 312. **(2nd)**

CHEM 4216 Biochemistry I

3 Cr.. (Hrs.:.:3 Lec.)

Introduces the general field of biochemistry emphasizing the unifying principles which relate biochemistry to other disciplines. The chemistry of amino acids and proteins, carbohydrates, lipids, and nucleic acids are discussed. Metabolism, catabolism and bioenergetics will be covered. **Prerequisite:** CHMY 323 or 210 and 371. **(1st)**

CHEM 4226 Biochemistry II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of CHEM 4216 which will include the dynamics of life. The biochemistry of life processes, biosynthesis & utilization of precursor molecules for cell replication will be covered. **Prerequisite:** CHEM 4216. **(2nd)**

CHEM 4236 Biochemistry Lab

1 Cr.. (Hrs.:.:3 Lab.)

The Biochemistry Laboratory Course provides a focused exploration of proteins and their functions. Lab exercises will focus on the following: enzyme purification; enzyme kinetics; 1D, 2D and 3D NMR experiments and mass spectrometry experiments to explore the structure elucidation of oligopeptides; the use of ELISA to both identify the presence of proteins in a complex matrix and to determine whether or not a Natural Product can inhibit a specific protein; SDS-PAGE electrophoresis and Western Blot to study genetic relations in fish through analysis of myosin; bioinformatics studies of various proteins; transformation of E.Coli and isolation of new protein product; and an exploration of 3-dimensional shape of proteins using Protein Database and molecular modeling. **Corequisites:** CHEM 4226. **(2nd)**

CHMY 430 Fate & Distribution of Organics

3 Cr.. (Hrs.:.:3 Lec.)

This course will examine how vapor pressure, solubility, partitioning, diffusion, sorption, reactivity, photochemistry, and biological processes affect the movement and distribution of organic chemicals introduced into the natural environment. The course will adapt a quantitative molecular understanding of these processes. **Prerequisite:** CHMY 210 or 321 and 371 or Consent of Instructor. **(1st)**

CHMY 435 Theoretical Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

Introduction to group theory, quantum mechanics and statistical thermodynamics. Topics include molecular modeling, the hydrogen atom, approximation methods, many electron atoms, and molecular spectroscopy. **Prerequisite:** M 274. **(1st)**

CHMY 440 Polymer Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

Covers the structure, synthesis, kinetics, distribution, conformations, and morphology of polymers. **Prerequisites:** CHMY 210 or 323, & 373. **(On Dem.)**

CHEM 442 Aquatic Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

This course utilizes physical and chemical principles to provide a detailed understanding of the chemistry of natural waters and the interaction of these waters with the environment. **Prerequisites:** CHMY 371. **(2nd)**

CHMY 450 Demonstrations

1 Cr.. (Hrs.:.:1 Lec., 2 Lab)

Students in this course will convey the excitement, wonder, and fun of science by developing, documenting, and performing three different demonstrations and/or hands on activities for external audiences. Each activity will involve assimilating the appropriate background literature and necessary components in support of the activity, supervised practice of both the activity and the explanation of the underlying science, safely performing the activity for an external audience, properly and safely transporting, storing, and disposing of the material used in the activity, and finally, providing a clearly written and referenced description of the activity that can be used by others to repeat the demonstration. **(On Dem)**

CHMY 465 Organic Spectroscopy

3 Cr.. (Hrs.:.:3 Lec.)

Interpretation of NMR, IR, UV and mass spectra are used to determine the structure of compounds. Variations in instrumental techniques to elucidate the structures are discussed. **Prerequisites:** CHMY 421, 323 or Consent of Instructor. **(On Dem.)**

CHMY 490 Undergraduate Research

Variable Credit

Designed for undergraduates who are involved in directed research projects. Students are required to prepare an extensive formal paper and present their research in CHMY 494w Chemistry Seminar. Three credits of this course is required for American Chemical Society certification. This course may be repeated as often as desired. **(On Dem., 1st & 2nd)**

CHMY 491 Special Topics

Variable Credit

Course title depends on topic. This course may be repeated as often as desirable. **(On Dem., 1st & 2nd)**

CHMY 494W Chemistry Seminar

1 Cr.. (Hrs.:.:1 Lec.)

All chemistry seniors are required to present two seminars - one in the fall semester and one in the spring semester. An extensive formal paper on the seminar topic must be written and approved by the department early in the semester before the seminar can be presented. Students who have taken or are taking undergraduate research for credit must prepare their paper and present their seminar based on this undergraduate research. If the student has done undergraduate research for credit on two distinct topics (perhaps with two separate faculty members), then both semesters must be used to present the undergraduate research. All junior chemistry students are expected to attend. May be repeated once for credit. **(1st & 2nd)**

CHMY 497 Chemistry Teaching Experience

1 Cr.. (Hrs.:.:1 Lec., 2 Lab)

Students in this course will gain experience teaching chemistry by serving as undergraduate teaching assistants in General Chemistry laboratories. Each credit requires the student to serve as the undergraduate teaching assistant for one semester in one section of General Chemistry laboratories. Weekly duties require the student to familiarize themselves with each laboratory lecture, attend the teaching assistant lecture, supervise and assist students performing the laboratory, and share in the grading of the laboratory. **(On Dem)**

CHMY 498 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Chemistry degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experience and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

Note regarding graduate level courses:
Enrollment in all 500 level courses requires graduate standing or the Consent of Instructor. For 5XX level courses that are double listed with 4XX courses, the 5XX course is expected to make additional demands on the student.

CHMY 501 Advanced Inorganic Chemistry I

3 Cr.. (Hrs.:.:3 Lec.)

This course will focus on the molecular structures and properties of inorganic compounds and complexes. We will study concepts in bonding, trends in periodic properties, molecular symmetry, solid-state, reaction mechanisms, coordination chemistry, and the descriptive chemistry of selected elements **Prerequisite:** CHMY 371. **(1st)**

CHMY 502 Advanced Inorganic Chemistry II

3 Cr.. (Hrs.:.:2. Lec., 3 Lab)

The theories introduced in CHMY 501 are applied to the elements and their compounds. The chemical and physical properties of each periodic group are discussed. **Prerequisite:** CHMY 501. **(2nd)**

CHMY 565 Organic Spectroscopy.

3 Cr.. (Hrs.:.:3 Lec.)

Interpretation of NMR, IR, UV and mass spectra are used to determine the structure of compounds. Variations in instrumental techniques to elucidate the structures are discussed. **Prerequisites:** CHMY 422, 323. **(On Dem.)**

CHMY 530 Chemistry Literature

2 Cr.. (Hrs.:.:1 Lec. 1 Lab)

Provides practical experience in locating and utilizing scientific and technical literature in the student's field of study. The lecture provides an overview of the purpose and structure of the weekly library assignment. The library assignment is designed to illustrate the main feature of a given resource. Includes familiarization with computer search methods. **(1st)**

CHEM 535 Theoretical Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

Introduction to quantum mechanics and statistical thermodynamics. Topics include the hydrogen atom, approximation methods, many electron atoms, molecular spectroscopy, and equilibrium statistical thermodynamics. **Prerequisite:** M 274. **(1st)**

CHMY 5406 Environmental Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

This course utilizes physical and chemical principles to provide a detailed understanding of the chemistry of natural waters and the interaction of these waters with the environment. **Prerequisites:** CHMY 371. **(2nd)**

CHMY 542 Fate & Transport of Organics in the Environment

3 Cr.. (Hrs.:.:3 Lec.)

This course will examine how vapor pressure, solubility, partitioning, diffusion, sorption, reactivity, photochemistry, and biological processes affect the movement and distribution of organic chemicals introduced into the natural environment. The course will adapt a quantitative molecular understanding of these processes. **Prerequisite:** CHMY 210 or 321 & 371, or Consent of Instructor. **(1st)**

CHEM 5506 Polymer Chemistry

3 Cr.. (Hrs.:.:3 Lec.)

Covers the structure, synthesis, kinetics, distribution, conformations, and morphology of polymers. **Prerequisites:** CHMY 210 or 323 and 373. **(2nd, Alt.)**

CHMY 594 Graduate Geochemistry Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Geochemistry graduate students are required to take two credits of seminar. These may be taken either in the Chemistry or Geology Department courses. It is recommended that one seminar be presented in each department. **(1st & 2nd)**

CHMY 5597 Geochemical Modeling

1-4 Credits each time elected

Covers special topics not specifically designated in other course titles. Some examples are as follows: Advanced analytical chemistry, electrochemistry, non-equilibrium thermodynamics, silicate chemistry, phase rule, clay mineralogy, radiogeology, groundwater chemistry. **Prerequisite:** Consent of Instructor. **(On Dem., 1st & 2nd)**

CHMY 599 Thesis Research

Credits to be Arranged

A specific theoretical or applied problem resulting in an original investigation within the field of geochemistry to be selected by the graduate student and the graduate committee. **(Summer, 1st, & 2nd)**

CHEM 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

CHEM 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

CIVIL ENGINEERING TECHNOLOGY

CET 0102 General Surveying

3 Cr.. (Hrs.:.: 2 Lec, 2 Lab)

Topics covered will include algebra and trigonometry review, measurement accuracies and errors, steel tape and electronic measuring procedures, differential and trigonometric leveling, traverse measurement and adjustment, mapping projections, horizontal datums and coordinate systems, and GPS measurement procedures.

CET 0220 Fundamentals of Cemented Aggregate Mixtures and Testing

3 Cr.. (Hrs.:.:3 Lec.)

Introduction to the fundamentals of aggregates, asphalt and portland cement concrete construction materials, including physical properties, testing, and placement. Discuss methods of cemented aggregate mix design. Utilize the ACI method for portland cement concrete mix design and Superpave methods for bituminous mix design and applies methods in the laboratory. Examine methods of materials testing.

CET 0234 Construction Surveying

3 Cr.. (Hrs.:.:3 Lec.)

This course will provide students with the knowledge and practical skills to conduct construction surveying for all phases of site construction. They will conduction surveys for buildings, water mains, sewer mains, storm water and road design, layout, and construction control. **(2nd)**

CET 0235 Legal Documents and Specifications

2 Cr.. (Hrs.:.:2 Lec.)

An introduction to Laws, Contracts, Engineering/Construction Specifications, and Proper Documentation for the Engineering/Technical Profession. **(2nd)**

CET 0236 Site Evaluation and Testing

3 Cr.. (Hrs.:.:3 Lec.)

Introduces students to the fundamentals of soils engineering technology, including soil composition, practical soil sampling and testing; classification toward unified, ASTM and ASSHTO specifications; Soil/site investigation, testing, and calculations for on site wastewater treatment and system design as well site calculations / evaluations of hydraulic and hydrology toward storm water management and design. **Prerequisite:** M 121

CET 0237 Cadastral Surveying

3 Cr.. (Hrs.:.:3 Lec.)

This class introduces students to the history, and principles of the public land survey system, legal descriptions, easements, and conveyances. Students will learn the fundamentals of legal boundary location and the identification of property corners and their monumentation. Students will be working both in the classroom and numerous locations around the county. **Prerequisite:** MIN 2100; **Corequisites:** D.T. 0204

CET 0299 Special Projects

1 to 4 Credits

This is either an independent investigation of a special problem or project associated with engineering technology or a means of offering classes of special interest as a onetime, short course, or Intersession offering. **Prerequisites: Fourth Semester Standing**

CET 0916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Engineering Technology degree programs. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

COMMUNICATIONS

COMM 0001 English

3 Cr.. (Hrs.:.:3 Lec.)

This course covers fundamentals of grammar and basic punctuation. Course credit does not count toward program requirement.

WRIT 095 Developmental Writing

3 Cr.. (Hrs.:.:3 Lec.)

Course provides instruction and practice in basic writing skills, emphasizes paragraph development and organization, and reviews sentence structure, word choice, and spelling. Assignments include short pieces, journals, and essays. Mastery of the basics of grammar and mechanics is assumed.

WRIT 122 Intro. to Business Writing

3 Cr.. (Hrs.:.:3 Lec.)

Class integrates major business English skills with traditional business communication concepts. Students will write letters and reports. Major emphasis is placed on writing clear, forceful, and persuasive documents. Technical aspects such as format, style, and organization will be covered. **(2nd)**

WRIT 080 Building Basic Writing Skills

1 Cr.. (Hrs.:.:1 Lec.)

A "refresher" course aimed at helping students improve their mastery of the standard rules and conventions of written English, including sentence structure, grammar, usage, and style. While open to all students, incoming students without the minimum ACT English score (or SAT equivalent) must enroll in and successfully complete WRIT 080 prior to enrolling in College Writing I (WRIT 101). This course does not count towards graduation. **(1st, 2nd)**

WRIT 101 College Writing I

3 Cr.. (Hrs.:.:3 Lec.)

Introduces students to forms and processes of written communication appropriate to college-level audiences. Coverage includes, at a minimum, expository prose, formal research writing, grammar, usage, and style. **(1st, 2nd)**

WRIT 101H College Writing I Honors

3 Cr.. (Hrs.:.:3 Lec.)

Honors course. Introduces students to forms and processes of written communication appropriate to college-level audiences. Coverage includes, at a minimum, expository prose, formal research writing, grammar, usage, and style. **(1st, 2nd)**

COMM 1216 Principles of Speaking

3 Cr.. (Hrs.:.:3 Lec.)

A performance course in public speaking for the beginner covering theory and practice in the preparation and presentation of original speeches to inform and persuade. Logical organization is stressed. **(1st, 2nd)**

COMM 1226 Public Speaking

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of COMM 1216 with greater emphasis on argumentation, persuasion, audience analysis and adaptation, and oral style. **Prerequisite:** COMM 1216 or Consent of Instructor. **(1st, 2nd)**

COMM 1956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of communications not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

COMM 2016 Presenting Technical Information

2 Cr..(Hrs.:.:1 Lec; 1 Recitation)

Interactive, participatory course which requires use of multimedia to enhance the visual dimension of oral presentations. **(1st, 2nd)**

WRIT 201 College Writing II

3 Cr.. (Hrs.:.:3 Lec.)

Enables students to further develop their expository writing skills, with particular emphasis on editing, writing for various disciplines, and research using both traditional and electronic sources. **Prerequisite:** WRIT 101. **(1st, 2nd)**

COMM 2146 Mass Media

3 Cr.. (Hrs.:.:3 Lec.)

Examines the impact of print and electronic media on the American environment. Introduces several media theories and examines both the application of these theories to the different media and the impact of the media on society. Particular attention is given to how media consumers can become better informed and able to assess their media environment intelligently. **(2nd)**

COMM 2956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of communications not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

COMM 3226 Group Dynamics

3 Cr.. (Hrs.:.:3 Lec.)

A study of decision-making, leadership and interpersonal communication in the small group. Intensive involvement in small problem-solving groups and participation in panel discussions and symposiums. **(2nd)**

COMM 3246W Business & Professional Communication

3 Cr.. (Hrs.:.:3 Lec.)

Examines communicative behavior in complex organizations. Change, conflict, decision-making, development and leadership are considered as communication variables within the organizational setting. Focuses on problems in management communication, leadership in meetings, conference procedures, interviewing techniques, and the delivery of scientific and professional speeches. **(2nd)**

COMM 3256 Advanced Speech Activities

2 Cr.. (Hrs.:.:2 Lec.)

Two credits may be earned per semester for a maximum of four semesters. Only those grade points and credits earned the first time will be counted toward graduation requirements in any degree program. **Prerequisites:** COMM 1216 and 1226. **(On Dem.)**

COMM 3276W Interpersonal Communication

3 Cr.. (Hrs.:.:3 Lec.)

Considers the nature and role of person-to-person communication and influence transactions. Emphasizes the development of knowledge and skills applicable to face-to-face interactions between individuals. **(1st)**

COMM 3286 Argumentation

3 Cr.. (Hrs.:.:3 Lec.)

Covers theories and techniques of argumentation and the critical analysis of selected argumentative speeches. Logic, analysis of proposition, briefing, tests of evidence, reasoning and fallacies in reasoning are stressed. **Prerequisite:** COMM 1216 or Consent of Instructor. **(2nd)**

COMM 3316 Creative Writing

3 Cr.. (Hrs.:.:3 Lab)

A course in writing imaginative literature of all kinds: short fiction, poetry, drama,

exposition, and longer fiction. **Prerequisite:** Consent of Instructor. **(2nd)**

COMM 3956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of communications not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

COMM 4216 Public Relations Practice & Management

3 Cr.. (Hrs.:.:3 Lec.)

Treats public relations as a complex management function by which an organization, institution or industry seeks to establish a good relationship with the individuals and groups with whom it is concerned. Provides a background in public relations theory, practice and management and seeks a balance between theory and practical problem-solving. **Prerequisite:** COMM 1216 or Consent of Instructor. **(1st)**

COMM 4296 Communication Theory

3 Cr.. (Hrs.:.:3 Lec.)

Survey of the contributions of behavioral sciences and philosophy to a unified theory of communication. Topics include the nature and development of contemporary communication theory, analysis of general and specific theories of communication, critiques of communication theory, humanistic contributions to communication theory, and future directions of communication theory. **Prerequisite:** COMM 1216 or Consent of Instructor.

COMM 4556 Persuasion

3 Cr.. (Hrs.:.:3 Lec.)

Deals with the analysis of persuasive communication as a form of influence, the process and functions involved in persuasive communication, and persuasive communication potential and limitations for individuals and organizations. Focuses on the principles involved in influencing an audience with emphasis on the means by which speakers try to influence the attitudes, beliefs, values, and actions of others. **Prerequisite:** COMM 1216 or 1226, or Consent of Instructor. **(2nd)**

COMM 4921 Senior Technical Communication Seminar

1 Cr.. (Hrs.:.: 1 Lec)

A participatory course in which students develop and refine both oral and written communication skills. This course supports and complements PET 4920 Petroleum Engineering Project Design and emphasized the development, organization, and effective delivery of technical information using written and multimedia formats. This course focuses on developing and refining the oral and written communication skills expected of professionals in the engineering field. Working from the assigned senior project topic (PET 4920), students will examine and apply the fundamentals of critical thinking and organization; planning drafting, and revising documents and oral presentations. Practice presentations will be used to solicit feedback from instructors and peers to help focus revision efforts and polish final delivery. Prerequisite: Senior Standing. Corequisites: PET 4920**. (1st, 2nd)**

COMM 4956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of communications not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

COMPUTER SCIENCE

C.S. 1006 Computer Science & Software Engineering Freshman Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Required introduction to the Computer Science and Software Engineering programs. Students will discuss what it means to be a professional in the fields of computer science and software engineering, meet professionals in these fields, and hear about the wide range of employment opportunities. Throughout the course students will meet the faculty of the Computer Science Department and learn of their diverse expertise. By the end of the course, each student will have developed a resume and a career plan and will have learned how a Tech education prepares them for rewarding employment. **(1st)**

C.S. 1016 Computational Thinking

2 Cr.. (Hrs.:.: 2 Lec)

Computational thinking involves solving problems, designing systems, and to understanding human behavior, by drawing on the concepts fundamental to computer science. It is the study of an effective approach used by people to solve problems. Critical thinking involves the systematic evaluation of information, and is a crucial piece of problem solving. The two are combined in this course to provide the student with a powerful set of tools to understand and solve the kinds of problems they will encounter in their college studies and future careers. **(1st)**

C.S. 1026 Computational Thinking with Lab

3 Cr.. (Hrs.:.: 2 Lec, 3 Lab)

Computational thinking involves solving problems, designing systems, and to understanding human behavior, by drawing on the concepts fundamental to computer science. It is the study of an effective approach used by people to solve problems. Critical thinking involves the systematic evaluation of information, and is a crucial piece of problem solving. The two are combined in this course to provide the student with a powerful set of tools to understand and solve the kinds of problems they will encounter in their college studies and future careers. The lab incorporates a programming component In this programming lab, students learn to carefully and systematically analyze problems and demonstrate the correctness of their solution by implementing it in program code. **(1st)**

C.S. 2106 Introduction to Computer Science I

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

An introduction to problem-solving methods and algorithm development. Stresses programming in a high level programming language with techniques of good programming style. **Corequisites:** M 151. **(1st, 2nd)**

C.S. 2116 Introduction to Computer Science II

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

A continuation of C.S. 2106. Explores the finer and more subtle elements of a programming language. Programming techniques and structures include arrays, records, and linked lists. **Prerequisite:** C.S. 2106. **(2nd)**

C.S. 2126 Applications Programming

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to problem-solving methods and algorithm development in an Object-oriented environment. Stresses techniques of good programming style. *(This course may not be substituted for C.S. 2106)*. **Prerequisite:** High School Algebra. **(1st, 2nd)**

C.S. 2136 Matlab Programming for Engineers and Scientists

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

An introduction to problem-solving methods and programming techniques using the Matlab programming package. The student will learn to construct efficient and easy to understand programs for engineering and scientific applications. **Corequisites:** M 151. **(1st)**

C.S. 2146 C Programming for Engineers and Scientists

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

An introduction to problem-solving methods and programming techniques that can be applied to C and other programming languages. The student will learn and use C to construct efficient and easy to understand programs for engineers and scientific applications. **Corequisites:** M 151. **(2nd)**

C.S. 2156 Embedded Systems Development

3 Cr.. (Hrs.:.:3 Lec.)

Develops basic concepts of computer systems and computer architecture. Includes base-2 arithmetic, octal and hexadecimal number systems, computer addressing modes, I/O, and assemblers. **Prerequisite:** C.S. 2106, C.S. 2146 or Consent of Instructor. **(2nd)**

C.S. 2546 Object-Oriented Programming

3 Cr.. (Hrs.:.:3 Lec.)

This course reinforces object-oriented programming concepts introduced in C.S. 2116. Students will learn and use a second programming language (e.g., C++, Java). Topics include object-oriented programming and design, including encapsulation, inheritance, and polymorphism. **Prerequisites:** C.S. 2116 or Consent of instructor. **(1st)**

C.S. 2656 Database Management

3 Cr.. (Hrs.:.:3 Lec.)

Studies concepts and applications in database management including the relational

model, relational algebra, structured Query Language (SQL), and application development. **Prerequisite:** C.S. 2116, or 3126, or 2136 & 2146. **(2nd)**

C.S. 2916 Internship

1 to 6 Cr.. (Variable)

For academic work in conjunction with an approved work experience related to Computer Science.

C.S. 2956 Special Topics

Variable Credit

Course title depends on topic. This course may be repeated as often as desirable. **(On Dem.)**

C.S. 2966 Independent Study

Variable Credit

Designed to allow students to work independently on a significant computing problem. Student must be directly supervised by a member of the Computer Science Department. May be repeated for a maximum of 15 credits. **(On Dem.)**

C.S. 3126 Advanced Application Programming

3 Cr.. (Hrs.:.:2 Lec.; 3 lab)

This class is a continuation of the introductory Application Programming class CS 2126. It will cover more advanced concepts in the Visual Basic Programming Language and how they apply to traditional business programming applications. Topic will include: ActiveXData Objects (ADO), Component Object Model (COM), ActiveXControls (creating and using and DLL's), Windows Application Programming Interfaces (API). data access and report presentation within the Data Environment. This course will also cover the actual Deployment and Support of Applications. Each laboratory will consist of a short lecture followed by actual application development. Upon successful completion of this course, the student should be able to use advanced programming techniques commonly required for creating commercial quality software. **Prerequisite:** C.S. 2126 or consent of the instructor. **(2nd)**

C.S. 3166 Discrete Structures

3 Cr.. (Hrs.:.:3 Lec.)

Course includes those mathematical topics which will help students in future courses. It refines problem solving skills by providing a vocabulary, structures and techniques for working with problems. Topics include basic counting techniques, recursion, logic, proofs, graph theory, cryptography and number theory. **Prerequisite:** C.S. 2116 & M 172 **(2nd)**

C.S. 3316 Data Structures & Algorithms I

3 Cr.. (Hrs.:.:3 Lec.)

Commonly used structures found in computing and the algorithms which manipulate them are studied. Design and analysis of algorithms are emphasized. Topics include stacks, queues, general lists, trees, hashing, searching, and sorting. **Prerequisites:** CS 2546; **Corequisites:** C.S. 3166. **(2nd)**

C.S. 3326 Data Structures & Algorithms II

3 Cr.. (Hrs.:.:3 Lec.)

Continuation of C.S. 3316. Advanced structures and algorithms are studied. **Prerequisites:** C.S. 3316. **(1st)**

C.S. 3356 Programming Languages

3 Cr.. (Hrs.:.:3 Lec.)

Develops concepts of high-level programming languages. Topics include compilers, interpreters, formal syntax and complexity. Syntax and semantics of several existing programming languages are studied. **Prerequisites:** C.S. 3316. **(2nd)**

C.S. 3406 Operating Systems Design

3 Cr.. (Hrs.:.:3 Lec.)

I/O management, memory management, processor management, device management and performance measurement/evaluation are examined. Other operating systems, theoretical and current, are discussed. **Prerequisite:** C.S. 2156 and 3316. **(2nd)**

C.S. 4206 Decision Support Systems

3 Cr.. (Hrs.:.: 3 Lec.)

Provides a grounding in decision support systems and prepares students to design, use, and evaluate these systems in a variety of application domains. Topics covered include rule-based production systems, fuzzy logic, and data mining for knowledgeable rule generation. **Prerequisites:** C.S. 2126 and CAPP 158. **(1st)**

C.S. 4386 Theory of Computation

3 Cr.. (Hrs.:.:3 Lec.)

Students will look abstractly at computers and what it means to be computable. Turing machines, which appear to be powerful enough to serve as the basis for defining computability, will be studied and students will learn that some questions are not computable by any computing machine. Regular and context-free languages will also be studied. **Prerequisite:** C.S. 3326. **(1st)**

C.S. 4406 Computer Architecture

3 Cr.. (Hrs.:.:3 Lec.)

Studies the organization and interconnection of components of computer systems. Topics include microprocessor architecture, memory and storage, I/O processing, overlap and pipeline processing, and parallel computers. **Prerequisite:** C.S. 2156 and C.S. 3316. **(2nd)**

C.S. 4516 Data Communication Systems & Networks

3 Cr.. (Hrs.:.:3 Lec.)

Studies data communication at the hardware level. Covers network management and the recent technology of distributed environments. Includes hands-on experience in programming and creating a network environment. **Prerequisite:** C.S. 2106 or 2126 or consent of the instructor. **(1st)**

C.S. 4526 Networking Principles

3 Cr.. (Hrs.:.:3 Lec.)

A study of the fundamental principles of computer based communication. Principles, design, and standards of networks will be discussed, including standard network protocols. Includes an introduction to telecommunications and basic data transfer processes. **Prerequisite:** C.S. 3326.

C.S. 4556 Artificial Intelligence

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to the basic concepts of Artificial Intelligence. Topics to be covered include the History of AI, and various artificial intelligence technologies, solution techniques, state spaces, search algorithms and heuristics.. **Prerequisite:** C.S. 3326. **(2nd)**

C.S. 4606 Senior Design Project

1 to 6 Credits

Individual or small group pursuit of a project preferably an advanced topic in computing. **Prerequisite:** Senior standing, Consent of Instructor and department head. **(1st, 2nd)**

C.S. 4616 Systems Design Process

3 Cr.. (Hrs.:.:3 Lec.)

Articulates the areas of computer technology, systems analysis, and systems design. Students are involved in designing complete computing systems for a range of applications, from the small business system to a large mainframe environment. **Prerequisite:** C.S. 2106 or 2126. **(1st)**

C.S. 4916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Computer Science degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

C.S. 4946 Senior Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Investigations in the Computer Science and Software Engineering fields. Students will report on their internship experience, present their senior design projects, and/or present their undergraduate research. Faculty and guest speakers will discuss current issues in computer science and software engineering, Students will take an exam covering their computer-related course work. Students will demonstrate their ability to apply a computer-related code of ethics (ACM, IEEE, or SE). This is a required seminar for computer science and software engineering seniors.. **Prerequisite:** Senior standing or Consent of Instructor. **(2nd)**

C.S. 4956 Special Topics

Variable Credit

Course title depends on topic. This course may be repeated as often as desirable.

C.S. 4966 Independent Study

Variable Credit

Designed to allow students to work independently on a significant computing problem. Student must be directly supervised by a member of the Computer Science Department. May be repeated for a maximum of 15 credits. **(On Dem.)**

CONSTRUCTION TRADES

CNST 0100 Construction Tech Fundamentals & Safety

3 cr..

Explore the basics in construction-related safety equipment. It also covers proper safety procedures in the operation of hand and power tools.

CNST 0110 Blueprint Reading, Codes and Estimation for Construction

3 cr..

Concentrates on concepts associated with blueprint reading, sketching, and interpreting light commercial and residential drawings. It includes instruction in the recognition of construction materials, procedures, specifications, codes and methods of estimating construction costs from blueprints. This course also covers trade-specific symbols found on construction drawings.

CNST 0280 Building Management

3 Cr..

DRAFTING TECHNOLOGY

D.T. 0115 Technical Drawing I

5 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course provides an introduction to the basics of drafting. Topics covered in this course include an identification of drafting equipment and its use, lettering fundamentals, line-work used on engineering drawings, geometric constructions, theories of multi-view projection, sketching techniques, principles of orthographic projection using two- and three-view drawings, basic dimensioning techniques, basic isometric drawings, and a brief coverage of sectional views. Material covered in this course will not only provide a strong basis for manual drafting, but will also benefit students who will take computer aided drafting (CAD) courses later on in the drafting program. **(1st)**

D.T. 0120 Technical Drawing II

3 Cr.. (Hrs.:.:1 Lec., 2 Lab)

This course is a continuation of D.T. 115—Technical Drawing I—and covers more advanced multi-view drawings, dimensioning techniques, sectional views, auxiliary views and revolutions, descriptive geometry, threads and fasteners, pictorial drawings including isometric and oblique drawings, tolerancing, and a brief coverage of electrical/electronic, piping, welding and structural drawings. **Prerequisite:** D.T. 0115 **(2nd)**

D.T. 0125 AutoCAD I

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course is designed to cover the basic AutoCAD 2D commands and procedures. The course covers drawing setup, computation for scale factors, geometric construction, sectional views, basic architectural room layouts, and civil plot plans. Annotation of drawing is also covered by the use of text and dimensions. **Corequisites:** D.T. 0115, CAPP 131 **(1st)**

D.T. 0126 MicroStation I

3 Cr.. (Hrs.:.:3 Lec.)

This course is to introduce the basic commands of MicroStation CAD. MicroStation is a computer aided drafting software utilized by the State Department of Transportation, engineering, surveying, and architectural firm's nation wide. This course will cover 2D drawing setup, development, and editing of geometric figures, plot plans, and architectural floor plans. The software similarities and differences between MicroStation and AutoCAD will be discovered. **Prerequisite:** D.T. 0125 **(2nd)**

D.T. 0204 Civil Drafting

3 Cr.. (Hrs.:.:3 Lec.)

The drafting student is presented with a new form of creating drawings. Students work from written legal descriptions and field notes to produce site plans, plats, topographic maps and engineering plans. **Prerequisite:** D.T. 0278 **(1st)**

D.T. 0205 Civil Drafting II

3 Cr.. (Hrs.:.:3 Lec.)

This course is designed to cover the methods and materials used to construct commercial and residential buildings. Blueprint reading is introduced to show material relationships and methods of construction. Product research, building codes, case studies, reference manuals, and sizes of structural steel components will also be covered in this course. **Corequisites:** D.T. 0125 **(2nd)**

D.T. 0250 Building Methods & Materials

4 Cr.. (Hrs.:.:4 Lec.)

This course is a continuation of D.T. 0204 Civil Drafting. Students will achieve an advanced knowledge to produce site plans, plats, and Civil Engineering plans, while utilizing advanced functions of Autodesk Civil 3D. Students will use software specific to civil design/drafting to draw roads with horizontal and vertical curves, pipe inverts, grading, road profiles and cross sections. **Prerequisite:** D.T. 0204. **(2nd)**

D.T. 0255 Architectural Drafting

3 Cr.. (Hrs.:.:3 Lec.)

This course is designed to cover drafting practices used to draft small commercial and residential buildings. Drafting a small commercial building is the main project for this class as well as Blueprint reading as it pertains to architectural buildings. **Prerequisite:** D.T. 0250, and 0278. **(1st)**

D.T. 0260 Architectural Drafting II

3 Cr.. (Hrs.:.:3 Lec.)

This course is a continuation of D.T. 0255 Architectural Drafting. This course is designed to cover advanced drafting practices used to draft small commercial and residential buildings. Drafting a small residential house and commercial building using software specific to architectural drafting are the primary projects. Computer mass modeling, component and assembly renderings and complete building renderings will be also be incorporated. **Prerequisite:** D.T. 0255. **(2nd)**

D.T. 0278 AutoCAD II

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course is a continuation of D.T. 0125 and covers some of the more advanced drafting procedures using AutoCAD. Block attributes and the extraction of the block information is the main focus of this course. The information extracted can be used in word processed documents and spreadsheets in the creation of bill of material and parts lists for engineering/ architectural drawings. **Prerequisite:** D.T. 0125 **(2nd)**

D.T. 0279 MicroStation II

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course is a continuation of MicroStation I. It will cover the more advanced features of 2D MicroStation, including cell and seed file construction, level manipulation, and multi-plan development. The creation of 3D objects, with multi-view planning/plotting. This course will cover all aspects for MDT Intermediate Certification. **Prerequisite:** D.T. 0126 - MicroStation I

D.T. 0280 AutoCAD III

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course is designed to give a comprehensive study of 3D objects, their construction techniques and properties. The creation of orthographic drawings from a single 3D object is also explored. Computer renderings, model studies, and animation are covered using various software programs. **Prerequisite:** D.T. 0278 **(1st)**

D.T. 0281 MicroStation III

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course will utilize MicroStation along with GeoGraphics, GEOPAK,

CivilDraft, Masterpiece, and other software and hardware applications for the development of engineering and architectural plan sets. Students will be required to develop mechanical working drawings, civil site & road plans, and architectural plan sheets utilizing add on software packages.

This class will develop macros, and programming aids to assist in drawing productivity and efficiency. **Prerequisite:** D.T. 0279 - MicroStation II

D.T. 0284 AutoCAD Applications

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course applies various computer hardware and software aspects to complete a project. Students will use various types of computer hardware such as scanners, video capture/output cards, and digitizers to obtain information and files used in office projects. Various software and software applications are explored such as the import and export of files, OLE&DDE, referencing, paper space, file conversion, and file name extensions and the software that can use and produce them are also explored. **Prerequisite:** D.T. 0278 **(2nd)**

D.T. 0285 Special Projects

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Project will be based on CAD experience. This course is designed to use all the tools and skills the students have learned to produce an advanced project. The project is one that is approved and is to include progress reports, notes and concept sketches, research notes, a project journal, and all drawings, renderings, and animations necessary to best represent the project **Prerequisite:** D.T. 0278 **(1st) (2nd)**

D.T. 0290 Advanced Special Projects

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Advanced project will be based on CAD experience. This course is designed to use all the tools and skills the students have learned to produce an advanced project. The project is one that is approved and is to include progress reports, notes and concept sketches, research notes, a project journal, and all drawings, renderings, and animation's necessary to best represent the advanced project. **(On Dem.)**

D.T. 0916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Drafting Technology degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

ECONOMICS

ECNS 202 Principles of Macroeconomics

3 Cr.. (Hrs.:.:3 Lec.)

Covers the principles of supply and demand in our national economy and the role of fiscal and monetary policy to help solve problems associated with inflation and unemployment in the United States. (SS) **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st, 2nd)**

ECNS 201 Principles of Microeconomics

3 Cr.. (Hrs.:.:3 Lec.)

Covers traditional microeconomics topics including supply and demand and elasticity relationships, marginal analysis for equilibrium levels of outputs and inputs for firms in various industry sectors and international trade and finance. (SS) **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st, 2nd)**

ECNS 203 Principles of Economics

3 Cr.. (Hrs.:.:3 Lec.)

Covers the major aspects of macroeconomics (national income accounts, employment and inflation, and monetary and fiscal policy) and microeconomics (firms and markets). (SS) **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st, 2nd)**

ECNS 391 Special Topics

Variable Credit

Special topics is to be determined by the faculty member offering the course and the department. Topic will deal with some aspect of economics not covered by existing departmental courses. This course is designed to complement present course offerings. **Prerequisite:** Consent of Instructor. **(On Dem.)**

ELECTRICAL ENGINEERING

E.E. 1010 Introduction to Electrical Engineering I

1 Cr.. (Hrs.:.: 3 Lab)

This laboratory course provides an introduction to the theory and practice of electrical engineering. Students work on projects that develop circuit building skills and a practical understanding of voltage, current and power measurements. An introduction to computer control and computer aided design in electrical engineering is presented. Short field trips and guest lectures will be featured exploring career paths in electrical engineering. A small design project is included. Prerequisite : M 121. Corequisites M 171. **(2nd)**

E.E. 2010 Introduction to Electrical Engineering II

1Cr. (Hrs.:. : 3 Lab)

A continuation of E.E. 1010 with an emphasis on digital circuits. The theory and practice of logic gates, truth tables, TTL IC's and logic probes are introduced through digital circuit building projects. A small design project requiring the student to build, troubleshoot and test a practical digital circuit is completed. Short field trips and guest lectures will be featured. Prerequisite: E.E. 1010. **(1st)**

E.E. 2530 Introduction to Electric Circuits

3 Cr.. (Hrs.:.:3 Lec.)

This course provides an introduction to basic electric circuit analysis. Concepts covered include steady-state DC circuits, AC steady-state circuits using phasor analysis, AC power calculation, first order transient, ideal op-amps, ideal transformers, and introduction to balanced 3-phase circuits. . **Corequisites:** PHYS 2086. **(1st,**

E.E. 2550 Electric Circuits Laboratory

1 Cr.. (Hrs.:.: 3 Lab)

A laboratory course covering basic steady-state passive AC and DC circuits, ideal op-amps, and first and second state transients. Includes use of the computer simulation program Pspice. **Corequisites:** E.E. 2530, PHYS 2106. (**1st, 2nd**)

E.E. 2910 Internship

1 to 6 Cr.. (Variable)

A course designed to give credit for academic work done in conjunction with an approved work experience related to the Engineering degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated for a total of four credits. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

E.E. 3270 Digital Circuit Design

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Digital circuit design techniques. Emphasis on combinational and sequential circuit design using commercially available TTL and MOS integrated circuits. Topics in analog to digital conversion (and vice-versa) together with digital data transmission are covered.
Prerequisite: PHYS 3036, E.E. 2010 **(2nd)**

E.E. 3540 Electric Machines

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course covers advanced topics in AC three phase power, DC generators and motors, AC synchronous alternators and motors including line synchronization, transformers, motor drives, and induction machines used as motors and generators. Laboratory exercises support lecture material and include motor and generator control, speed control, testing, trouble shooting, and torque-speed characteristics. **Prerequisite:** E.E. 2530 and 2550. (**1st**)

E.E. 3550 Electric Circuits II

4 Cr.. (Hrs.:. 3 Lec., 3 Lab)

Continuation of E.E. 2530 and 2550 covering transient analysis, frequency response analysis, and introduction to filtering. Concepts include the use of Laplace transforms, Fourier series, Fourier transforms, and Bode plots for analyzing circuits. Labs include use of computer simulation programs and physical labs.

Prerequisite: E.E. 2530 & 2550. **(1st)**

E.E. 3570 Electronic Design

4 Cr.. (Hrs.:. 3 Lec., 3 Lab)

Review of basic circuit analysis laws, semiconductor physics of electronic devices, operational amplifiers, diodes, BJTs, JFETs, and MOSFETs. Application of these devices to electronic circuit design with emphasis on practical instrumentation problems. Laboratories focus on computer modeling of circuits and electronic circuit design for practical applications. **Prerequisite:** PHYS 3036 and E.E. 3550. **(2nd)**

E.E. 3580 Signals & Systems Analysis

3 Cr.. (Hrs.:.:2 Lec.; 3 Lab)

Continuous and discrete-time signals and systems. Concepts covered include time and frequency-domain analysis using Laplace and Fourier transformers forms, discrete Fourier transforms, Z-transforms, and sampling theory. Labs include use of analysis software. Applications to circuits, feedback control, and communication systems are emphasized. **Prerequisite:** E.E. 3550. **(2nd)**

E.E. 3950 Special Topics

Variable Credits

Specific topic to be determined by individual faculty member offering course. Topic will deal with some aspect or application of engineering not covered by existing courses. This course is designed to compliment existing course offering. May be repeated for a maximum of six credits. **Prerequisite:** Consent of Instructor. **(On Dem.)**

E.E. 4280 Intro. to Microprocessors

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

An advanced course in the application of embedded systems and digital circuit applications. Embedded Microcontroller architecture, programming and interfacing. Use of modern embedded systems and digital circuits to solve I/O problems.

Prerequisites: CS 2156 and E.E. 3270 and an introductory programming course. **(1st, odd years)**

E.E. 4410 Control System Theory & Design

3 Cr.. (Hrs.:.:3 Lec.)

An introductory treatment of the methods for feedback control system analysis and design. Topics include modeling (frequency and time domain), analysis, and classical design (root locus and frequency response methods). The class includes a detailed treatment of PID and lead-lag controllers. Course includes a design project. **Prerequisites:** E.E. 3550; **(1st)**

E.E. 4420 Control Systems Laboratory

1Cr. (Hrs.:: 3 Lab)

Application of control systems theory to real-time systems. Design and implementation of analog, digital and computer/microprocessor feedback control to fluid flow, motor, mechanical and thermal open loop systems. Use of computer simulation as a design tool is investigated. A capstone design project is required. **Prerequisites:** ENGR 4410; **(2nd)**

E.E. 4440 Communications Systems

3Cr. (Hrs.:: 3 Lec)

Provides an introduction to the theory of modern communication systems. Course includes a review of discrete and continuous system theory for time domain and frequency domain, and an introduction to continuous modulation and demodulation methods including amplitude, angle, and frequency techniques. Other topics include system bandwidth considerations, probability and random signals, statistical evaluation of systems and noise, sampling theory, analog pulse modulation, digital coding, error correcting, and basic digital communications. **Prerequisites:** E.E. 3570, and E.E. 3580 **(1st)**

E.E. 4450 Process Instrumentation & Control

3 Cr.. (Hrs.:.:3 Lec.)

Provides an introduction to instrumentation used in process control and applications and discrete control. Course content includes: 1) standard methods for measuring plant processes; 2) smart instrumentation design, communication and calibration; 3) final control element selection, setup and operation; 4) application of continuous control; and 5) use of PLC's and control elements. A design project is included. Cross-listed with ENGR 4450. **Prerequisite:** E.E. 2530; PHYS 2106 **(1st)**

E.E. 4460 Process Instrumentation & Control Lab

1 Cr.. (Hrs.:.:3 Lab)

Application of principles and practices presented in ENGR 4450. A design project is included. Cross-listed with ENGR 4460. **Prerequisite:** E.E. 2530; PHYS 2106 **Corequisites:** E.E. 4450 **(1st)**

E.E. 4470 Analog and Discrete Network Synthesis

3 Cr.. (Hrs.:.: 2 Lec., 3 Lab)

Course covers methods of synthesizing transfer functions using analog active electrical circuits and discrete-time difference equations, design of analog active filters, and design of discrete-time filters. **Prerequisite** E.E. 3570 and E.E. 3580. **(1st, odd years**).

E.E. 4500 Power System Analysis

3 Cr.. (Hrs.:.:3 Lec.)

Provide an introduction to electrical engineering analysis tools for three-phase synchronous systems. This includes basic transformer, transmission line, generator and load modeling methods; power-flow analysis; symmetrical components for unbalanced systems; and introduction to fault analysis. **Prerequisite:** E.E. 3540 . **(1st,)**

E.E. 4510 Power System Protection, Operation, & Control

3 Cr.. (Hrs.:.:3 Lec.)

Continuation of E.E. 4500. Symmetrical and unsymmetrical fault analysis, system protection, introduction to load frequency control, voltage control, economic dispatch, and introduction to power system stability. **Prerequisite:** E.E. 4500 or Consent of Instructor. **(2nd, odd years)**

E.E. 4520 Power Electronics

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Common power electronic devices are studied and their design applications are developed. Devices studied include power diodes, thyristors, transistors, and gating devices. Common design applications include DC-DC, DC-AC, AC-DC, and AC-AC converters and power supplies. The lab component will include the use of design computer software and actual circuit construction. **Prerequisite:** E.E. 3570 and PHYS 4056 or Consent of Instructor. **(2nd, even years)**

E.E. 4910 Internship

1 to 6 Cr.. (Variable)

A course designed to give credit for academic work done in conjunction with an approved work experience related to the Engineering degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated for a total of four credits. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

E.E. 4920W Engineering Design

2 Cr.. (Hrs.:.:1 Lec., 3 Lab)

The first semester of a capstone engineering design sequence that requires students to apply engineering principles to a project either selected by instructor or the student with instructor's approval, or provided by industry. Students shall develop a design proposal that includes requirement and multiple constraints, and initiate work on the project. **Cross listed with ENGR 4920W. Prerequisite:** E.E. 3570. **Corequisites:** E.E. 4410 or E.E. 4440. **(1st)**

E.E. 4930W Engineering Design

1 Cr.. (Hrs.:.:0 Lec., 3 Lab)

The second semester of a capstone engineering design sequence that requires students to apply engineering principles to a project either selected by instructor or the student with instructor's approval, or provided by local industry. Students shall complete the design. Cross listed with ENGR 4930W. **Prerequisite:** E.E. 4920W. **(2nd)**.

E.E. 4970 Special Problems

Variable Credit

A special study at the senior or graduate level of some area of Engineering or engineering design. The student is expected to show initiative and originality under minimum supervision. A written report of accomplishment may be re-

quired. **Prerequisite:** Senior or graduate standing and/or Consent of Instructor. **(On Dem.)**

E.E. 4980 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual
Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

E.E. 5030 Advanced Topics in Engineering

Variable Credit

Special or more advanced topics in Engineering at the graduate level. **(On Dem.)**

E.E. 5220 Engineering Optimization

3 Cr.. (Hrs.:.:3 Lec.)

Covers system models plus analytical and numerical techniques for finding maximum and minimum values of single and multivariable equations. Applicable to all engineering disciplines. **Prerequisite:** M 274. **(On Dem.)**

E.E. 5270 Embedded Controllers

3 Cr.. (Hrs.:.:3 Lec.)

Microprocessors and microprocessor circuits are studied. The Intel 8031 family of ICs are studied. A cursory discussion of the Motorola 68 HC11 Series is included. I/O, memory, memory mapping, and software will be discussed. **Prerequisites:** E.E. 4280 or Consent of Instructor. **(On Dem.)**

E.E. 5370 Random Signals

3 Cr.. (Hrs.:.:3 Lec.)

Provides basic knowledge of the principles of probability theory and statistical analysis techniques that can be used in the design and development of linear systems that must process random signals. Includes probability, random variables and random signals in engineering systems; stochastic calculus, stationary, ergodicity, correlation and power spectra; propagation of random signals through linear systems; least-squares, optimum filtering, and kalman filter. **Prerequisite:** E.E. 3580 or Consent of Instructor. **(1st, odd years)**

E.E. 5380 Advanced Signals and Systems

3 Cr.. (Hrs.:.:3 Lec.)

Linear spaces and linear operators; descriptions of dynamic systems; input-output descriptions; state-space concepts; canonical forms; controllability and observability; minimal realizations; application to control and general systems analysis; pole assignment; observers. **Prerequisite:** ENGR 4410 or Consent of Instructor. **(1st, even years)**

E.E. 5400 Discrete-Time Control Systems:

3 Cr.. (Hrs.:.: 3 Lec.)

Covers basic topics in discrete-time (digital) system modeling, analysis, and control. Topics covered include: advanced Z-transform methods; discretizing continuous systems and controllers; introduction to system identification; classical control design methods (emulation, digital root-locus, and digital PID); and introduction to multi-variable state-space design methods (pole placement and optimal control). Course includes extensive use of control-system design and analysis software, and a system modeling and control project. **Prerequisite:** E.E. 4410 or Consent of Instructor. **(On Dem.)**

E.E. 5410 Advanced Control Systems

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of ENGR 4410 into advanced topics of feedback control. Topics may include state space, robust control, optimal control, observer, LQG, intelligent control, nonlinear control and multiple input-output systems. **Prerequisite:** E.E. 4410 and E.E. 5380 or Consent of Instructor. **(On Dem.)**

E.E. 5550 Power System Dynamics and Control

3 Cr.. (Hrs.:.:3 Lec.)

Advanced study of electric three-phase power system dynamic modeling, analysis, and control. Includes turbine speed-governors, excitation systems, transient and steady-state stability, voltage stability, computer simulation and analysis. **Prerequisite:** E.E. 4500 and E.E. 4410 or Consent of Instructor. **(On Dem.)**

E.E. 5970 Engineering Problems

Variable Credit

An individual laboratory, library or design problem requiring a detailed report on the student's work. **(On Dem., 1st & 2nd)**

E.E. 5990 Thesis Research

Variable Credit

An original problem is selected by the student, with the approval of the department, and is pursued until the results permit the writing and submission of a thesis. **(Summer, 1st & 2nd)**

E.E. 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

E.E. 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

GENERAL ENGINEERING

ENGR 1000 Basic Engineering Problems

1-3 Cr..

The course introduces students to engineering type problems and how to solve them. The use of programmable calculators to make future courses and real-life engineering problems easier is learned. Sources of information needed to solve engineering problems are identified. (**On Dem.**)

ENGR 1010 Intro. to Engineering Calculations & Problem Solving

3 Crs. (Hrs.:.:2 Lec., 3 Lab)

An introduction to engineering calculations and problem solving using the computer. Students are taught how to solve and present engineering problems using computer software such as spreadsheets, graphics programs, and database programs. In addition, an introduction to engineering design is presented and a small design project completed. **Corequisites:** M 121 **(1st, 2nd) Cross-list with** MIN 1010

ENGR 1050 Introduction to General Engineering

1 Cr.. (Hrs.:.:1 Lec.)

Introduces the student to the fields of General Engineering including electrical, mechanical, welding, civil engineering and heavy construction. Career opportunities and paths will be explored. Short field trips and guest lectures will be featured along with introductory level engineering problem solving. **(1st)**

ENGR 1110 Welding Methods I

2 Cr.. (Hrs.:.:1 Lec.; 1 lab)

Students will learn practical welding skills using OFW, OFC and SMAW processes. Carbon steel plate and pipe materials will be welded and brazed. Mechanical properties test will be performed on the student's work. **(1st)**

ENGR 2050 Engineering Mechanics-Statics

3 Cr.. (Hrs.:.:3 Lec.)

The study of the laws governing equilibrium. Uses equilibrium equations to compute the reactions and internal forces resulting from applied loads. Covers addition of forces, equilibrium of particles in two and three dimensions, equilibrium of structures, member forces for trusses and hinged frames, internal shear and moment forces plus shear and moment diagrams for beams, friction, centroids of areas and solids, moments of inertia of areas and solids. **Prerequisites:** PHYS 1046. **(1st, 2nd, Summer)**

ENGR 2060 Engineering Mechanics-Dynamics

3 Cr.. (Hrs.:.:3 Lec.)

The study of the effects of forces upon the motion of material bodies. Covers kinematics of particles, kinetics of particles including force, mass, acceleration, work, energy, impulse and momentum, kinematics and kinetics of rigid bodies. **Prerequisites:** ENGR 2050 & M 172. **(1st, 2nd)**

ENGR 2120 Welding Methods II

1 Cr.. (Hrs.:.:1 lab)

Students will perform hands-on welding using the GMAW and GTAW and PAC processes. Students will learn and practice welding techniques needed to pass the AWS entry-level welder exam. **Prerequisites:** ENGR 1110 **(1st)**

ENGR 2150 Introduction to Computer Aided Design & Problem Solving

2 Cr.. (Hrs.:.:6 Lab)

Students will solve engineering problems using a basic programming language and mathematical software such as Matlab/Simulink. Analysis of 3-D structures and design of solid models will be preformed using drafting and analytical software appropriate for civil and mechanical engineering. **Prerequisites:** M 172, ENGR 2050 & ENGR 1010. **(1st, 2nd)**

ENGR 2260 Plant Layout &Materials Handling

2 Cr.. (Hrs.:.:2 Lec.)

Covers the major engineering problems of essential coordination between plant layout, materials handling, and production planning and control. **Prerequisite:** Sophomore standing. **(On Dem.)**

ENGR 2300 Construction Estimation

3 Cr.. (Hrs.:.:3 Lec.)

Teaches students to read plans and perform quality take-offs from plans. Quantities then result in cost estimates Dirt moving and costs are presented in detail. Specifications are introduced, as is scheduling. **Prerequisites:** ENGR 1010 or consent of instructor. **(1st)**

ENGR 3140 Introduction to Welding Engineering

2 Cr.. (Hrs.:.:2 Lec.)

Survey of common welding processes, introduction to heat flow, arc physics, welding metallurgy, design, welding symbols, weld quality, testing, codes and NDE. **Prerequisites:** PHYS 2076 **(2nd)**

ENGR 3150 Introductory Engineering Computer Applications

2 Cr.. (Hrs.:.:1 Lec., 3 Lab)

The concepts of concurrent engineering and computer aided engineering analysis are introduced. The integration of computer aided design (CAD) and computer aided manufacturing (CAM) with engineering computer graphics will be used by the student to solve engineering design problems. **Prerequisite:** ENGR 3350. **(1st, 2nd)**

WRIT 321 Advanced Technical Writing

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes effective, clear and accurate scientific and technical communication. Focuses on writing theory and on the process approach to writing. Rewriting is stressed. Written work integrated with major fields. (C) **Prerequisite:** Junior standing or Consent of Instructor. **(1st, 2nd, Sum) (formally ENGR 3210W)**

ENGR 3260 Fluid Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

The study of fluids at rest or in motion. Fluids may be liquids, vapors, gases or combinations of these. The effects of static forces and compressibility are given special attention. Kinematics, dynamic, flow, flow resistance, and physical effects of flow are considered in detail for moving fluids. **Prerequisite:** ENGR 2050 & M 172. **(1st, 2nd, Summer)**

ENGR 3280 Fluid Mechanics Lab.

1 Cr.. (Hrs.:.:3 Lab)

Experiments in fluid mechanics, demonstrating principles studied in ENGR 3260. **Prerequisite or corequisites:** ENGR 3260. **(1st, 2nd)**

ENGR 3340 Thermodynamics I

3 Cr.. (Hrs.:.:3 Lec.)

The study of energy and its transformation, the processes involved and properties of the substances employed. Topics include the first and second laws of thermodynamics, enthalpy, entropy, available energy, ideal gases, the phases of pure substances, mixtures and psychometry. Selected applications are covered as time permits. **Prerequisite:** PHYS 2076. **(1st, 2nd)**

ENGR 3350 Mechanics of Materials

3 Cr.. (Hrs.:.:3 Lec.)

Treats the elastic properties of materials plus the elastic and stability properties of members. Includes the special subjects of stress, strain, tension, compression, shear, torsion, bending and other force effects as they occur in beams, columns, other structural members, and joints. **Prerequisite:** ENGR 2050 & M 172. **(1st, 2nd, Summer)**

ENGR 3360 Mechanics of Materials Laboratory

1 Cr.. (Hrs.:.:3 Lab)

Studies mechanical properties of common construction materials used by industry. Wood, mortar and concrete, as well as ferrous and nonferrous materials will be observed under compression, tension, bending, buckling and fatigue situations. Hardness and impact testing is also conducted. Familiarization with three generations of tension-compression testers is acquired by the students. Extensive report writing is required. **Prerequisite or corequisites:** ENGR 3350. **(1st, 2nd)**

ENGR 3380 Heat Transfer

3 Cr.. (Hrs.:.:3 Lec.)

Principles of heat transfer by conduction, convection, boiling and radiation, fluid flow with forced and natural convection, heat exchanger analysis, and selected applications. The emphasis of the course is on heat transfer principles. **Prerequisite:** ENGR 3340; **Corequisites:** ENGR 3260. **(2nd)**

ENGR 3440 Welding Process Applications

3 Cr.. (Hrs.:.:2 Lec.; 1 Lab)

This course provides detailed coverage of common welding processes used in manufacturing, including arc (GTAW,GMAW, SMAW, FCAW, SAW), resistance (RSW) and laser (LBW) processes. Solid-state welding processes , such as friction stir welding (FSW), are also covered. Process selection and methods to determine values for primary process parameters are reviewed and the influence of welding parameters on weld quality, production rate, and manufacturing economy are discussed. In the lab, the welding process are applied to collect process data and develop welding procedure specifications. **Prerequisites:** ENGR 2400 **(1st)**

ENGR 4020 Mechanical Engineering Laboratory

1 Cr.. (Hrs.:.:3 Lab)

Covers practical application and experimentation in the areas of energy conversion, heat transfer, power cycles, HVAC, dynamics, kinematics, vibration analysis and balancing. **Prerequisite:** senior standing and completion of ENGR 3340, 3380, 4340, and 4570. **(2nd)**

ENGR 4040 Professional Engineering

1 Cr.. (Hrs.:.:3 Lab)

Preparation for professional employment, development of professional attitudes and conduct, ethical considerations, employer-employee relations. Students must take FE exam to complete course requirements. **Prerequisite:** Limited to graduating seniors. **(1st, 2nd)**

ENGR 4150 Engineering Computer Applications

3 Cr.. (Hrs.:.:3 Lec.)

Introduces finite element concepts and methods as applied in the analysis of engineering problems. This course employs third party software (such as COSMOS and ALGOR) to utilize the data files formed from mesh generation during the execution of the CADKEY software. Applications from the areas of structural analysis, heat flow and fluid mechanics will be studied. **Prerequisite:** ENGR 2150, ENGR 3350 and MATH 2236. (ENGR 3150 recommended) **(2nd, even years)**

ENGR 4260 Fluid Power Machinery Design

3 Cr.. (Hrs.:.:3 Lec.)

A study of the science of generating, transmitting, controlling and applying smooth, effective power of pumped or compressed fluids (such as water, oil or air) when used to pull, push, rotate, drive or regulate the mechanisms of modern machinery. **Prerequisites:** ENGR 3260 and 3350. **(2nd odd years)**

ENGR 4290 Machine Design Laboratory

1 Cr.. (Hrs.:.:3 Lab)

The course is to familiarize students with machine shop practices and components of real machines. Machine tool operation will be experienced by the students and they will have to justify the design of machine components such as connecting rods, landing gear struts, hypoid gearing, bearings use in real machines. **Prerequisite or corequisites:** ENGR 4550. **(On Dem.)**

ENGR 4300 Plant Maintenance Engineering: Theory & Science

3 Cr.. (Hrs.:.:3 Lec.)

Studies the science and engineering involved in preventing plant failure and production interruption within the constraints of existing structure, machine elements, and circuitry. Studies maintenance problems of all types of plant equipment and modern computer monitoring techniques. **Prerequisite:** Senior standing in any engineering discipline or Consent of Instructor. **(1st, even years)**

ENGR 4340 Thermodynamics II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of ENGR 3340, Thermodynamics I. Topics include energy conversion as in steam power generation, fuel cells, cogeneration and combined cycle plants. **Prerequisites:** ENGR 3340. **(1st)**

ENGR 4400 Design of Welded Connections

2 Cr.. (Hrs.:.:2 Lec.)

A review of material and geometric properties important to welded connections, the influence of welding processes on weld metal mechanical properties, fundamental analysis of static and dynamic stress, selection of materials, fillers, joint design and welding processes in welding design, welding procedures to reduce distortion and residual stress, application and interpretation of welding symbols, codes and NDE methods during design and fabrication. **Prerequisites:** ENGR 3350, ENGR 3360 **(2nd)**

ENGR 4430 Physics of Welding

3 Cr.. (Hrs.:.:2 Lec.; 1 lab)

This course covers the physical processes underlying most welding processes including primary energy sources, thermal sources, shielding requirements and the application of force or pressure. Specific topics include an atomic view of welding, the requirements for chemical bonding (coalescence), heat source/material interactions, arc physics, 2- and 3-D heat flow, mass flow, melting and solidification and the development of residual stresses. The lab portion makes use of demonstrations and engineering measurement exercises to complement the discussion of welding physics lectures. Computerized data collection equipment is used to record raw data from welding processes (primarily arc welding processes). The data is then analyzed to extract meaningful engineering information and correlated to weld properties. Lab exercises include measurements of weld heat-affected zone thermal cycles, solidification and cooling rate, heat source and melting efficiencies and weld pool geometry. **Prerequisites**: ENGR 3400 **(1st)**

ENGR 4450 Process Instrumentation & Control

3 Cr.. (Hrs.:.:3 Lec.)

Provides an introduction to instrumentation used in process control and applications and discrete control. Course content includes: 1) standard methods for measuring plant processes; 2) smart instrumentation design, communication and calibration; 3) final control element selection, setup and operation; 4) application of continuous control; and 5) use of PLC's and control elements. A design project is included. Cross-listed with E.E. 4450. **Prerequisite:** E.E. 2530; PHYS 2106 **(1st)**

ENGR 4460 Process Instrumentation & Control Lab

1 Cr.. (Hrs.:.:3 Lab)

Application of principles and practices presented in ENGR 4450. A design project is included. Cross listed with ENGR 4460. **Prerequisite:** E.E. 2530; PHYS 2106 **Corequisites:** ENGR 4450 **(1st)**

ENGR 4480 Heating, Ventilating & Air Conditioning (HVAC)

3 Cr.. (Hrs.:.:3 Lec.)

This course covers the fundamentals of heating, ventilating and air conditioning of commercial and industrial buildings. Topics include conduction, convection and radiative heat transfer, building heating and cooling systems, lighting systems, typical pneumatic and electronic HVAC control systems and system design. Attention is given to recent developments in costs for applications in commercial and industrial heating, ventilating and air conditioning. **Prerequisite:** ENGR 3340. **(2nd)**

ENGR 4490 HVAC Systems Design

3 Cr.. (Hrs.:.:1 Lec., 6 Lab)

Elements of producing a design project on schedule within budget and correctly. Involves individual and team project work in designing systems, selecting equipment, and estimating loads, energy consumption and operating costs for applications in commercial and industrial heating, ventilating and air conditioning. **Prerequisite:** ENGR 4480. **(2nd)**

ENGR 4550 Fundamentals of Machine Design

3 Cr.. (Hrs.:.:3 Lec.)

A study of the fundamentals of mechanical design such as safety factors, shafting, belts, fasteners, welded connections, bearings, gearing, and lubrication. An important part of the course is the selection of the proper material for specific applications. **Prerequisite:** ENGR 3350. **(2nd)**

ENGR 4570 Dynamics & Kinematics of Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

A study of the motions and accelerations of moving components and the resulting inertial effects, vibrations, balancing, critical speeds, and effects of friction on motion and forces. **Prerequisite:** ENGR 2060. **(1st)**

ENGR 4740 Control of Robotic Manipulators Lab

1 Cr.. (Hrs.:.:1 Lab)

This course provides the student with an elementary understanding the requirements to control different types of multi-axis robotic manipulators. There are both hardware and software components to the project. A personal computer is connected via analog and digital interfaces to the robotic manipulators. Control signals are generated to drive joint motor controller and are acquired to read position feedback from encoders. Low-level software drivers are written to interface higher-level software code to the hardware interfaces. Coordinated motion between the robotic manipulator axes is realized in high-level software executing forward and inverse kinematic models of the robotic manipulation hardware. **Prerequisite:** ENGR 2530. **Corequisites:** ENGR 4450/4460 **(1st)**

ENGR 4750 Industrial Robotics

1 Cr.. (Hrs.:.:1 Lab)

This course provides students with exposure to a common robotic manufacturing application – robotic welding. The course focuses on the application-level robotic motion programming. Both point-to-point programming via the teach pendant and off-line part programming are explored. **Prerequisites:** ENGR 2150 **(1st)**

ENGR 4760 Nondestructive Examination

3 Cr.. (Hrs.:.:2 Lec., 1 Lab)

Introduction to Nondestructive Evaluations techniques including theory and application of visual, dye-penetrant, magnetic particle, eddy current, ultrasonic and x-ray techniques. **Prerequisites:** PHYS 2086 **(2nd)**

ENGR 4840 Reinforced Concrete Design

3 Cr.. (Hrs.:.:3 Lec., 3 Lab)

An introduction to the design of reinforced concrete beams, columns and footings will be made. Single reinforced, double reinforced and T-beams will be designed for both bending and shear. Column design will include both tied and spiral reinforced columns. The class will include the analysis and design of a three-story reinforced concrete building frame with beam, column and footing designs. **Prerequisite:** ENGR 3350. **(1st, even years)**

ENGR 4860 Soil Mechanics & Foundation Design

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Develops an understanding of soil as a construction material. Includes field exploration, index properties, moisture and drainage, frost action, compaction, shear strength, lateral pressures, slope stability, bearing capacity and consolidation. **Prerequisite:** ENGR 2050. **(1st)**

ENGR 4870 Subdivision Design

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course presents the engineering fundamentals of land development: grading, roads, drainage, survey, water delivery, sanitary sewage transport.
The lab component teaches AutoCAD and an AutoCAD add-on to design and plot the development. **Prerequisite:** ENVE 4020. **(2nd)**

ENGR 4880 Structural Analysis & Design

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to structural theory and design of steel, timber and concrete structures. Special emphasis is directed toward design, but the analysis of statically indeterminate structures is also considered. **Prerequisite:** ENGR 3350. **(1st, odd years)**

ENGR 4900 Highway Bridge Design

3 Cr.. (Hrs.:.:3 Lec.)

The primary emphasis will be on the structural design of the bridge; however, the parapet, bridge deck, abutments, piers, and foundations will also be considered. Influence lines will be used to help solve for the design loads for the moving live loads. **Prerequisite:** ENGR 4880. **(1st, 2nd)**

ENGR 4910 Internship

1 to 6 Cr.. (Variable)

A course designed to give credit for academic work done in conjunction with an approved work experience related to the Engineering degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated for a total of four credits. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

ENGR 4920W Engineering Design

2 Cr.. (Hrs.:.:1 Lec., 3 Lab)

A capstone engineering course that requires students to apply engineering principles to a project either selected by instructor or the student with instructor's approval, or provided by local industry. Projects may require application of knowledge and/or talents in the diverse areas of Mathematics, physics, engineering, economics, and personnel interaction. Written reports are required and must be prepared with word processors, spread sheets, data base software and CAD packages where appropriate. At the conclusion of the semester, an oral presentation to peers, faculty, and practicing engineers is expected. **Prerequisite:** ENGR 3150 & Senior standing or Consent of Instructor. **(1st, 2nd)**

ENGR 4930W Engineering Design

1 Cr.. (Hrs.:.:0 Lec., 3 Lab)

The second semester of a capstone engineering design sequence that requires students to apply engineering principles to a project either selected by instructor or the student with instructor's approval, or provided by local industry. Students shall complete the design. Cross listed with E.E. 4930W. **Prerequisite:** ENGR 4920W. **(2nd)**.

ENGR 4940 Engineering Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Investigations in the engineering field and its many problems. Students will present research papers, make field trips to industrial plants and discuss problems with practicing, off-campus engineers. **Prerequisite:** Senior standing or Consent of Instructor. **(1st, 2nd)**

ENGR 4970 Special Problems

Variable Credit

A special study at the senior or graduate level of some area of Engineering or engineering design. The student is expected to show initiative and originality under minimum supervision. A written report of accomplishment may be required. **Prerequisite:** Senior or graduate standing and/or Consent of Instructor. **(On Dem.)**

ENGR 4980 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

ENGR 5040 Advanced Dynamics

3 Cr.. (Hrs.:.:3 Lec.)

A study of free, damped and forced vibrations of linear single degree of freedom systems, non-linear single degree of freedom systems and multi-degree of freedom systems. **Prerequisites:** ENGR 2060; M 405 or 406. **(On Dem.)**

ENGR 5150 Graduate Writing Seminar

1 Cr.. (Hrs.:.:1 Lec.)

This course or ENGR 5160 is required of all Science & Engineering graduate students in both the thesis and the non-thesis options, this course complements but does not cover bibliography. Course emphasis is on thorough review of basic writing mechanics, on organization of thinking, on thesis and report format, and on oral presentations to committees and seminars. Students are encouraged to enroll in this course sooner rather than later in their graduate studies. Grading is by Pass/Fail only. **Prerequisite:** Graduate Standing in an on-campus program. **(1st).**

ENGR 5160 Technical Writing & Publishing Seminar

1 Cr.. (Hrs.:.:1 Lec.)

This course or ENGR 5150 is required of all Science & Engineering graduate students in both the thesis and the non-thesis options. This one credit course will provide a practical guide for improving all technical writing, with a special emphasis on preparing documents for publication in peer reviewed journals. The course is taught over a single weekend and includes in-class lecture-discussion followed by out-of-class writing assignments due within one month of the completion of the lecture portion of the course. Final grades will be based on class attendance, class participation, and the writing assignments. Grading is by Pass/Fail only. **Prerequisite:** Graduate Standing in an on-campus program. **(2nd).**

-ENGR 5350 Experimental Stress Analysis

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Experimental stress analysis emphasizes the determination of strains, stresses and the directions of maximum stresses by experimental methods. Electronic strain gage application is studied in depth, and other topics include strain measurement by mechanical methods, photoelasticity, brittle coatings and structural models. **Prerequisite:** ENGR 3350. **(On Dem.)**

ENGR 5440 Advanced Thermodynamics

3 Cr.. (Hrs.:.:3 Lec.)

Extension of the principles of elementary thermodynamics to include heat transfer, refrigeration, air conditioning, steam turbines, gas turbines, internal combustion engines, and testing procedures. **Prerequisite:** ENGR 3340. **(1st, odd years)**

ENGR 5500 Hydraulic Structures

3 Cr.. (Hrs.:.:3 Lec.)

Gives students the capacity to design safe and effective surface flow control structures such as culverts, channels, rip-rap and energy dissipaters. Hydrologic prediction and watershed surface water modeling are presented via computer software. **Prerequisites:** ENVE 4020 or Graduate Standing or Instructor's permission. **(1st)**

ENGR 5560 Advanced Machine Design

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Applies the fundamentals of mechanical design to the design of a complete piece of machinery. Typical design project would be a speed reduction gear box, hoisting machinery, a conveyor system, a one-cylinder engine, a small punch press, etc. The use of engineering information for component manufacture is discussed. **Prerequisites:** ENGR 3260 and 4550. **(On Dem.)**

ENGR 5710 Advanced Fluid Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

Covers advanced work in the mechanics of fluids. Studies include, but are not limited to, basic hydrodynamics, potential flow, rotational and irrotational flow. Includes Navler-Stokes equations and introduction to boundary-layer theory. **Prerequisites:** ENGR 3260; M 274. **(1st, even years)**

ENGR 5840 Reinforced Concrete Design

3 Cr.. (Hrs.:.:3 Lec., 3 Lab)

An introduction to the design of reinforced concrete beams, columns and footing will be made. Single reinforced, double reinforced and T-beams will be designed for both bending and shear. Column design will include both tied and spiral reinforced columns. The class will include the analysis and design of a three-story reinforced concrete building frame with beam, column and footing designs. **Prerequisite:** ENGR 3350. **(1st, cross-listed as ENGR 4840)**

ENGR 5850 Advanced Mechanics of Materials

3 Cr.. (Hrs.:.:3 Lec.)

Considers advanced strength topics and reviews elementary strength of materials. Topics considered are beam deflections, statically indeterminate beams, fatigue, two and three dimensional Mohr's circle stress problems, advanced beam topics (shear center, unsymmetrical bending, curved flexural members, beams on elastic foundations, nonlinear stress-strain diagrams), advanced torsion problems, thick-walled pressure vessels, rotating disks, contact stresses and stress concentrations, elastic and geometric stability. **Prerequisite:** ENGR 3350. **(2nd, odd years)**

ENGR 5880 Structural Analysis & Design

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to structural theory and design of steel, timber and concrete structures. Special emphasis is directed toward design, but the analysis of statically indeterminate structures is also considered. **Prerequisite:** ENGR 3350. **(1st, cross-listed as ENGR 4880)**

ENGR 5890 Industrial Leadership

3 Cr.. (Hrs.:.:3 Lec.)

The course covers those factors which allow an executive to make his department, company, section or corporation to be preeminent, letting the others be competitive. An executive is anyone who must get things done through the efforts of others. The course covers the functions of the executive. **Prerequisite:** Senior standing in engineering, or Consent of Instructor. **(2nd, even years)**

ENGR 5940 Engineering Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Graduate students present talks dealing with their research investigations or other selected engineering topics. **(1st & 2nd)**

ENGR 5970 Engineering Problems

Variable Credit

An individual laboratory, library or design problem requiring a detailed report on the student's work. **(On Dem., 1st & 2nd)**

ENGR 5990 Thesis Research

Variable Credit

An original problem is selected by the student, with the approval of the department, and is pursued until the results permit the writing and submission of a thesis. **(Summer, 1st & 2nd)**

ENGR 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

ENGR 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

ENVIRONMENTAL ENGINEERING

ENVE 1060 Environmental Software

2 Cr.. (Hrs.:.:2 Lec.)

This course will introduce software applicable to solve environmental problems. Students will be given basic overview and hands on experience with some of the most often used software in the environmental engineering area. **(2nd)**

ENVE 1180 Environmental Sampling I

1 Cr.. (Hrs.:.:1 Lec., 3 Lab)

A laboratory course designed to familiarize the student with standard methods for the collection, preservation, and physical, chemical and biological analyses of water and wastewater. **(2nd)**

ENVE 1940 Environmental Seminar I

1 Cr.. (Hrs.:.:1 Lec.)

To give an overview of environmental engineering issues and to promote problem solving capabilities to freshman students including: the multimedia approach to solve environmental problems, the holistic approach to designing environmental engineering systems, the understanding of ethics and environmental justice, the understanding of challenges, responsibilities and career opportunities. **(1st)**

ENVE 2040 Environmental Process Engineering

3 Cr.. (Hrs.:.:3 Lec.)

The basic engineering principles important to Environmental Engineering including, mass balance, and heat balance are taught. **Prerequisites:** CHMY 143; M 171; PHYS 1046. **(1st, 2nd)**

ENVE 2170 Environmental Sampling II

1 Cr.. (Hrs.:.:1 Lec., 3 Lab)

The course familiarizes the student with calibration and operation of simple reactor equipment for sampling, monitoring, and analysis of air pollutants. Additionally, noise pollution and soil contamination are addressed. **(1st)**

ENVE 2910 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Environmental Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

ENVE 3130 Air Diffusion Modeling

3 Cr.. (Hrs.:.:3 Lec.)

Introduces the basic principles of pollution movement in air masses and reviews some of the diffusion models developed by the EPA. **Prerequisites:** ENVE 2040; **(2nd)**

ENVE 4020 Surface Water Hydrology

3 Cr.. (Hrs.:.:3 Lec.)

Introduces components of the hydrologic cycle and their interactions including weather systems, precipitation, evaporation, transpiration, infiltration and runoff. Methods for stream flow measurement, hydrograph development, flood routing for channels and reservoirs and stochastic hydrology are covered. **Prerequisites:** ENGR 3260, M 332. **(2nd)**

ENVE 4030 Water & Waste Water Treatment

3 Cr.. (Hrs.:.:3 Lec.)

The principles of equilibrium, kinetics, and unit operations are combined to design an industrial waste water treatment systems. **Prerequisite:** ENVE 2040, ENGR 3260. **(2nd)**

ENVE 4040 Surface Water Quality

3 Cr.. (Hrs.:.:3 Lec.)

Water quality requirements for public water supplies, surface waters and wastewater discharges are discussed, and surface waters including streams, rivers, lakes, reservoirs, estuaries and oceans are covered. Point and non-point pollution sources are introduced for both conventional and priority pollutants, and receiving water impacts are assessed. **Prerequisite:** ENVE 4020. **(1st)**

ENVE 4140 Land and Stream Restoration

3 Cr.. (Hrs.:.:3 Lec., 3 Lab)

The techniques and costs for reclaiming disturbed lands are studied. Topics include cover earth work, recontouring, erosion and sediment control structures and revegetation techniques. The class is developed upon information obtained from past course work, site studies, laboratory testing, references, resource agencies and personnel, etc. **Prerequisite:** ENVE 4020. **(1st)**

ENVE 4150 Environmental Laws & Regulations

2 Cr.. (Hrs.:.:2 Lec.)

Covers environmental laws and regulations. Students are introduced to pertinent resources and required to use those resources to develop responses to scenarios regarding facility setting, exploration, construction, operation and shutdown. **Prerequisite:** Junior standing. **(2nd)**

ENVE 4160 Environmental Permitting

1 Cr.. (Hrs.:.:1 Lec.)

This course will provide an overview of environmental permitting related to air, water, and land. Students will be given case studies and asked to write a permit for a facility as a group project. **(2nd)**

ENVE 4180 Air Pollution Control Engineering I

3 Cr.. (Hrs.:.:3 Lec.)

Studies the relationship of current natural and technological contributions to air pollution problems, including gases and aerosols from various sources. Designing of air pollution control devices for particulates such as mechanical collectors, fabric filters, electrostatic precipitators and wet scrubbers. **Prerequisites:** ENVE 3130; ENGR 3260. **(2nd)**

ENVE 4190 Air Pollution Control Engineering II

3 Cr.. (Hrs.:.:3 Lec.)

Applies current technology to solving gaseous air pollution problems. Equipment discussions include design, installation and operation of incinerators, adsorption systems, NO_x control systems, packed towers, SO_x control systems and ventilation systems. **Prerequisite:** ENVE 4180. **(1st)**

ENVE 4210 Risk Analysis

2 Cr.. (Hrs.:.:2 Lec.)

The course familiarizes the student with the field of health risk assessment. The general risk assessment process is examined, including hazard identification, dose-response assessment, exposure assessment, and risk characterization. A project is required which includes computer modeling, a formal written report, and an oral presentation. **Prerequisite:** ENVE 3130. **(1st)**

ENVE 4290 Hazardous Waste Engineering

3 Cr.. (Hrs.:.:3 Lec.)

Examines the engineering principles of hazardous wastes including generation, handling, collection, transport, processing, recovery, and disposal. The design of RCRA & other governmental agency approved facilities will be covered. **Prerequisites:** CHMY 210 & ENVE 2040. **(2nd)**

ENVE 4300 Soil & Subsurface Remediation

3 Cr.. (Hrs.:.:3 Lec.)

A calculation-oriented course analyzing subsurface contaminant fate and transport, and applying in situ remediation technologies including soil vapor extraction, steam injection, air sparging and bioremediation. **Prerequisites:** CHMY 210; GEOE 420. **(2nd)**

ENVE 4400W Pollution Prevention

2 Cr.. (Hrs.:.:2 Lec.)

The course familiarizes the student with local, national, and worldwide pollution prevention strategies. Preferred approaches are examined such as source reduction, recycling, and treatment. **Prerequisites:** ENVE 4020, 4180. **(1st)**

ENVE 4500 Sustainable Environmental Quality Management

2 Cr.. (Hrs.:.:2 Lec.)

This course will introduce sustainable development concepts with respect to environmental issues. Discussion of global warming, green house gases, green engineering, clean manufacturing, cradle to cradle approach, browns field development, sustainable management of energy and natural resources.

ENVE 4810 Environmental Design

1 Cr.. (Hrs.:.:1 Lec., 3 Lab)

Students will work in teams, select projects, conduct literature study, and develop design options. (1st)

ENVE 4820W Environmental Design

2 Cr.. (Hrs.:.:)

Students will work in groups on actual environmental projects obtained from government & industry. The product of the group effort will be a design report that recommends a solution to the environmental problem. **Prerequisite:** Take in Senior year. **(1st, 2nd)**

ENVE 4910 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Environmental Engineering degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisite:** Junior standing and consent of instructor. **(On Dem.)**

ENVE 4940 Environmental Seminar II

1 Cr.. (Hrs.:.:1 Lec.)

Students will be asked to prepare presentations on industrial and environmental processes to improve their technical and presentation communication skills. Students also will be taken out on field trips to facilities to provide a hands on education. (**2nd)**

ENVE 4970 Special Problems

Variable Credit

An individual environmental laboratory, field, library or design problem is assigned requiring a detailed report on the student's work. **Prerequisite:** Consent of instructor. **(1st, 2nd)**

ENVE 4980 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

ENVE 5020 Surface Water Hydrology

3 Cr.. (Hrs.:.:3 Lec.)

Introduces components of the hydrologic cycle and their interactions including weather systems, precipitation, evaporation, transpiration, infiltration and runoff. Methods for stream flow measurement, hydrograph development, flood routing for channels and reservoirs and stochastic hydrology are covered. **Prerequisites:** ENGR 3260. **(2nd)**

ENVE 5030 Water Quality Engineering II

3 Cr.. (Hrs.:.:3 Lec.)

The physical and chemical parameters associated with waters in the hydrologic cycle are quantitatively examined. Major industrial, municipal, and agricultural sources of waste water are considered: water renovation and treatment techniques are studied. **Prerequisite:** ENVE 3180, ENGR 3260 or Graduate standing. **(2nd)**

ENVE 5190 Air Pollution Engineering II

3 Cr.. (Hrs.:.:3 Lec.)

Applies current technology to solving gaseous air pollution problems. Equipment discussions include design, installation and operation of incinerators, adsorption systems, NO_x control systems, packed towers, SO_x control systems and ventilation systems. **Prerequisite:** ENVE 4180. **(2nd)**

ENVE 5290 Hazardous Waste Engineering

3 Cr.. (Hrs.:.:3 Lec.)

Examines the engineering principles of hazardous wastes including generation, handling, collection, transport, processing, recovery, and disposal. The design of RCRA & other governmental agency approved facilities will be covered. **Prerequisites:** CHMY 210. **(2nd)**

ENVE 5300 Subsurface Remediation

3 Cr.. (Hrs.:.:3 Lec.)

A design-oriented course analyzing subsurface contaminant fate and transport, and applying in situ remediation technologies including soil vapor extraction, steam injection, air sparging and Bioremediation. **Prerequisites:** CHMY 210; GEOE 420 **(1st)**

ENVE 5390 Bioremediation

3 Cr.. (Hrs.:.:1 Lec; 3 Lab)

A design-oriented course dealing with advanced, modern biological techniques for cleaning up contaminated water and soils. **(1st)**

ENVE 5400 Pollution Prevention

3 Cr.. (Hrs.:.:3 Lec.)

The course familiarizes the student with local, national, and world-wide pollution prevention strategies. Preferred approaches are examined such as source reduction, recycling, and treatment. Students also will be introduced to environmental managerial systems. **Prerequisites:** ENVE 4020, 4180. **(2nd)**

ENVE 5500 Landfill & Impoundment Design

3 Cr.. (Hrs.:.:3 Lec.)

Planning and design of impoundments and municipal landfills. Planning includes site selection and waste characterization. An understanding of site soil materials is essential. Grade design must consider waste depositing, equipment performance, and leachate collection. Alternatives for lining and capping are presented. **Prerequisites:** ENVE 4020 or Graduate Standing or Instructor's permission. **(On Dem.)**

ENVE 5610 Advanced Water Quality

3 Cr.. (Hrs.:.:3 Lec.)

Surface water quality topics including pathogens, dissolved oxygen, nutrients, toxic substances, and temperature are covered. Various pollution sources are discussed, potential impacts modeled, and control measures evaluated. Various water quality models are studied. **Prerequisite:** ENVE 4040. **(2nd)**

ENVE 5620 Advanced Industrial Pollution Control

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes the engineering approach to the solution of pollution treatment problems encountered by the minerals industry. Thermodynamics, kinetics, and reactor design are used to develop equipment design criteria and to give an in-depth understanding of pollution control. **Prerequisite:** ENVE 4030. **(2nd)**

ENVE 5630 Advanced Air Diffusion Modeling

3 Cr.. (Hrs.:.:3 Lec.)

Provides a working knowledge of the air diffusion modeling programs used by the E.P.A. in granting permits for the construction of new plants and the expansion of existing ones. Both the theoretical and the practical aspects are considered in order to evaluate the results obtained from a modeling study. **Prerequisite:** ENVE 3130. **(1st)**

ENVE 5640 Toxic Emissions & Pollution Prevention Engr.

3 Cr.. (Hrs.:.:3 Lec.)

Studies toxic emissions from industrial and non-industrial sources. Discusses measurement and control technologies for toxins. Reviews basic pollution prevention techniques that are effective for industrial applications and evaluates the cost of specific pollution prevention techniques for selected industries. **Prerequisites:** ENVE 4180 or graduate standing. **(1st)**

ENVE 5650 Combustion of Hazardous & Hospital Wastes

3 Cr.. (Hrs.:.:3 Lec.)

Reviews combustion techniques that are applicable too hazardous and hospital wastes. Waste characterization, design of combustion devices, design of control system devices, and emission characterization are emphasized. Health risk associated with incinerator emissions will also be discussed. **Prerequisites:** ENVE 4190 or graduate standing. **(2nd)**

ENVE 5940 Graduate Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Students prepare written and oral reports covering assigned aspects of Environmental Engineering projects or thesis work. **Prerequisite:** Graduate standing. **(1st & 2nd)**

ENVE 5970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

ENVE 5990 Thesis Research

Variable Credit

Students pursue research on an advisor approved topic. Credit is awarded upon satisfactory completion of a thesis. **(Summer, 1st, 2nd)**

ENVE 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

ENVE 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

GEOGRAPHIC INFORMATION

G.I. 0210 GIS Software

2 Cr.. (Hrs.:.:2 Lec.)

The student is introduced to the various software packages used in GIS. Applications of these packages include natural resources, marketing, and government. Differences in Raster and Vector GIS programs will be explained. **Corequisites:** CAPP 158 **(2nd)**

GEOLOGICAL ENGINEERING

GEO 101 Introduction to Physical Geology

3 Cr.. (Hrs.: 2 Lec, 3 Lab)

An introduction to Earth materials and the processes operating at and beneath the surface of the earth. Basic concepts of geological engineering are introduced. Mineral and rock identification, topographic map reading, and basic interpretation of geologic maps are covered in lab. A working knowledge of basic trigonometry is recommended **(1st, 2nd)**

GEOE 104 Introduction to Geological Engineering

1 Cr.. (Hrs.:. 3 Lab)

Introduces the student to the field of geological engineering: career opportunities, academic options, and faculty specialties. Emphasis on engineering with geomaterials: rock, soil, water and hydrocarbons. Field trips and lab work. Some computer applications. **Prerequisite**: GEO 101, M 121 **(2nd)**

GEO 204 Introduction to Mineralogy-Petrology

3 Cr.. (Hrs.:. 2 Lec., 3 Lab)

An introduction to the classification and identification of common rock-forming and ore minerals, followed by an introduction to rock-forming processes and the systematic classification and identification of igneous, sedimentary, and metamorphic rocks. **Prerequisite:** GEO 101 & CHMY 143, or equivalent. **(2nd)**

GEO 209 Introduction to Field Geology

1 Cr.

An introduction to observation, description, and collection of geologic data in the field. It includes map reading, air photo interpretation, use of the brunton compass, and geologic mapping. Course will be conducted over a 6 day period before the beginning of the fall semester. **Prerequisite:** GEO 101 **(1st)**

GEO 257 Sedimentology & Petroleum Geology

3 Cr.. (Hrs.:.:3 Lec.)

A study of sedimentology and stratigraphy in the context of petroleum geology. This survey emphasizes the factors controlling composition, characteristics, and geographic and stratigraphic distribution of sedimentary rocks. Basic methods of studying rocks in the subsurface will be introduced. **Prerequisites:** GEO 101 **(2nd)**

GEOE 298 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Geological Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit.

GEOE 403 Structural Geology for Engineers

3 Cr..(Hrs.:.:2 Lec. 3 Lab)

The study of brittle and ductile deformation of the earth's crust emphasizing the mechanics of formation of local and regional structural features. Laboratory work

focuses on the solution of structural geology problems commonly encountered in the practice of engineering by mathematical, graphical, and stereonet methods. **Prerequisites:** GEO 101 and ENGR 3350 or GEO 101 and GEOP 225. **(2nd)**

GEOE 406 Geomorphology/Photogeology

3 Cr..(Hrs.:.:2 Lec., 3 Lab)

The origin and development of landforms and landscapes and their relations to and impacts on engineering design. Landforms and landscape displayed on aerial photographs are interpreted to recognize geologic hazards and to design solutions to geological engineering and construction problems. Solutions are presented in professional caliber reports and oral presentations. **Prerequisites:** GEO 204, GEOE 257 **(2nd)**

GEOE 409 Field Geology & Geophysics

6 Cr..

Provides instruction and practice in field geological and geophysical techniques to produce data that must be interpreted and/or applied to engineering design. Three weeks will be devoted to field geological studies and three weeks to field geophysical studies. **Prerequisite:** GEOE 403 and GEOP 302 **(Summer)**

GEOE 410 Mining Geology

3 Cr..(Hrs.:.:2 Lec., 3 Lab)

Nature of mineral resources, their economics, and environmental considerations with respect to the practice of mining geology. Laboratory exercises based on real-world scenarios recreate types of problems encountered in industry. Field trips to operating mines introduce students to mine mapping methods and actual working conditions & professional responsibilities. **Prerequisite:** Senior or graduate standing in Geological, Geophysical or Mining Engineering. **(1st)**

GEOE 411 Metallic Ore Deposits

3 Cr..(Hrs.:.:2 Lec. 3 Lab)

The study of the origin, character and distribution of deposits of metals. Theories of the origin of ore deposits are investigated and their applications related to known occurrences. The lecture series includes detailed description of classical mining districts throughout the world. **Prerequisites:** GEO 204 or Consent of Instructor. **(2nd)**

GEOE 420 Hydrogeology for Engineers

3 Cr..(Hrs.:.: 2 Lec., 3 Lab)

A basic course in ground water resource study and evaluation. This applied hydrogeology course covers ground water movement, storage, and exploration. It emphasizes the basics of saturated flow, well hydraulics, resource evaluation and water quality. **Prerequisite:** GEO 101, M 172 **(1st, 2nd)**

GEOE 422 Groundwater Flow Modeling

3 Cr..(Hrs.:.:1 Lec., 6 Lab)

An introduction to the equations of groundwater flow, numerical techniques, and state of the art computer programs for solution of groundwater problems. Emphasis is upon application of modeling options to fit realistic problems of geologic variability, surface–ground-water interaction, groundwater management & prediction. **Prerequisites:** GEOE 420 **(1st)**

GEOE 429 Field Hydrogeology

3 Cr.

Provides 3 weeks of intensive training in field methods of applied hydrogeology, including water well drilling, design and completion of monitoring wells, pumping tests, slug tests, stream gaging, seepage meters, mini-piezometers, geophysics, water level surveys, and water quality sampling and analysis. Well-suited to students majoring in geological, geophysical, environmental, or general engineering. **Prerequisite:** GEOE 420. **(Summer)**

GEOE 440 Engineering Geology

3 Cr..(Hrs.:.:2 Lec., 3 Lab)

A study of the application of geology to engineering practice covering the characterization and engineering behavior of soil and rock, geologic site investigation, geologic hazards, and the influence of geology on various types of construction projects (particularly excavations, dams, and foundations). **Prerequisites:** GEO 101 and ENGR 2050. **(1st)**

GEOE 499W Geological Engineering Design Project

3 Cr.. (Hrs.:.:3 Lec.)

A capstone design course for seniors in Geological Engineering. Students will be assigned a team project to complete during the semester. The course grade will based on the performance shown on the design project. Readings and exercises may be assigned as needed to implement design procedures. **Prerequisite:** ENGR 3210 and within two semesters of graduation. **(1st, 2nd)**

GEOE 4570 Subsurface Methods in Petroleum Geology

3 Cr.. (Hrs.:. 2 Lec.,:3 Lab)

The objectives of subsurface petroleum geology are to find and develop oil and gas reserves. To that end, this course focuses on the use, integration, and correct application of available data to construct and interpret subsurface geological maps and cross sections. These techniques are important and applicable to other fields, such as; mining groundwater, or waste disposal. **Prerequisite:** GEO 257. **(1st)**

GEOE 490 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

GEOE 491 Special Topics

Variable Credit

An original or special research study in a field of interest to both student and instructor. The student is required to devote a minimum of 48 hours to the investigation for each hour of credit taken. **Prerequisites:** Senior or graduate standing and Consent of Instructor. **(On Dem.)**

GEOE 498 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Geological Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Senior standing and Consent of Instructor. **(On Dem.)**

GEOE 520 Advanced Hydrogeology

3 Cr..(Hrs.:.:3 Lec.)

An extension of GEOE 420 focusing on a more in depth look at the movement and occurrence of groundwater, under non-ideal conditions. Production well construction and design will be expanded to well field development and dewatering methods. Advanced applications of aquifer analysis, using a variety of techniques with groundwater exploration and development issues will be evaluated with case histories and student projects. Advanced topics and design are emphasized. **Prerequisites:** GEOE 420 **(1st)**

GEOE 522 Groundwater Monitoring

2 Cr..(Hrs.:.: 2 Lec.)

Theory and practice of monitoring design to evaluate groundwater quality degradation resulting from land fills, mining operations, and other industrial and agricultural practices. Emphasizes local flow systems, unsaturated flow, and state-of-the-art technology. **Prerequisites:** GEOE 420, 520. **(2nd)**

GEOE 523 Groundwater Monitoring Laboratory

1 Cr..(Hrs.:.:3 Lab)

Methods of collection, and interpretation of monitoring data. Includes field trips. **Corequisites:** GEOE 522. **(2nd)**

GEOE 528 Contaminant Transport

3 Cr..(Hrs.:.:1 Lec., 6 Lab)

A sequel class to GEOE 422. This course enhances the student's ability in groundwater flow modeling and adds the dimension of contaminant transport. State-of-the-art software packages are utilized to simulate a variety of field problems. The physical, chemical, and biological processes which control groundwater contamination are explored. **Prerequisite:** GEOE 422. **(2nd)**

GEOE 531 Acid-Rock Drainage

3 Cr..(Hrs.:.:3 Lec.)

A review of the chemical and physical controls on the release of acid and heavy metals from mine waste is followed by a discussion of up to date methods to predict, prevent, and treat acid rock drainage. Several field trips include visits to abandoned and active mine sites, as well as on-going reclamation projects in the Butte-Anaconda area. **Prerequisites:** GEOE 420 or Consent of Instructor. **(1st)**

GEOE 532 Geochemical Modeling

2 Cr..(Hrs.:.:6 Lab)

Theory and practical application of computer programs for calculating aqueous speciation, mineral dissolution and precipitation, sorption/desorption reactions, and reaction path modeling. An emphasis will be given to low temperature aqueous systems, although hydrothermal fluids will also be discussed. **Prerequisite:** GEOE 533 or CHMY 540, or Consent of Instructor. **(On Dem.)**

GEOE 533 Hydro-Geochemistry

3 Cr..(Hrs.:.:3 Lec.)

Covers the basic principles of geochemistry applied to ground and surface water. Thermodynamic background, carbonate chemistry and pH control, aqueous speciation, mineral dissolution and precipitation, adsorption and cation exchange, kinetics and chemical weathering, redox reactions, acid rock drainage, environmental isotopes, and geothermal systems are covered. Well-suited to students in Hydrogeology Minor or Option. **Prerequisites:** CHMY 141-143 or equivalent.

GEOE 540 Applied Statistics & Experimental Design

3 Cr..(Hrs.:.:3 Lec.)

An applied statistics course with emphasis on multivariate statistics, geostatistics and experimental design. Intended for graduates that will need to collect and interpret spatially distributed thesis data or students with an interest in applied statistics. **Prerequisites:** GEO 101; STAT 332. **(2nd).**

GEOE 541 Advanced Engineering Geology

3 Cr..(Hrs.:.:2 Lec., 3 Lab)

Field and laboratory investigations of actual and potential construction sites to determine geologic parameters and hazards and the engineering solutions to them. **Prerequisite:** GEOE 440, graduate standing, or Consent of Instructor. **(2nd)**

GEOE 542 Slope Stability Analysis & Design

3 Cr..(Hrs.:: 2 Lec., 3 Lab)

Covers basic factors influencing slope stability, site investigations and data acquisition, analysis methods used for soil and rock slopes, and slope design and stabilization techniques. **Prerequisites:** Graduate standing or Consent of Instructor**. (1st)**

GEOE 590W Graduate Research or Design Project

3 Cr. (Hrs.:: 3 Lec.)

An individual capstone research or engineering design project for non-thesis option Geoscience graduate students specializing in geological engineering, hydrogeological engineering, hydrogeology, or applied geology. A written report and oral presentation of the project is required. . **Prerequisite:** Consent of Graduate Advisor. May only be taken during the semester prior to graduation. May not be repeated for credit.

GEOE 591 Special Topics

Variable Credit

An original or special research study at the graduate level in a field of interest to both student and instructor. The student is required to devote a minimum of 48 hours to the investigation for each hour of credit taken. **Prerequisite:** Consent of Instructor. **(On Dem.)**

GEOE 599W Thesis Research

Variable Credit

An original investigation of a geologic problem that involves mapping of an area of large and complex nature or a detailed laboratory study. Problems may be selected by the student with the approval of the department, and are undertaken under close advisory supervision. A written report of the investigation must satisfy all departmental requirements before credit is allowed. The thesis must be a real contribution to knowledge in some recognized field of geology. **(Summer, 1st, 2nd)**

GEOE 697 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

GEOE 699 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

GEOPHYSICAL ENGINEERING

GEOP 101 Intro. to Geophysics I

1 Cr.. (Hrs.:.:1 Lec.)

Provides a basic description of the geophysical processes shaping the earth as well as an introduction to the uses of geophysical techniques in mining, petroleum, and groundwater exploration and geotechnical applications in engineering site evaluation. **(1st)**

GEOP 102 Intro. to Geophysics II

1 Cr.. (Hrs.:.:1 Lec.)

Continuation of GEOP 101. **Prerequisite:** GEOP 101. **(2nd)**

GEOP 225 Physics of the Earth

3 Cr.. (Hrs.:.:3 Lec.)

Surveys the fundamental problems in solid-earth geophysics. The earth's physical properties including radioactivity, heat flow, seismicity, gravitational effects, and magnetism are discussed quantitatively. **Prerequisites:** PHYS 2076; **Corequisites:** M 274; PHYS 2086. **(2nd)**

GEOP 250 Matlab Programming

1 Cr.. (Hrs.:.:1 Lec.)

An Introduction to the use of MATLAB as a programming language for solving engineering and scientific problems. MATLAB is a high-level programming language used for numeric computation, data analysis, and visualization. **Prerequisites:** M 171 or Consent of Instructor. **(On Dem.)**

GEOP 291 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Geophysical Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

GEOP 302 Elements of Geophysics

3 Cr.. (Hrs.:.:3 Lec.)

Studies methods of geophysical exploration with emphasis on the fundamental theory of measurement of the physical properties of the earth. The four major methods used in geophysical exploration are gravitational, magnetic, seismological, and electrical. The instrumentation used to measure these physical properties is studied. **Prerequisites:** PHYS 2076, 2086; M274 or Consent of Instructor. **(1st)**

GEOP 401 Intro. to Seismic Processing

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

An application-oriented course covering the fundamentals of digital seismic processing. Frequency analysis, deconvolution, velocity analysis, common midpoint processing, and migration are emphasized. **Prerequisites:** GEOP 302; Computer Programming Language. **(1st)**

GEOP 4070 Potential Theory

3 Cr.. (Hrs.:.:3 Lec.)

Applies the theory of potential to simple mass distributions, theorems of Green and Gauss, harmonic functions, and Legendre polynomials. **Prerequisites:** GEOP 302; M 274, and adequate preparation in Mathematics. **(On Dem.)**

GEOP 408 Seismic Prospecting

3 Cr.. (Hrs.:.:3 Lec)

Studies the propagation of seismic waves in elastic media, transmission and reflection at an interface, and the instruments used for making these measurements. Exercises include the interpretation of actual field data. **Prerequisite:**

M 274. **(1st)**

GEOP 410 Electrical Prospecting

3 Cr.. (Hrs.:.:3 Lec.)

Studies the electrical methods used in geophysical exploration and includes the theory of natural and induced electrical fields, the resistivity of the earth's crustal material, and the instruments used to measure these. Interpretation and measurement techniques are studied in the exercises. **Prerequisite:** PHYS 2086. **(1st)**

GEOP 412 Gravity & Magnetic Exploration

3 Cr.. (Hrs.:.:3 Lec.)

Covers the gravity and magnetic fields of the earth, field instruments, data acquisition, data reduction and interpretation. Lectures concentrate on potential theory as applied to the calculation of gravity and magnetic effects, the use of modeling in interpretation, continuation of potential fields, and other processing of data. Exercises are devoted to field surveys, data reduction and interpretation. **Prerequisites:** M 274; PHYS 2086. **(2nd)**

GEOP 421 Field Geology & Geophysics

6 Cr..

Provides instruction and practice in field geological and geophysical techniques to produce data that must be interpreted and/or applied to engineering design. Three weeks will be devoted to field geological studies and three weeks to field geophysical studies. **Prerequisite:** GEOE 403 and GEOP 302 **(Summer)**

GEOP 430 Introduction to Artificial Neural Networks

3 Cr.. (Hrs.: 2 Lec.:3 Lab)

An introduction to the subject of artificial neural networks. Various neural network paradigms will be covered by introducing the theory, developing the algorithm, and applying the algorithms using the Neural Network Toolbox in MATLAB. **Prerequisite:** Consent of Instructor. **(On Dem.)**

GEOP 4450 Introductory Earthquake Seismology

3 Cr.. (Hrs.:.:3 Lec.)

Introduces observational seismology, instrumentation and seismogram interpretation from records from the local seismic station. Intended for students of Geology and Geophysics. **Prerequisites:** PHYS 2076 and 2086; GEOP 302 or Consent of Instructor. **(On Dem.)**

GEOP 446 Applied Linear Systems

3 Cr.. (Hrs.:.:3 Lec.)

This course covers the application of the Z Transform, Fourier Transform, and Laplace Transform in the analysis of the relationship between input and output signals of linear systems. Mechanical, electrical, seismic, gravitational, and magnetic systems are studied. Topics include convolution, filters, auto- and cross-correlation, power spectra, sampling theory, and aliasing. Time and spatial signals are analyzed as well as analog and discrete signals. **Prerequisite:** ENGR 3550 or M 405 or PHYS 4536. **(2nd)**

GEOP 450 Inversion, Experiment Design & Interpretation

3 Cr.. (Hrs.:.:3 Lec.)

Applies inverse theory to the problem of evaluating information content of noisy data. Applications to experiment design to optimize data acquisition and interpretation to estimate model parameters and uncertainties. Students select a measurement system and develop a program for parameter estimation and experimental design. **Prerequisite:** M 333; Computer programming language.

GEOP 4750 Geophysical Engineering Design

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

A senior level design course requiring the integration of principles, knowledge and skills developed in previous course work. The design problem in geophysical engineering includes the integration of existing geological and geophysical data, specifications for surveys and further data acquisition and as a final phase, the synthesis of all of the information into a geologically reasonable interpretation. **Prerequisite:** Senior Standing.

GEOP 498 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Geophysical Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

GEOP 491 Special Topics

Variable Credit

Designed to allow interested faculty and students to study specialized subjects not normally covered in the Geophysics curriculum. **Prerequisite:** Consent of Instructor. **(On Dem.)**

GEOP 490 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

GEOP 503 Earthquake Seismology

3 Cr.. (Hrs.:.:3 Lec.)

A rigorous mathematical approach to the propagation of elastic waves in layered media covering dispersion of surface waves, seismogram interpretation and instrument characteristics. **Prerequisite:** Consent of Instructor. **(On Dem.)**

GEOP 5050 Continuum Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

Continuum mechanics are developed from the viewpoint of non-equilibrium thermodynamics. After specializing to the theory of elasticity, particular attention is given to dispersive wave propagation in elastic media. **(On Dem.)**

GEOP 508 Problems in Seismic Prospecting

3 Cr.. (Hrs.:.:3 Lec.)

Covers selected topics of interest to class members. **Prerequisite:** GEOP 408 or Consent of Instructor. **(On Dem.)**

GEOP 509 Problems in Gravity & Magnetic Prospecting

3 Cr.. (Hrs.:.:3 Lec.)

Covers selected topics of interest to class members. **Prerequisites:** GEOP 412 or Consent of Instructor. **(On Dem.)**

GEOP 510 Problems in Electrical Prospecting

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Covers selected problems of interest to class members. **Prerequisite:** GEOP 410 or Consent of Instructor. **(On Dem.)**

GEOP 594 Geophysics Graduate Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Requires oral presentation and interaction with attending students and faculty, on topics of relevance. Can be presented in conjunction with seminars in other departments. Required of all graduate students. **Prerequisite:** Graduate standing. **(1st & 2nd)**

GEOP 595 Advanced Topics in Geophysics

Variable Credit

Designed to allow interested faculty and students to study specialized subjects not normally covered in the Geophysics curriculum. **Prerequisite:** Consent of Instructor. **(On Dem.)**

GEOP 599 Thesis Research

Variable Credit

A specific problem which may be either theoretical or experimental is selected for each graduate student. After a thorough literature search, the student is expected to pursue research with a minimum of supervision. **(Summer, 1st, 2nd)**

GEOP 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

GEOP 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

GEOSCIENCE

GSCI 5940 Graduate Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Requires oral presentation and interaction with attending students and faculty, on topics of relevance to mineral economics. Can be presented in conjunction with seminars in other departments. Required of all graduate students. **Prerequisite:** Graduate standing. **(1st & 2nd) Repeated twice for credit.**

HEALTH

HLTH 0101 Introduction to Health care Careers

2 Cr.. (Hrs.:.:2 Lec.)

This course provides a broad overview of the health care delivery system in the United States. It provides the students with an opportunity to learn about various health care professional occupations and participate in a job shadowing experience. This course is appropriate for any student with an interest in health care. This is a web-based course delivered via Blackboard. **(1st, 2nd)**

HLTH 0102 Soft Skills for the Health Professional

1 Cr.. (Hrs.:.:1 Lec.)

This course is designed to teach students about the personal values and interpersonal skills necessary to succeed in today's working environment. These "soft skills" play a crucial and increasingly important role in career development and are fast becoming the deal breaker in many of today's hiring decisions. **(1st)**

HLTH 0103 Medical Terminology

3 Cr.. (Hrs.:.:3 Lec.)

Designed to familiarize the student with modern health care terminology and taxonomies. Concepts related to the storage and retrieval of health care information, including provisions for privacy and security are also presented. This is a web-based course delivered via Blackboard. **(Sum, 1st, 2nd)**

HLTH 0104 Medical Ethics

2 Cr.. (Hrs.:.:2 Lec.)

This course will provide students with the opportunity to delve into the development of ethical decision making strategies employed by health care professionals. Several models will be studied to allow for critical analysis of a few of the common conflicts that arise in health care careers. This course is appropriate for any student with an interest in health care. This is a web-based course delivered via Blackboard. **(Sum, 1st, 2nd)**

HLTH 0107 Basic Anatomy & Physiology

2 Crs (Hrs.:.: 2 Lec)

This is a 2 credit online course with laboratory opportunities. Students will learn basic knowledge of structure and function of the human body and associated terminology. This is a web-based course delivered via Blackboard. This course is good review for students who will take BIOL 2016 and 2026 **(Sum, 1st, 2nd)**

HLTH 0110 Nursing Fundamentals

3 crs (Hrs.:.: 2 Lec., 1 Lab)

Through caring, communication, professionalism, and critical thinking, this course will give the student the basic knowledge and competencies required in order to provide patient care as a nursing assistant in both the acute and long-term care settings. This course includes a didactic portion which is web-based, delivered via BlackBoard and a face to face lab portion. Students have the opportunity to take the Montana Headmaster Test to become Certified Nurse Assistants in MT. (Sum**, 1st, 2nd)**

HLTH 0201 Intro. to Physical & Biological Sciences

3 Cr.. (Hrs.:.:3 Lec.)

This course will provide students a basic functional grasp of the concepts of physics, chemistry and cellular biology. **(**This is a web-based course delivered via Blackboard. **(1st, 2nd)**

HLTH 0205 Fundamentals of Medical Assisting I

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

This course is a medical assistant foundation course. It offers skill development necessary for assisting the physician with patient care in the medical office clinic setting. Included is assessment of vital signs, patient charting, aseptic technique, surgical aseptic technique, patient examination and administration of medication. Prerequisites BIOL 2016 & 2026. **(1st)**

HLTH 0206 Medical Assisting Practicum I

2 Cr.. (Hrs.:.:6 Lab)

This course allows for placement in a medical office setting for guided Medical Assistant experience providing the student with a practical application of learned medical office skills. This practicum will focus on the "front office" skills generally associated with medical office administration. Corequisites HLTH 0205 and instructor permission required to take this course. **(1st)**

HLTH 0207 Fundamentals of Medical Assisting II

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

This course continues skill development in all aspects of inpatient care in the medical office clinical setting. The course includes development of phlebotomy skills, care of equipment, specimen collection, basic laboratory skills, and diagnostic procedure techniques as applied to electrocardiograms, spirometry, x-ray, and physical therapy. **Prerequisites**: HLTH 0205 & 0206. **(2nd)**

HLTH 0208 Medical Assisting Practicum II

3 Cr.. (Hrs.:.:10 Lab)

This course provides placement in a clinical medical office setting for a guided experience providing the Medical Assistant student with the practical application of previously and concurrently learned clinical skills. This practicum will focus on the "back office" or clinical skills generally associated with medical assistants. **Prerequisites**: HLTH 0205 & 0206. **(2nd)**

HLTH 0209 Pharmacology

3 Cr.. (Hrs.:.:3 Lec)

This is a 3 credit blended learning course. The course provides students with a basic introduction to pharmacology, which includes common drug classes to familiarize students with medication names, therapeutic uses, administration and pharmacological properties. The course content includes a review of drug dosage calculations, pharmaceutical law and use of drug references. **(2nd)**

HEALTH, PHYSICAL EDUCATION, AND RECREATION

I. LEISURE TIME ACTIVITIES

HPER 1016 Physical Education Activities

1 Cr.. (Hrs.:.:2 Lab)

Includes team and individual sports such as swimming, gymnastics and rhythmics, as well as physical fitness activities which are not taught in special courses. Students may elect to be graded on a pass/fail basis. **(On Dem.)**

The following activities courses (HPER 1206 through 2566) provide the opportunity for students to learn fundamental skills and the rules of participation. Practice time is provided to perfect the skills learned. Students may elect to be graded on a pass/fall basis. **(On Dem.)**

HPER 1206-1906 excluding HPER 1626

1 Cr.. (Hrs.:.:2 Lab)

HPER 1206 Beginning Judo
HPER 1226 Beginning Golf
HPER 1246 Beginning Karate
HPER 1256 Beginning Tennis
HPER 1266 Beginning Swimming
HPER 1276 Beginning Basketball
HPER 1286 Beginning Cross Country Skiing
HPER 1296 Beginning Racquetball
HPER 1366 Intermediate Swimming
HPER 1526 Weight Training
HPER 1536 Power Volleyball
HPER 1546 Downhill Skiing
HPER 1556 Aerobic Fitness
HPER 1596 Martial Arts - Self Defense
HPER 1626 Scuba Diving

3 Cr.. (Hrs.:.:2 Lec., 2 Lab)

Minimum age for certification is fifteen. **Prerequisite:** HPER 1366.

HPER 1686 Outdoor Recreational Activities
HPER 1706 Intro. to Physical Fitness
HPER 1716 Physical Fitness Activities

This course may be repeated for up to 4 Credits. **Prerequisite:** HPER 1706.

HPER 1786 Soccer
HPER 2016 Physical Education Activities

1 Cr.. (Hrs.:.:2 Lab)

Physical activities including team and individual sports, such as swimming, gymnastics, rhythmic activities and physical fitness development not taught in special courses. Students may elect to be graded on a pass/fail basis. **(On Dem.)**

HPER 2206-2556

1 Cr.. (Hrs.:.:2 Lab)

HPER 2206 Advanced Judo
Prerequisite: HPER 1206.
HPER 2226 Advanced Golf
HPER 2296 Advanced Racquetball
HPER 2536 Advanced Power Volleyball
HPER 2546 Advanced Skiing
HPER 2556 Advanced Aerobic Fitness
HPER 3156 Water Safety Instructor

2 Cr.. (Hrs.:.:1 Lec., 2 Lab)

Theory and practical work leading to certification as a Water Safety instructor upon satisfactory completion of requirements. **Prerequisites:** HPER 2496 or current certification, and 17 years of age. **(On Dem.)**

II. ATHLETICS - *1 Cr.. (Hrs.:.:2 Lab)*

HPER 1426 Varsity Volleyball (R)
HPER 1436 Varsity Football (R)
HPER 1446 Varsity Basketball (R)
HPER 1456 Varsity Golf (R)
HPER 2316 Modern Basketball Theory

2 Cr.. (Hrs.:.:2 Lec.)

A study of modern basketball theories for the player, the fan, or the prospective coach. Philosophies, strategies, and techniques of Montana Tech basketball and of other systems. **(On Dem.)**

HPER 2326 Modern Football Theory

2 Cr.. (Hrs.:.:2 Lec.)

A study of the rules and theory of modern football emphasizing an understanding of the game and application of sophisticated football rules and coaching philosophies. The use of football as a leisure time activity is explored. **(On Dem.)**

HPER 2336 Modern Volleyball Theory

2 Cr.. (Hrs.:.:2 Lec.)

A study of the rules and the theory of power volleyball stressing rules and coaching philosophies. The use of power volleyball as a leisure time activity is explored. **(On Dem.)**

HPER 2426 Varsity Volleyball (R)
HPER 2436 Varsity Football (R)
HPER 2446 Varsity Basketball (R)

HEALTH CARE INFORMATICS

HCI 1016 Introduction to Health Care Informatics Section 1

3 Cr.. (Hrs.:.:3 Lec.)

Introduce the discipline of health care informatics. An overview of the subject including the history, basic knowledge of health care informatics and tools as applied in support of health care delivery. Students will understand an introductory level about the complexities of health care and how informatics fits within the US Health Care System. **(1st)**

HCI 1016 Introduction to Health Care Informatics Section 2

3 Cr.. (Hrs.:.:3 Lec.)

Section 2 has the same requirements as section 1. This section will present the same material as Section 1 during the same time. Section 2 is delivered via distance in a live format. The student will need computer high speed internet access, speakers and microphone. Students may also need to visit with the instructor during the course. **(1st)**

HCI 1206 Medical Data and Terminologies

3 Cr.. (Hrs.:.:3 Lec.)

Designed to introduce the student to the structure and use of health care terminologies and classifications and build the basic body of knowledge of data in clinical information systems. The terminology is presented as it is the subject of medical computing and students will learn to differentiate between primary and secondary medical data. Course will cover the nature and specificity of data from site of capture to roles in decision-making. An overview of nomenclature and taxonomies in HIPAA, ICD, HCPCS, CPT, SNOMED, LOINC, NCDCP, HL7 and other standards is presented. **(1st, 2nd, on demand)**

HCI 2106 Health Care Ethics and Regulations

3 Cr.. (Hrs.:.:3 Lec.)

The course is a combination of medical ethics, health care business ethics, and major health care regulations and legal issues. The class also covers health care regulations from various federal and state agencies as it relates to ethics. **Prerequisites:** HCI 1016 or Consent of Instructor **(2nd)**

HCI 2156 Health Care Facility Procedure Section 1

3 Cr.. (Hrs.:.:3 Lec.)

This course introduces the student to common procedures and practices found in health care settings and the information systems that support such procedures/practices. This course focuses on the major functional areas of the he acute care setting, providing an overview of how individual departments operate and interact. **Prerequisite:** HCI 1016 **(2nd)**

HCI 2156 Health Care Facility Procedure Section 2

3 Cr.. (Hrs.:.:3 Lec.)

Section 2 has the same requirements as section 1. This section will present the same material as section 1 during the same time. Section 2 is delivered via distance in a live format. The student will need computer high speed internet access, speakers and microphone. Students may also need to visit with the instructor during the course. **Prerequisite:** HCI 1016.**(2nd)**

HCI 2256 Data, Information & Knowledge Section 1

2 Cr.. (Hrs.:.:2 Lec.)

Provides students with the opportunity to examine three concepts that are fundamental to the field of informatics - data, information and knowledge. The course focuses in database principles, health care classification systems and concepts of data set. **Prerequisites:** CAPP 158, HCI 1016. **(1st)**

HCI 2256 Data, Information & Knowledge Section 2

2 Cr.. (Hrs.:.:2 Lec.)

Section 2 has the same requirements as section 1. This section will present the same material as Section 1 during the same time. Section 2 is delivered via distance in a live format. The student will need computer high speed internet access, speakers and microphone. Students may also need to visit with the instructor during the course. **Prerequisites:** CAPP 158, HCI 1016 **(1st)**

HCI 2306 Overview of HCI Systems

4 Cr.. (Hrs.:.:2 Lec., 6 Lab)

Course introduces the student to health information systems concepts, components, processes, and design. Topics include implementation of health information systems and the use of information systems technologies in a health care setting, including clinical applications systems, electronic medical records, and administrative and management applications. Opportunities for hands-on experiences with software products are provided. **Prerequisite:** HCI 1016 or Consent of Instructor. **(2nd)**

HCI 3106 Health Care Delivery in the US I

3 Cr.. (Hrs.:.:1 Lec., 6 Lab)

This course covers the different sectors of health care delivery in the United States today. The student will learn about the various aspects of the US delivery system and how the system functions on different levels from an industry and economic perspective. **Prerequisite:** HCI 1016 **(1st)**

HCI 3126 Health Care Delivery in the US II

3 Cr.. (Hrs.:.:1 Lec., 6 Lab)

A continuation of HCI 3106. The goal is to teach the student the various aspects

of the US delivery system and how the system functions on different levels. **Prerequisite:** HCI 3106. **(2nd)**

HCI 3206 Information Systems Security

3 Cr.. (Hrs.:.:2 Lec., 1 Lab)

The course covers information systems security in a broad context and gives practical approaches in real life context to ensure data security. Examples will be drawn from health care systems. Topics include data disaster preparedness, data storage and transfer, uniform code sets, and use of patient and other identifiers.. **Prerequisite:** Consent of Instructor.. **(2nd)**

HCI 3406 Elect Hlth Rcrd in Med Pract

3 Cr.. (Hrs.:.:2 Lec., 1 Lab)

Students will learn the personnel functions and associated workflows required in an ambulatory care physician clinic and how to prepare for, implement and use an electronic health record (EHR) to achieve a paperless office environment and improved quality of care. Office function, associated workflow and EHR use will include all office personnel roles from receptionist through nurse and physician. EHR use will include both in-office functions and its role in Health Information Exchange (HIE) with other health care providers and organizations including laboratories, pharmacies, consulting physicians and payers. **Prerequisite:** HCI 2156 or Consent of Instructor. **(1st)**

HCI 4106 Project & System Management

4 Cr.. (Hrs.:.:3 Lec., 1 Lab)

Students learn to design health care informatics applications from "the ground up." Methodologies for analyzing information needs and determining information requirements will be examined. A systematic evaluation process will be introduced which includes economics and technology assessments. **Prerequisite:** Consent of Instructor. **(1st)**

HCI 4206 Public Health Informatics

3 Cr.. (Hrs.:.:3 Lec.)

The governmentally-based health care system (Public Health) is important in the assurance and assessment of the quality of health care delivered in the US. The course covers the challenges and the opportunities associated with technology, implementation in the public health system; examining the political, information systems and project management concepts associated with health informatics programs put into operation in the public health sector. Online tools will be used extensively to support collaboration both inside and outside the classroom, giving students substantial exposure to the technologies supporting group work. **Prerequisite:** HCI 3106 or Consent of Instructor. **(1st)**

HCI 4306 HCI Practicum

Variable Credit

Students work in group and individually to identify and address potential roadblocks to effective implementation of information management systems within health care facilities. Opportunities to react to unexpected outcomes or events are provided within a laboratory setting. **Prerequisite:** HCI 4106, 4206, or consent of the instructor. **(1st, 2nd)**

HCI 4406 HCI Internship

6 Cr.. (Hrs.:.:12-18 Lab.)

An off-campus internship that places the student within an assigned health care facility to complete a focused informatics needs assessment and work with facility staff to provide a solution for a least one identified informatics need within the facility. **Prerequisite:** HCI 4306.

HCI 4916 Internship

Variable Credit

Max 6 cr.. for credit plus an additional 6 cr.. for pass/fail. An office-campus Internship that places the student within an assigned health care facility to complete a focused informatics needs assessment and work with facility staff to provide a solution for at least one identified informatics need within the facility. **(1st, 2nd, sum)**

HCI 4946 Health Care Informatics Seminar

2 Cr.. (Hrs.:.:2 Lec.)

HCI seminar is an integrative course in which the medical, social, ethical, and legal issues surrounding the use of Health Information Technology (HIT) will be examined. One or two faculty members preside over the course, overseeing the observation component and running the debriefing sessions. Speakers will be invited form the outside to greatest extent possible. Readings illustrating current issues will be used to supplement/reinforce materials provide by the speakers. Online tools will be used extensively, giving students exposure to the technologies used to support life-long learning. **Prerequisite:** HCI 3106 or Consent of Instructor. **(2nd)**

HCI 4986 Undergraduate Research

HUMANITIES

HUMN 1086 Art & Music

3 Cr.. (Hrs.:.:3 Lec.)

This course surveys the artistic and musical creations of Europe from the Greeks through the 20th Century. Students will study the evolution of artistic and musical styles in their cultural context as both European music and the visual arts responded to the same cultural influences. **(2nd)**

LIT 126 Introduction to Poetry & Drama

3 Cr.. (Hrs.:.:3 Lec.)

Introduces drama and poetry as literary forms, with emphasis on the analysis and evaluation of a broad range of selected examples. **(1st)**

LIT 112 Introduction to Literature: Fiction

3 Cr.. (Hrs.:.:3 Lec.)

Companion to LIT 126. Studies examples of short and long fiction, with emphasis on evaluation and analysis. **(2nd)**

FRCH 101 Elementary French I

5 Cr.. (Hrs.:.:5 Lec.)

Students acquire language skills through practice in reading, writing, listening, and speaking. Basic grammar is stressed, and use is made of the well-known series French in Action. **(1st, Alt.)**

FRCH 102 Elementary French II

5 Cr.. (Hrs.:.:5 Lec.)

A continuation of HUMN 1416. The study of basic grammar is completed as emphasis shifts to writing and speaking. Readings in French literature and culture are introduced, and further use is made of French in Action. **(2nd, Alt.)**

GRMN 101 Elementary German I

5 Cr.. (Hrs.:.:5 Lec.)

Emphasizes the audio-lingual approach to mastery of the language and includes a study of basic grammar. **(1st, Alt.)**

GRMN 102 Elementary German II

5 Cr.. (Hrs.:.:5 Lec.)

A continuation of HUMN 1436. The study of basic grammar is completed, and readings in culture and literature are included. **Prerequisite:** GRMN 101 or one year of high school German. **(2nd, Alt.)**

SPNS 101 Elementary Spanish I

3 Cr.. (Hrs.:.:3 Lec.)

Introduces students to the basic elements of the Spanish language. Oral and written skills are developed through the study of vocabulary, grammar and idioms. Pronunciation, comprehension and writing are emphasized. (H) **(1st)**

SPNS 102 Elementary Spanish II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of SPNS 101. More basic grammar is introduced, enabling students to speak and write Spanish in a range of everyday situations. **Prerequisite:** SPNS 101. **(2nd)**

ARAB 101 Elementary Modern Arabic I

4 Cr.. (Hrs.:.:4 Lec.)

This course introduces the sound and writing systems of the Modern Standard Arabic language. Various components of the language, i.e., sounds, letters, grammar, vocabulary...etc., serves the ultimate goal of communication at an elementary level. Speaking and Writing are emphasized.. **(1st)**

ARAB 102 Elementary Modern Arabic II

4 Cr.. (Hrs.:.:4 Lec.)

This Arabic course adopts a communicative approach where emphasis is placed on the functional use of the Arabic language. The introduction of various components of the language, i.e., sounds, letters, grammar, vocabulary... etc, serves

the ultimate goal of enabling students to communicate in Arabic, especially in speaking and writing **Prerequisite:** ARAB 101. **(2nd)**

HSTR 101 Western Civilization I

3 Cr.. (Hrs.:.:3 Lec.)

A comprehensive introductory history of western civilization from prehistoric times to the sixteenth century. Studies developments in the fields of political thought, economics, science, philosophy, and religion. Serves as an introduction to the humanities and the social sciences. **(1st, 2nd)**

HSTR 101H Western Civilization I - Honors

3 Cr.. (Hrs.:.:3 Lec.)

Honors course. A comprehensive introductory history of western civilization from prehistoric times to the sixteenth century. Studies developments in the fields of political thought, economics, science, philosophy, and religion. Serves as an introduction to the humanities and the social sciences. **(1st, 2nd)**

HSTR 102 Western Civilization II

3 Cr.. (Hrs.:.:3 Lec.)

A comprehensive introductory history of western civilization from the seventeenth century to the present. **Prerequisite:** HSTR 101 or Consent of Instructor. **(1st, 2nd)**

HUMN 1956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of humanities not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

HUMN 2076 Ethics

3 Cr.. (Hrs.:.:3 Lec.)

What makes life worth living? How do we decide what actions are morally right? Why ought we to care about others? Is morality subject to progress? Moral philosophy strives to develop valid ethical decision principles to answer such questions. This course surveys the development of moral theory in Western Civilization from Socrates' philosophy to Feminist ethics. **(2nd)**

LIT 223 British Literature I

3 Cr.. (Hrs.:.:3 Lec.)

Studies major British writers from the Old English Period through the end of the eighteenth century. Pays attention to the relation of works to their age, and analyzes the works as literature. **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st)**

LIT 224 British Literature II

3 Cr.. (Hrs.:.:3 Lec.)

Covers major authors and works from the Romantic Period to the twentieth century. **Prerequisite:** Sophomore standing or Consent of Instructor. **(2nd)**

HSTA 101 American History I

3 Cr.. (Hrs.:.:3 Lec.)

Stresses the nature of our American heritage, examining the results of exploration and colonization, colonial institutions and life, cultural achievements, the revolt of the English colonies, the formation of the Constitution and the conflict between particularism, nationalism, the War of 1812, territorial growth, and the sectional conflict and secession leading to the Civil War. **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st)**

HSTA 102 American History II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of HSTA 101 dealing with the aftermath of the Civil War, agrarianism, urbanization, business and politics, the Spanish-American War, both World Wars, problems following World War II, twentieth century achievements, and some contemporary problems. **Prerequisite:** HSTA 101 or Consent of Instructor. **(2nd)**

LIT 210 American Literature I

3 Cr.. (Hrs.:.:3 Lec.)

Studies American literature from Colonial times to the Civil War with emphasis on the major philosophical & literary concepts of each period. (H) **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st)**

LIT 211 American Literature

3 Cr.. (Hrs.:.:3 Lec.)

A sequel to LIT 210. Examines American literature, especially prose, from the Civil War to the present. **Prerequisite:** Sophomore standing or Consent of Instructor. **(2nd)**

LIT 231 Ancient to Ren World Lit

3 Cr.. (Hrs.:.:3 Lec.)

Surveys major works of world literature from antiquity through the Renaissance, including both Western and non-Western examples. Explores the cultural context, universal themes, and literary style of works in various genres. **(1st)**

LIT 232 Modern World Literature

3 Cr.. (Hrs.:.:3 Lec.)

Surveys major works of world literature from the Renaissance to the present, including both Western and non-Western examples. Explores the cultural context, universal themes, and literary style of works in various genres. **(2nd)**

HUMN 2396 Intro. to Philosophy

3 Cr.. (Hrs.:.:3 Lec.)

An introductory study, based on selected philosophical writings, of the nature and scope of philosophy and some of its constituent fields of inquiry: epistemology, metaphysics, ethics, esthetics, the philosophy of history, and the philosophy of science. **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st)**

HSTR 201 The 20th Century World I

3 Cr.. (Hrs.:.:3 Lec.)

Traces the European impact on Africa, Asia and the Americas in terms of imperialism and industrialization up to World War II. Treats the rise of Communism and Fascism in Europe and the development of nationalism in the underdeveloped countries. **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st, Alt.)**

HSTR 202 The 20th Century World

3 Cr.. (Hrs.:.:3 Lec.)

Traces the course and impact of World War II with particular emphasis on the breakup of the European colonial empires and the emergence of new nations in Africa and Asia. Examines the rise to world dominance of the United States and the Soviet Union, the background to the Cold War, and the course of West" and "East" relations since 1945. Discusses the historical origins of major international problems (such as the Middle East, Latin American Revolution, Third World crises, etc.). **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st, Alt.)**

HUMN 2956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of humanities not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

HUMN 3016W Professional Ethics

3 Crs. (Hrs.:.:3 Lec.)

"Everyone is an expert": As a society of experts, we rely on professionals to guide us at every turn in our personal and collective social path. This is an interdisciplinary course in applied moral philosophy, wherein we confront contemporary problems arising in professions such as engineering, business, and nursing. Special emphasis is given to technological "progress" as the driving force behind many of these problems. **(1st)**

HUMN 3116 Shakespeare: Comedies & Romances

3 Cr.. (Hrs.:.:3 Lec.)

Surveys Shakespeare's major comedies and romances, and provides an introduction to Shakespearean criticism and scholarship, to Elizabethan dramaturgy, and to pertinent features of the socio-historical context in which the comedies and romances were written, and to recorded modern interpretations of the works. Close attention to dramatic poetics and prosody will include some coverage of relevant sonnets. **Prerequisite:** Sophomore standing or Consent of Instructor.

HUMN 3126 Shakespeare: Tragedies & Histories

3 Cr.. (Hrs.:.:3 Lec.)

Surveys Shakespeare's major tragedies and histories, and provides an introduction to Shakespearean criticism and scholarship, to Elizabethan dramaturgy, to

pertinent features of the socio-historical context in which the works were written, and to recorded modern interpretations of the works. Close attention to dramatic poetics and prosody will include some coverage of relevant sonnets. **Prerequisite:** Sophomore standing or Consent of Instructor.

HUMN 3216 History of Public Address

3 Cr.. (Hrs.:.:3 Lec.)

A study of rhetorical theory and the application of rhetorical theory and principles to the criticism of outstanding American and/or British public address from the eighteenth century to the present. **Prerequisite:** COMM 1216 or Consent of Instructor. **(On Dem.)**

HSTA 255 Montana History

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes the activities of economic and political groups in a study of the land and people of Montana. **Prerequisite:** HSTA 102 or Consent of Instructor. **(On Dem.)**

HSTA 350 History of Indians in the Northwest

3 Cr.. (Hrs.:.:3 Lec.)

This course is designed to examine the role Native Americans have played in the development of the United States. The first half of the course will examine pre-Columbian peoples on a regional basis. It will emphasize their cultural diversity and complexity and the impact of a conflicting value system on their lives. With this as a background, the second half of the course will concentrate on the culture and history of the native peoples of the Northwest from first contact through the reservation system. **(On Dem.)**

FRCH 401 French Literature I

3 Cr.. (Hrs.:.:3 Lec.)

French Literature from the Middle Ages through the Enlightenment: A survey of French literature from the Medieval Courtly Romance Tristan and Isolde through the fictional and philosophical works of the 18th century. Readings will include Rabelais' Gargantua and Pantagruel, selected works of playwrights of the Classical period, and Voltaire's Candide. Class discussions will focus on the historical significance of the texts, as well as recent critical interpretations of them. **Prerequisite:** Sophomore standing or Consent of Instructor. **(1st).**

FRCH 402 French Literature II

3 Cr.. (Hrs.:.:3 Lec.)

A sequel to HUMN 3416W, this course will cover representative works from the Romantic period to the present. Reading selections vary, but will include texts by Naturalist, Symbolist, Decadent, and Existential writers. **Prerequisite:** Sophomore standing or Consent of Instructor. **(2nd)**

HUMN 3476 History of Philosophy

3 Cr.. (Hrs.:.:3 Lec.)

A chronological survey, beginning with the Pre-Socratic Greeks and ending with contemporary thinkers, of the development of philosophy. Emphasizes the growth of philosophic schools and problems, as well as the men who contributed to that growth. **Prerequisite:** HUMN 2396 or Consent of Instructor. **(2nd)**

HUMN 3956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of humanities not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

HSTA 332 American History: WWII to Present

3 Cr.. (Hrs.:.:3 Lec.)

Introduces students to a broad variety of recent academic thought focused on the attempt to identify, analyze and interpret dominant trends, key events, and important social movements shaping American society since the beginning of WWII. The course is conceived broadly so as to allow study and discussion of our nation's immediate past seen from viewpoints of individuals and groups associated with a number of disciplines: political science, sociology, psychology, society & technology studies, economics, pop culture studies, film studies, mass media, journalism, etc. **Prerequisite:** HSTR 101/102 or HSTA 102/102 or HSTR 201/202 or completion of a freshman or sophomore history course sequence at another college or Senior-level standing. **(1st, 2nd)**

HUMN 4456W History of Fascism

3 Cr.. (Hrs.:.:3 Lec.)

This course introduces students to a broad variety of recent academic thought focused on identifying the dominant characteristics of European Fascism during the period 1914 to 1945. Beginning with explanations for the emergence of fascist ideology during the 1890s, the course presents students with contrasting views on: the importance of World War I in the creation of fascist movements; the appeal of fascism in the post-war era; the methods by which fascist movements came to power; the similarities and differences between Italian Fascism and German National Socialism; the development of the Fascist State; the experience of women under fascist rule; and the contemporary debates to whether fascism has continued to flourish since 1945. **Prerequisite:** Junior or Senior standing.

HUMN 4466W Literature of the Industrial Age

3 Cr.. (Hrs.:.:3 Lec.)

A study, through literature of the effects of industrialization on society. Readings will include works from Britain and America as well as from various other national literatures. Discussions will focus on utopian and dystopian views of technology and on the place of the individual in a mechanized society. Issues addressed in the course and problems described in the texts will be examined from a historical, philosophical, psycho-social, as well as critical perspective. **Prerequisite:** 6 credits of lower division literature, Society & Technology. **(1st, every other year.)**

HUMN 4476 History of Modern Philosophy

3 Cr.. (Hrs.:.:3 Lec.)

Designed to cover the metaphysics, epistemology, and ethics of modern philosophers from Descartes to Wittgenstein and Irigaray. Emphasis is on philosophical questions, development of philosophical questions in a historical context, and future implications of major historical philosophical ideas. "Doing philosophy" includes lecture, discussion, panel discussion, wonder, and playing around in all forms. **Prerequisite:** HUMN 2396 & 3476 or Consent of Instructor. **(2nd)**

HUMN 4486W Literature of the Fantastic

3 Cr.. (Hrs.:.:3 Lec.)

An interdisciplinary, comparative literature study of a broadly defined genre encompassing Romantic fairy tales (the German Märchen), Gothic horror fiction, the French "conte fantastigue," and the Surrealist novel. The class begins with a theoretical discussion of the fantastic and present various critical definitions of the fantastic.

HSTR 462 Holocaust in Nazi Occupied Europe

3 Cr.. (Hrs.:.:3 Lec.)

This course will study, from a range of perspectives, the tragedy of the Holocaust. The first half will focus on history, the second on literature. As well, films will be shown. Students will compare the Holocaust with other genocides and ponder what general lessons the Holocaust offers for humanity. Upper division standing is required. In order to fulfill the course's "W" designation, students will be asked to write either three five-pages papers, or one fifteen page paper, including revisions. **(On Demand)**

HUMN 4956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of humanities not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

INDUSTRIAL HYGIENE

I.H. 5076 Statistical Analysis

3 Cr.. (Hrs.:.:3 Lec.)

Covers common statistical tests used in industrial hygiene, safety and epidemiology. Emphasizes experimental design, sampling strategies, and interpretation of statistical information. **Prerequisite:** STAT 216. **(2nd)**

I.H. 5136 Industrial Hygiene Management

2 Cr.. (Hrs.:.:2 Lec.)

Industrial Hygiene (IH) management addresses not only the interpersonal and management skills so essential in the safety and health field, but also the addresses the IH leader and manager, IH program elements and assessment and the IH management team. Various management styles and mandates are introduced.

This course links management techniques with the practice of occupational and environmental health and safety. **Prerequisite:** Graduate Standing or Consent of Instructor

I.H. 5156 Noise

3 Cr.. (Hrs.:.:3 Lec.)

Designed to familiarize students with the evaluation and control of noise. Emphasizes the selection of appropriate evaluation techniques, instruments, analysis of data, and design of adequate and cost-effective controls. **(1st)**
Prerequisite: Phys. 1036 and Graduate Standing or Consent of Instructor

I.H. 5276 Advanced Industrial Toxicology

3 Cr.. (Hrs.:.:3 Lec.)

Presents a detailed study of specific industrial chemical classifications and target organs including such topics as exposure routes, acute and chronic toxicity and high risk occupational groups. Current industrial toxicological research methods are covered. Regulatory efforts concerned with providing toxicological information regarding chemical exposures in the workplace are also discussed. **Prerequisites:**
Prerequisite: Graduate Standing or Consent of Instructor **(2nd)**

I.H. 5286 Sampling and Evaluation of Health Hazards (ONLINE STUDENTS ONLY)

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Teaches sampling techniques and procedures as stipulated by occupational safety and health regulatory agencies for evaluating occupational health hazards arising from chemical and physical agents in the workplace. It includes the calibration and use of personal monitoring and direct reading instrumentation for the assessment of an employee's exposure to common industrial hygiene hazards including air contaminants, noise, nonionizing radiation and temperature extremes. **Prerequisite:** OSH 4216. **(2nd)**

I.H. 5296 Sampling and Evaluation of Health Hazards

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Teaches sampling techniques and procedures as stipulated by occupational safety and health regulatory agencies for evaluating occupational health hazards arising from chemical and physical agents in the workplace. It includes the calibration and use of personal monitoring and direct reading instrumentation for the assessment of an employee's exposure to common industrial hygiene hazards including air contaminants, noise, nonionizing radiation and temperature extremes. **Prerequisite:** OSH 4216. **(2nd)**

I.H. 5426 Principles of Epidemiology

3 Cr.. (Hrs.:.:3 Lec.)

Develop an understanding of epidemiology by analyzing data on disease incidence, mortality rates, and hospital admissions. This course is designed to show how classic epidemiological methodology is used to research diseases. Data collection in the workplace for purposes of future epidemiological analysis will also be studied. **Prerequisites:** Graduate standing. **(1st)**

I.H. 5476 Strategies for Occupational Exposure Assessment

3 Cr.. (Hrs.:.:3 Lec.)

This course is designed to provide and overview of comprehensive exposure assessment strategies including workplace, workforce, and agent characterization, exposure assessment, health hazard control, communication and documentation, and data handling and analysis. **Prerequisites:** OSH 4296

I.H. 5606 Systems Safety & Process Safety Management

3 Cr.. (Hrs.:.:3 Lec.)

Systematic techniques for managing hazards are addressed. These techniques are primarily used for identifying hazards, assessing risks, choosing appropriate hazard controls, and determining if the controls are acceptable. Applications to industrial chemical processes are emphasized. **Prerequisites:** Graduate standing or faculty consent. **(2nd)**

I.H. 5626 Radiological Health & Safety

3 Cr.. (Hrs.:.:3 Lec.)

Covers the concepts of radioactive decay, measurement and radiation protection and demonstrates radiation sampling procedures and equipment. Control techniques including time, distance and shielding are also covered. Regulations governing exposures, record-keeping, monitoring, etc. are emphasized. **Prerequisite:** PHYS 1036 and OSH 4226. **(2nd)**

I.H. 5676 Industrial Respiratory Protection

3 Cr.. (Hrs.:.:3 Lec.)

Presents the concepts essential to developing and implementing an acceptable respiratory protection program as an aspect of a comprehensive industrial hygiene program. Selection, operation, training, fitting and inspection of respirators are taught as well as record-keeping requirements specific to respiratory protection. **Prerequisite:** OSH 4216 **(2nd)**

I.H. 5686 Advanced Ergonomics

2 Cr.. (Hrs.:.:2 Lec.)

Methods used for conducting ergonomic analysis and studies are addressed. The emphasis is on occupational applications of ergonomics, particularly hazards associated with manual material handling and highly repetitive motions. The course assumes students have completed an introductory course in ergonomics. **Prerequisites:** Graduate standing or consent of instructor. **(1st)**

I.H. 5946 Graduate Seminar

1 Cr.. each (Hrs.:.:1 Lec.)

Students prepare written and oral presentations concerning current industrial hygiene literature, research and equipment developments.

I.H. 5966 Industrial Hygiene Report

3 Cr.. (Hrs.:.:3 Lec.)

Students pursue written research on an advisor approved topic. Credit is awarded upon satisfactory completion of the written report and presentation.

I.H. 5976 Special Problems

(1 - 4 crs.)

An individual laboratory, field, library or research problem is assigned requiring written and oral reports of the student's work. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

I.H. 5996 Thesis Research

(1 - 8 crs.)

Students pursue original research on an advisor-approved topic. Credit is awarded upon satisfactory completion of a thesis. This course is taken for Pass/Fail **(Summer, 1st, 2nd)**

I.H. 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

I.H. 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

INFORMATION TECHNOLOGY

I.T. 0100 Web Page Fundamentals

3 Cr.. (Hrs.:.:3 Lec.)

This course will cover the basics of developing Web pages from scratch using HTML, XHTML, and XML. Learn how to build and maintain a site without the need for an expensive web page developing program. Understand what the code generated by a web page development program such as FrontPage and DreamWeaver means and be able to alter code within pages created by such programs to your specifications, allowing you full control of your pages. No prior experience is necessary.

I.T. 0110/1116 Introduction to Operating Systems (MCSA 1)

3 Cr.. (Hrs.:.:3 Lec.)

This course is an introduction to the most popular operating system, Microsoft Windows. This is the first course in a series that prepares for the MCSA certification exams. **(1st)**

I.T. 0114 Windows

2 Cr.. (Hrs.:.:2 Lec.)

This course provides the skills required to perform basic installation, configuration tasks, and day-to-day administration tasks. The course also teaches students how to troubleshoot basic installation, configuration, and administration problems.

I.T. 0115/1156 Intermediate Windows Server

3 Cr.. (Hrs.:.:3 Lec.)

This course will cover networking components using the latest server platform including: IP addressing basics, configuring name resolution, implementing and managing DNS service, securing network traffic, remote access, internet authentication service, routing, security templates, and troubleshooting network connectivity. **(2nd)**

I.T. 0117 Web Site Development

3 Cr.. (Hrs.:.:3 Lec.)

This course uses a real-life, problem-solving approach to teaching web site development with the use of a web page editing programming. The course will cover what a student needs to know in order to get Web sites up and running, offering basic coverage as well as more advanced features of editing software. **(1st)**

I.T. 0126/1266 Networking Fundamentals (CCNA 1)

4 Cr.. (Hrs.:.:4 Lec.)

This course introduces the architecture, structure, functions, components, and models of the internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. This course is the first course in a four course series that leads towards certification as a CCNA (Cisco Certified Network Associate). **(1st, 2nd)**

I.T. 0130/1306 Intro. to Windows Server (MCSA 2)

3Cr. (Hrs.:.:3 Lec.)

This course will introduce the most important topics of Microsoft Windows 2008 server. Lessons include planning a Server deployment, planning and implementing server commissioning and decommissioning, installation of server roles, creating a configuration change plan, implement security, manage application versioning in Windows Server 2008, plan for a high-availability, plan a server update maintenance schedule, maintain a distributed file system (DFS), define server backup requirements and policies for Window Server Backup, plan and implement a restore, implement server monitoring, and focus on troubleshooting skills. **(2nd)**

I.T. 0147 Word

3 Cr.. (Hrs.:.: 3 Lec.)

This class will provide students with the opportunity to learn about Microsoft Word concepts required for employment purposes. Practice will be provided enabling students to acquire skills for not only basic to intermediate functions, but also advanced to desktop publishing skills. Theory and practical applications are components of the class. **Prerequisite:** ACTG 101

I.T. 0154/1546 Introduction to Unix/Linux

3 Cr.. (Hrs.:.:3 Lec.)

This course will introduce the Linux operating system commands and operating environment commands. Also the Common Desktop Environment is demonstrated. Students will learn fundamental command-line features of the Linux environment including file system navigation, file permissions, the vi text editor, command shells and basic network use. CDE features include Standard Desktop Tools, Text Editor, and printing. **Prerequisite:** I.T. 0110 **(1st)**

I.T. 0176/1766 Introduction to Router Technologies (CCNA 2)

4 Cr.. (Hrs.:.:4 Lec.)

This course describes the architecture, components, and operations of routers, and explains the principles of routing and routing protocols. Students analyze, configure, verify, and troubleshoot the primary routing protocols RIPv1, RIPv2, EIGRP, and OSPF. **(1st)**

I.T. 0195/1956 I.T. Essentials

4 Cr.. (Hrs.:.:4 Lec.)

This course provides an introduction to the IT industry and interactive exposure to personal computers, hardware, and operating systems. Students participate in hands-on activities and lab-based learning to become familiar with various hardware and software components and discover best practices in maintenance and safety. **(1st, 2nd)**

I.T. 0210/2106 Intro. to Novell Netware

3 Cr.. (Hrs.:.:3 Lec.)

This course will introduce the most important topics of Novell Netware. Lessons include installation, planning the NDS tree, managing users, managing trustee assignments, and login scripts. **(1st)**

I.T. 0226/2266 Routing & Switching (CCNA 3)

4 Cr.. (Hrs.:.:4 Lec.)

This course covers more advanced router configurations with both lecture and hands-on activities. Topics include LAN switching, network management, and advanced network design. This course is the third course in a four course series that leads towards certification as a CCNA (Cisco Certified Network Associate). **(2nd)**

CAPP 141 Basic Internet

3 Cr.. (Hrs.:.: 3 Lec.)

The student is introduced to search and navigation techniques of the World Wide Web. The use of E-mail, Newsgroups, and other discussion tools are explored. Web page composition is also introduced. **Prerequisites:** BUS 0103 or consent of the instructor.

CAPP 154 MS Word

3 Cr.. (Hrs.:.: 3 Lec.)

Students, while enhancing their keyboarding skills, are provided with an exposure to the major capabilities of Corel WordPerfect software. **Prerequisite:** BUS 0120

I.T. 0247/2476 Intro. to Programming

3 Cr.. (Hrs.:.: 3 Lec.)

Course provides an introduction to computer programming using the Visual Basic programming language. **(1st)**

I.T. 0250 Interactive Web Pages

3 Cr.. (Hrs.:.: 3 Lec.)

Students will learn how to create rich interactive experiences for the Web, from banners and interactive menus to a complete Web site, using Adobe's Macromedia Flash. In addition to teaching essentials, the course focuses on teaching best practices for creating Flash content.

I.T. 0253 Java Programming

3 Cr.. (Hrs.:.: 3 Lec.)

This course introduces the beginning programmer to the fundamentals of object-oriented programming while becoming acquainted with many of the core features of Java. The student will be exposed to the creation of a variety of games and applications. After the basics, the student will learn to develop his or her own systems of classes, eventually working with many of Java's Graphical User Interface (GUI) features and will develop a desktop Windows application. (2nd)

I.T. 0254 Web Graphics/Video Integration

3 Cr.. (Hrs.:.: 3 Lec.)

Students will learn how to implement professionally looking graphics and video into Web sites and turn static looking interfaces into attractive professional Web pages. The course implements Web graphics and video using digital photo and digital video software editing programs. (2nd)

I.T. 0255 Web Scripting

3 Cr.. (Hrs.:.: 3 Lec.)

Students will develop Server Side Scripts, Client Side Scripts, and Active Server Pages with VB script and PHP. Course will incorporate the integration of relation databases and how to develop dynamic web pages to create, update, and view data stored in relational databases. It will teach students how to make their Web sites data-driven. The course will provide exposure to MySQL databases and how data from these sources can populate a web page. (2nd)

I.T. 0260/2666 Fundamentals of Voice & Data Cabling

3 Cr.. (Hrs.:.: 3 Lec.)

This course focuses on cabling issues related to data and voice connections and provides an understanding of the industry and its worldwide standards, types of media and cabling, physical and logical networks, as well as, signal transmission. Students will develop skills in reading network design documentation, part list set up and purchase, pulling and mounting cable, cable management, choosing wiring closets and patch panel installation and termination as well as installing jacks and cable testing. This course will help prepare students for the BICSI Registered Installer exam. **Prerequisite:** CAPP 131 **(2nd)**

CAPP 156 MS Excel

3 Cr.. (Hrs.:.: 3 Lec.)

Provides the student with skills in spreadsheet construction. Areas of instruction include worksheet construction, formatting, charting and chart enhancements, multiple worksheets, special functions, database operations, macros, operations including list data, scenario management, and pivot tables. Import/export operations involving spreadsheet data, hyperlinks and an introduction to Visual Basic for Applications programming language is included This course will prepare the student to take the Proficient level Certified Microsoft Office User Exam for Microsoft Excel. **Prerequisite: CAPP** 131 or ACTG 101

I.T. 0262 Special Projects - Spreadsheets

2 Cr.. (Hrs.:.: 2 Lec.)

Prerequisite: CAPP 156

CAPP 158 MS Access

3 Cr.. (Hrs.:.: 3 Lec.)

This course will provide an in-depth use of current database software to provide an understanding of relational database systems. The course will include how to create and maintain a database. Functions include how to create forms, reports, queries, and custom reports. Also, this course will integrate Access with the web and other software programs, automate tasks with macros, use and write Visual Basics for Applications Code, and manage and secure a database Emphasis is placed on problem solving, thinking creatively, individual responsibility and self management. Hands-on computer projects are assigned to assist students in comprehending overall database management concepts. **Prerequisite:** CAPP 131 or ACTG 101

I.T. 0265 Special Project - Database

2 Cr.. (Hrs.:.: 2 Lec.)

Prerequisite: CAPP 158

CAPP 270 Oracle

3 Cr.. (Hrs.:.: 3 Lec.)

This course offers students an extensive introduction to data server technology. The class covers the concepts of both relational and object relational databases and the powerful SQL programming language. Students are taught to create and maintain database objects and to store, retrieve, and manipulate data. Students learn to retrieve data by using advanced techniques such as ROLLUP, CUBE, set operators, and hierarchical retrieval. Students also learn to write SQL and SQL *Plus script files using the iSQL *Plus tool to generate report-like output. Demonstrations and hands-on practice reinforce the fundamental concepts. **(1st)**

I.T. 0271/2716 Web Authoring Tools

3 Cr.. (Hrs.:.:3 Lec.)

This course introduces the web authoring tools of the Macromedia suite. **(1st)**

I.T. 0272/2726 Fundamentals of Wireless LANs

3 Cr.. (Hrs.:.: 3 Lec.)

This introductory course to Wireless LANs focuses on the design, planning implementation, operation and troubleshooting of Wireless LANs. This class is a comprehensive overview of technologies, security, and design best practices with particular emphasis on hands-on skills. **(1st)**

I.T. 0274/2746 Introduction to Publications

3 Cr.. (Hrs.:.: 3 Lec.)

Reports, brochures, advertisements, and newsletters are formatted using a combination of text and graphics. HTML formatting is introduced and students gain exposure to Web authorizing software. **Prerequisite:** ACTG 101

I.T. 0276/2766 WAN Technologies (CCNA 4)

4 Cr.. (Hrs.:.:4 Lec.)

This course discusses the WAN technologies and network services required by converged applications in enterprise networks. The course uses the Cisco Network Architecture to introduce integrated network services and explains how to select the appropriate devices and technologies to meet network requirements. Students learn how to implement and configure common data link protocols and how to apply WAN security concepts, principles of traffic, access control, and addressing services. Finally, students learn how to detect, troubleshoot, and correct common enterprise network implementation issues. **(2nd)**

I.T. 0280 Oracle II

3 Cr.. (Hrs.:.: 3 Lec.)

This course introduces PL/SQL -- a programming language that provides procedural extensions to the SQL relational database language. Students will use PL/SQL to perform many kinds of programming functions. (1st)

CAPP 153 MS Power Point

3 Cr.. (Hrs.:.: 3 Lec.)

Presentation graphics software allows students to create, design, and deliver multimedia slide shows which convey convincing and professional messages. **Prerequisite:** ACTG 101

I.T. 0294 Visual Basic for Applications

2 Cr.. (Hrs.:.: 2 Lec.)

This course will give the student the ability to use Visual Basic for Applications to write data and applications for Microsoft applications. VBA for all four Office applications, object-oriented programming, working with record sets and eternal data, and integration will be covered. **Prerequisite**: I.T. 0247. **(2nd)**

I.T. 0916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Information Technology (AAS) degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

I.T. 1206 Core Concepts in Computer Utilization

4 Cr.. (Hrs.:.:4 Lec.)

Introduces the student to core concepts related to operating systems, programming, software usage, and computer maintenance & repair. **Prerequisite**: familiarity with personal computer use. **(1st)**

CAPP 131 Basic MS Office

3 Cr.. (Hrs.:.:3 Lec.)

This course is a basic introduction into the various capabilities and uses of the microcomputer. The student is exposed to the major areas of microcomputer usage in business today using operating system and application software including word processing, spreadsheets, databases and presentation. Emphasis is placed in problem solving, thinking creatively, individual responsibility, and time management. Hands-on computer projects are assigned to assist students in comprehending the overall concepts of microcomputers. **(1st , 2nd)**

I.T. 1426 Contemporary Operating Systems

3 Cr.. (Hrs.:.:3 Lec.)

Provides an in-depth understanding of personal computer hardware, operating systems and capabilities. Includes an introduction to networking and graphics. **Prerequisite:** CAPP 131. **(1st, 2nd)**

CAPP 156 MS Excel

3 Cr.. (Hrs.:.:3 Lec.)

Provides an in-depth understanding of spreadsheets, including related graphics, database and macro capabilities. Explores the use of spreadsheets in business applications. **Prerequisites:** CAPP 131 or its equivalent. **(1st, 2nd)**

CAPP 158 MS Access

3 Cr.. (Hrs.:.:3 Lec.)

Covers microcomputer databases with an in-depth use of current software packages. Also utilizes database software in business applications. **Prerequisites:** CAPP 131 or its equivalent. **(1st, 2nd)**

I.T. 2916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the IT&D degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

I.T. 3016 Building Scalable Internetworks (CCNP 1)

4 Cr.. (Hrs.:.:4 Lec.)

Students will learn how to create an efficient and expandable enterprise network by installing, configuring, monitoring, and troubleshooting network infrastruc-

ture equipment according to the Campus Infrastructure module in the Enterprise Composite Network model. Topics include how to configure EIGRP, OSPF, IS-IS, and BGP routing protocols and how to manipulate and optimize routing updates between these routing protocols. Other topics include multicast routing, IPv6, and DHCP configuration. **Prerequisite:** I.T. 0276/2766. **(2nd)**

I.T. 3026 Remote Access Networks (CCNP 2)

4 Cr.. (Hrs.:.:4 Lec.)

Students learn how to secure and expand the reach of an enterprise network with focus on VPN configuration and securing network access. Topics include teleworker configuration and access, fram-mode MPLS, site-to-site IPSEC VPN, Cisco EZVPN, strategies used to mitigate network attacks, Cisco device hardening and IOS firewall features. Prerequisite: I.T. 0276/2766 **(2nd)**

I.T. 3036 Advanced Novell Administration

3 Cr.. (Hrs.:.:3 Lec.)

This course provides the student with hands-on experience dealing with designing and securing the directory tree, server optimization, Netware Web Server and IntraNetware Server management, and upgrade and migration tasks. This course is designed to prepare the student to pass the Novell CNE 60-614 Certification Exam. **Prerequisite:** I.T. 0210 **(2nd)**

I.T. 3046 Network Security

3 Cr.. (Hrs.:.:3 Lec.)

This course will focus on the overall security processes with particular emphasis on skills in the following areas: Security policy design & management, Security technologies, products & solutions, Firewall and secure router design, installation, configuration, and maintenance. Studies include AAA implementation using routers and firewalls and VPN implementation using routers and firewalls. **Prerequisite:** I.T. 0276 **(2nd)**

I.T. 3056 Web Server Administration

3 Cr.. (Hrs.:.:3 Lec.)

This course provides a comprehensive overview of the tools and techniques needed to succeed as a Web Server Administrator as well as the tasks they are expected to perform. This text provides the basics of this job role, covers server installation, and then moves on to the installation, configuration, and administration of web servers. This text covers all topics for both Linux and Microsoft Windows server environments. Work with Microsoft Windows 2008 Server, Red Hat Linux, Internet Information Services (IIS), Apache Web Server, Microsoft Exchange Server, Send Mail, and more. **(1st)**

I.T. 3116 Advanced Windows Server (MCSA 4)

3 Cr.. (Hrs.:.:3 Lec.)

This course is designed to prepare the student to implement and manage Microsoft's Active Directory Services and will cover in-depth each component of Active Directory. The course requires students to design a Microsoft Active Directory network. **Prerequisite:** I.T. 0130 **(2nd)**

I.T. 3416 Spreadsheet Applications II

3 Cr.. (Hrs.:.: 3 Lec)

This course continues the work begun in I.T. 2416. Through the use of unstructured exercises and cases studies, students will be expected to apply the skills learned in previous courses to develop creative and innovative solutions to a variety of business and non business problems, while gaining additional proficiency in the use of the advanced features of Microsoft Excel. Prerequisite: CAPP 156

I.T. 3426 Database Applications II

3 Cr.. (Hrs.:.: 3 Lec) This course continues the work begun in CAPP 158. Throughout the use of unstructured exercises and case studies, students will be expected to apply the skills learned in previous courses to develop creative and innovative solutions to a variety of business and non business problems, while gaining additional proficiency in the use of the advanced features of Microsoft Access. **Prerequisite:** I.T. 1426

I.T. 4016 Multi-Layer Switching (CCNP 3)

4 Cr.. (Hrs.:.:4 Lec.)

Multilayer Switching teaches students about the deployment of state-of-the-are campus LANs. The course focuses on the selection and implementation of the appropriate services to build reliable, scalable, multilayer-switched LANs. Topics include: Virtual Local Area Networks (VLANs), Spanning Tree Protocol, Inter-VLAN Routing, High Availability in a campus environment, wireless client access, and minimizing service loss and data theft in a campus network. **Prerequisite:** I.T. 0276/2766 **(1st)**

I.T. 4026W Network Troubleshooting (CCNP 4)

4 Cr.. (Hrs.:.:4 Lec.)

This course introduces students to optimizing and providing effective QoS techniques in converged networks operating voice, wireless and security applications. Topics include implementing a VOIP network, implementing QoS on converged networks, specific IP QoS mechanisms for implementing the DiffServ Qos model, AutoQos, wireless security and basic wireless management. Prerequisite: I.T. 0276/2766 **(2nd)**

I.T. 4206 Information Technology Management

3 Cr.. (Hrs.:.: 3 Lec) Directed at future business decision-makers, this course addresses key areas of managing the acquisition, implementation, and use of information technology in a business enterprise, including the management of hardware and software implementation projects, the technology policy making, and information technology security. **Prerequisites:** C.S. 2126 and ACTG 321; Senior level standing **(1st)**

I.T. 4216 Industry Software Applications

3 Cr.. (Hrs.:.: 3 Lec) This course exposes the student to both enterprise and industry-specific systems employed in a variety of industries, such as SAP and Oracle (enterprise systems), and xxxx (health care), Merak PEEP (oil and natural gas), xxxx (mine management) (industry-specific systems). The implementation and use of this software will be examined, with particular emphasis on its capabilities to support business decision-making. **Prerequisites:** C.S. 2126 and CAPP 158; Senior level standing **(2nd)**

I.T. 4916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the IT&D degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

I.T. 4986 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

JOURNALISM

JOUR 1116 Radio Programming (R)

2 Cr.. (Hrs.:.:1 Lec., 2 Lab)

Students assist in the operation of the campus radio station, write and produce special programming. On-air shifts are required. **(1st)**

JOUR 2286 Documentary Photography

3 Cr.. (Hrs.:.:2 Lec. 3 Lab)

Emphasizes the use of photography as a tool for gathering and disseminating information and ideas. Introduces photographic principles equipment, materials and techniques. Laboratory sessions provide practical experience in photography. Limited enrollment. (C) **(1st)**

JOUR 2706 Reporting

3 Cr.. (Hrs.:.:3 Lec.)

Develops basic newswriting techniques through frequent writing. Emphasis is placed on the development of skills needed to gather and disseminate information to mass audiences in an electronic age. **Prerequisite:** WRIT 101 or Consent of Instructor. (C) **(2nd)**

LIBERAL STUDIES

L.S. 1006 Career/Life Planning

2 Cr.. (Hrs.:.:2 Lec.)

Students learn an integrative process of career/life planning that examines interests, skills, education, training, values, and lifestyle. Students use a variety of assessment instruments, journal writing, library and computer resources, and information interviews to develop career goals and a personal life mission statement. **(1st)**

L.S. 2916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Liberal Studies degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experience and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

L.S. 2956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of humanities and/or social science not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

L.S. 3956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of humanities and/or social science not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

L.S. 3966 Independent Study

Variable Credit

Conference, research and independent reading in a field of special interest arranged with an instructor in the Liberal Studies Department. Reading and research may be oriented to concurrent work, but must not replace subject matter of regularly scheduled courses. May be repeated a maximum of four times for credit. **Prerequisites:** Junior standing, Consent of Instructor, and prior departmental approval. **(1st, 2nd)**

L.S. 4016 Health & Environmental Communication

3 Cr.. (Hrs.:.:3 Lec.)

This is a course for anyone in a profession that requires communicating about health, environmental or safety concerns. Course emphasizes listening and oral communication skills. **Prerequisite:** Consent of Instructor. **(1st)**

L.S. 4026 Conflict Management

3 Cr.. (Hrs.:.:3 Lec.)

This is a speech communication course concerned with conflict management in the workplace as well as in personal relationships. While students will be (introduced to theory and research) in the field of conflict resolution and taught how to use conflict assessment instruments, the major emphasis of the course is on the development of listening and speaking strategies and skills for handling conflicts effectively. **Prerequisite:** Consent of Instructor. **(2nd)**

L.S. 4916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Liberal Studies degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

L.S. 4956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of humanities and/or social science not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

L.S. 4986 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

Pre-Apprenticeship Line Program
(Course Description will appear in the Fall 2008-09 Catalog)
Line 0100 Introduction to the Utility Industry

2Cr. (Hrs.:.: 2 Lec.)

LINE 0110 Math for the Utility Industry

5 Cr.. (Hrs.:.: 5 Lec.)

LINE 0120 Electrical for the Utility Industry

3Cr. (Hrs.:.: 3 Lec.)

LINE 0130 Safety and Certifications

3Cr. (Hrs.:.: 3 Lec.)

LINE 0140 Pole Yard

16 Cr.. (Hrs.:.: 16 Lec.)

Master's IN PROJECT ENGINEERING MANAGEMENT

MPEM 5010 Entrepreneurship & Economic Feasibility (Core)

3 Cr.. (Hrs.:.: 3 Lec.)

The purpose of this course is to help engineers understand the basic concepts of marketing, business organization, management accounting, business finance, and financial feasibility analysis of new business ventures and of new project proposals in established firms. **(GRADUATE) (On Dem.)**

MPEM 5020 Project and Engineering Management (Core)

3 Cr.. (Hrs.:.: 3 Lec.)

Fundamental principles of engineering project management including planning, scheduling, controlling, and budgeting. Engineering management aspects of human resources including organizational design, group dynamics, leadership, motivation, and performance evaluation. **(GRADUATE) (On Dem.)**

MPEM 5030 Legal Issues Related to MPEM (Core)

3 Cr.. (Hrs.:.: 3 Lec.)

This course evaluates processes involved in patents, contracts. The course also will include management regulations related to project engineering, and regulations related to environmental issues. **(GRADUATE) (On Dem.)**

MPEM 5040 Financial Management of Technological Enterprises (Core)

3 Cr.. (Hrs.:.: 3 Lec.)

Investigation of the sources and uses of funds, cash and working capital management, capital budgeting and administration of debt and equity in technological enterprises. **Prerequisite:** Consent of Instructor. **(GRADUATE) (On Dem.)**

MPEM 5050 Management, Economics, & Accounting (Core)

3 Cr.. (Hrs.:.: 3 Lec.)

The course will provide an introduction to financial and managerial accounting concepts with an emphasis on the use rather than the preparation of financial statements. The course will also introduce the interpretation and application of economic theory in the firm. The course will use accounting and economic information to address the strategy, structure, and performance of the firm. **Prerequisite:** Consent of Instructor. **(GRADUATE) (On Dem.)**

MPEM 5060 Advanced Management Seminar (Core)

3 Cr.. (Hrs.:.: 3 Lec.)
A capstone study of business policy and strategic management facilitated by case presentations and guest lectures. This course is built on three pedagogical pillars; text, cases, and practical insights from senior management practitioners. **Prerequisite:** Consent of Instructor. **(GRADUATE) (On Dem.)**

MPEM 5100 Pollution Prevention (Elective)

3 Cr.. (Hrs.:.: 3 Lec.)
The course familiarizes the student with local, national and worldwide pollution prevention strategies. Preferred approaches are examined such as source reduction, recycling, and treatment. **(GRADUATE) (On Dem.)**

MPEM 5110 Energy Conversion (Elective)

3 Cr.. (Hrs.:.:3 Lec.)
Application of thermodynamic principles to the analysis of energy conversion processes. Topics include but are not limited to steam power generation, cogeneration, internal combustion engines, refrigeration, air conditioning, heat transfer, heat recovery systems and alternative or renewable energy conversion processes. Cross-listed as ENGR 4010. **Prerequisite:** ENGR 3340 or Consent of Instructor. **(GRADUATE) (On Dem.)**

MPEM 5120 Application and Design of Industrial Experiments (Elective)

3 Cr.. (Hrs.:.: 3 Lec.)
Statistical analysis applied to experiments in engineering and industry. Experimental designs and analyses for a wide variety of problems; EVOP and response and surface analyses. **(GRADUATE) (On Dem.)**

MPEM 5130 Hazardous Waste Engineering (Elective)

3 Cr.. (Hrs.:.: 3 Lec.)
Examination of the technologies, regulations, political and environmental impacts of hazardous wastes. Management approached are developed through fundamental studies of case histories. **(GRADUATE) (On Dem.)**

MPEM 5140 Systems Safety & Management (Elective)

3 Cr.. (Hrs.:.: 3 Lec.)
This course is designed to cover the techniques of systems safety analysis, with special emphasis on Preliminary Hazard Analysis (PHA), Operating Hazard Analysis (OHA), Fault Tree Analysis (FTA), and Failure Mode and Effects Analysis (FMEA). Fundamental, current approaches, problem areas and use of system safely as a cost-effective management tool will be addressed. **(GRADUATE) (On Dem.)**

MPEM 5150 - Information Technology for Managers (Elective)

3 Cr.. (Hrs.:.: 3 Lec.)
An introduction to Information Technology and Computer-based Information Systems for managing enterprises, organizations, and projects. The course gives a hands on experience of using IT for management tasks and a basic understanding of computer hardware, software, database technology, telecommunications network, organizational and managerial support systems. It also provides a basic knowledge of planning, developing, and managing information systems with hands on experience. **(GRADUATE) (On Dem.)**

MPEM 5160 Managerial Communication for Project Managers (Elective)

3 Cr.. (Hrs.:.: 3 Lec.)
This course gives working professionals the opportunity to improve their ability to communicate effectively as project managers. Students examine and practice the communication strategies and skills that are essential for success in project engineering management settings. The course goals are to improve understanding and ability to: (1) apply appropriate communication strategies; (2) practice managerial writing and presentation skills; and (3) understand and respond effectively to cross-cultural and corporate communication issues from within the framework of project management. **(GRADUATE) (On Dem.)**

MPEM 5900 Special Projects (Core, Elective)

Variable Credit
Individual projects suitable for graduate study are assigned. Students submit written and oral reports for each project. **Prerequisite:** Consent of Instructor. **(GRADUATE) (On Dem.)**

See additional course information at www.mtech.edu/mpem

MATHEMATICS

M 061 Basic Mathematics

3 Cr.. (Hrs.:.:3 Lec.)
Introduction and review of Mathematical concepts needed for successful completion of specialized math courses with specific programs. Topics include whole numbers, fractions, decimals, percents, ratios, and proportions. Course credit does not count toward program requirement. Compass score of 17-44 **(1st, 2nd)**

M 090 Introductory Algebra

4 Cr.. (Hrs.:.:4 Lec.)
Brief review of fractions and decimals. Beginning algebra concepts including the real number system, algebraic expressions, linear equations, exponents and polynomials, the rectangular coordinate system, and simple factoring. Also, basic geometry, measurement, and problem solving with applications for technical and business fields. **Prerequisite:** M 061 or Compass score of 45-54 **(1st, 2nd, Summer)**

M 095 Intermediate Algebra

3 Cr.. (Hrs.:.:3 Lec.)
Note: This course is preparation for M 121 College Algebra. Credit in this course does not count towards an Associate of Science or a Bachelors Degree.
Introduction to algebra; notations and definitions; addition and subtraction of signed numbers; simple equations; principles of multiplication of algebraic terms and expressions; division and factoring of algebraic terms and expressions; algebraic fractions; equations and their applications; equations with more than one unknown; exponents; and quadratic equations. Compass score of 55 and greater; ACT 20-21 or SAT 490 **(1st, 2nd, Summer)**

M 111 Technical Mathematics

3 Cr.. (Hrs.:.:3 Lec.)
This course presents basic mathematical topics as they are applied in a technical program. Topics covered include percent, ratio proportion, formula evaluation, basic algebra and geometry concepts, trigonometry and measurement are developed and integrated in a technical setting. **Prerequisite:** M 090 or qualifying score on the placement exam. **(2nd)**

M 121 College Algebra

3 Cr.. (Hrs.:.:3 Lec.)
Covers standard topics of college algebra including linear and quadratic functions, polynomial and rational functions, exponential and logarithmic functions, and complex numbers. **Prerequisite:** At least two years of high school algebra; ACT 22-23 or SAT 520-550. **(1st, 2nd, Summer)**

M 141 Mathematics for Business & Social Sciences I

3 Cr.. (Hrs.:.:3 Lec.)
A comprehensive treatment of selected topics from finite mathematics, linear algebra, matrix algebra, linear programming, probability, and probability models. Applications from the areas of Business and Management Sciences will be emphasized. **Prerequisite:** ACT Above 24 or SAT 560; M 121 or equivalent. **(1st)**

M 142 Mathematics for Business & Social Sciences II

3 Cr.. (Hrs.:.:3 Lec.)
Includes the study of limits of functions, continuous functions, tangents and derivatives, implicit differentiation, optimization, curve sketching, antiderivatives, integrals of continuous functions. Applications from the area of Business and Management Science will be emphasized. Trigonometry is **not** a prerequisite for this course. **Prerequisite**: M 121 or equivalent. **(2nd)**

M 151 Precalculus

4 Cr.. (Hrs.:. 4 Lec.)
Includes the study of linear, polynomial, exponential, logarithmic and trigonometric functions and conic sections. Algebra topics include solving polynomial, exponential and logarithmic equations and quadratic and rational inequalities, graphing all of the functions and conic sections, and algebra applications. Trigonometric topics include right triangle trigonometry and applications, trigonometric graphs, identities, the Law of Sines and Cosines and polar coordinates. **Prerequisite:** M 121 or ACT 24-26 or SAT 560-600 **(1st, 2nd, Summer)**

STAT 131 Introduction to Biostatistics

3 Cr.. (Hrs.:.:3 Lec.)

Terminology and principles of biostatistics and epidemiology. Statistical measures of center and dispersion, bivariate relationships, measures of risk, statistical inference for proportions, 2x2 contingency table analysis, methods for critically reviewing biomedical and epidemiological research. **Prerequisite:** M 121 or equivalent **(1st, 2nd)**

STAT 216 Introduction to Statistics

3 Cr.. (Hrs.:.:3 Lec.)

Studies of basic probability, probability distributions, statistical measures of center and dispersion, bivariate relationships, sampling procedures, point and interval estimation, and hypothesis testing. **Prerequisite:** M 121 or equivalent **(1st, 2nd, Summer)**

M 171 Calculus I

3 Cr.. (Hrs.:.:3 Lec.)

Includes the study of limits of functions, continuous functions, tangents and derivatives, implicit differentiation, extreme values, curve sketching, antiderivatives, integrals of continuous functions, and the Fundamental Theorem of Integral Calculus. **Prerequisite:** ACT Above 27 or SAT 610; M 121 or equivalent. **(1st)**

M 172 Calculus II

3 Cr.. (Hrs.:.:3 Lec.)

Includes the study of methods of integration including, u-substitution, integration by parts, integration by partial fractions. Studies the derivatives and integral of the inverse trigonometric functions, exponential functions, and hyperbolic functions. Also studied are applications of the integral, sequences, and infinite series. **Prerequisite:** M 171. **(1st, 2nd, Summer)**

M 194 Freshman Seminar in Mathematics

1 Cr.. (Hrs.:.:1 Lec)

Provides an introduction to the study of modern mathematics, mathematics education, and statistics. Faculty and seniors in the math program will discuss their current research, undergraduate research topics and opportunities, important developments in modern mathematics, and job opportunities in the mathematical sciences. This course will be graded on a pass/fail basis. **(1st)**

M 242 Methods of Proof

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to the axiomatic nature of modern mathematics. Emphasis is placed on the different methods of proof that can be used to prove a theorem. Mathematical topics discussed include symbolic logic, methods of proof, specialized types of theorems and proofs, and number systems and number theory. **Prerequisite:** M 172 **(1st)**

M 273 Multivariable Calculus

4 Cr.. (Hrs.:.:4 Lec.)

Includes the study of vector-valued functions, parametric functions, curves in the plane, the polar coordinate system, partial derivatives, multiple integrals and calculus of vector fields. **Prerequisite:** M 172. **(1st, 2nd)**

M 274 Introduction to Differential Equations

3 Cr.. (Hrs.:.:3 Lec.)

A study of first order and linear second order differential equations, power series methods, numerical techniques, Laplace transform, with applications to mechanical vibrations and circuits. **Prerequisite:** M 273. **(1st, 2nd)**

M 298 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the mathematics degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor**. (On Dem.)**

M 291 Special Topics

Variable Credit

Special demand courses. **(**May be repeated for **up to 15 credits.)**

M 325 Discrete Mathematics *3 Cr.. (Hrs.:.:3 Lec.)*

Explores the mathematical theory of computer science. Topics include relations, trees, languages, and finite-state machines. **Prerequisite:** C.S. 2116; **Corequisites:** M 333. **(1st) Cross list w/C.S. 3166**

MATH 323 Methods of Proof II

3 Cr.. (Hrs.:.:3 Lec.)

Continuation of Methods of Proof. Emphasis is placed on the study of functions, sequences, continuity, differentiation, sets, set theory, groups, and group theory. The primary focus of this course is the writing of proofs in an axiomatic system. **Prerequisite:** M 242. **(2nd)**

M 333 Matrices & Linear Algebra

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to matrices and matrix algebra, inverses, determinants, solving simultaneous linear equations, vector spaces, dot products and norms, linear transformations, eigenvalues and eigenvectors. **Prerequisite:** M 172. **(1st, 2nd)**

M 329 Modern Geometry

3 Cr.. (Hrs.:.:3 Lec.)

A study of the axioms and theorems of Euclidean geometry. A comparison of several geometric axiom systems and their theorems, including those of some non-Euclidean, projective, and finite geometries. **Prerequisite:** M 242 and 333. **(2nd)**

M 330 History of Mathematics

3 Cr.. (Hrs.:.:3 Lec.)

Studies the evolution of mathematics from earliest to modern time including the development of mathematics and the lives of prominent Mathematicians from antiquity up through the 20th century. **Prerequisite:** M 274. **(1st)**

M 351 Algebraic Structures I

3 Cr.. (Hrs.:.:3 Lec.)

Introduction to algebraic structures, including groups, group theory, subgroups, cyclic groups, rings, and ideals. **Prerequisite:** M 333 or Consent of Instructor. **(1st)**

M 352 Algebraic Structures II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of M 351 including the study of fields, number theory, vector spaces and Boolean Algebra. **Prerequisite:** M 351. **(2nd)**

MATH 376 Topology

2 Cr.. (Hrs.:.:2 Lec.)

Studies metric spaces, open and closed sets, complete metric spaces, connected sets, compactness and continuous mappings. **Prerequisites:** M 242 and 333 or Consent of Instructor. **(On Dem.)**

STAT 332 Statistics for Scientists & Engineers

3 Cr.. (Hrs.:.:3 Lec.)

Studies probability, random variables, univariate discrete and continuous probability models, expected values, sampling distributions, data collection, point and interval estimation, and hypothesis testing. **Prerequisite:** M 172. **(1st, 2nd)**

M 405 Advanced Engineering Mathematics I

3 Cr.. (Hrs.:.:3 Lec.)

Studies Fourier series and integrals, derivation and solution of partial differential equations of engineering, Bessel functions and Legendre polynomials and Laplace transforms. **Prerequisite:** M 274 or Consent of Instructor.

M 406 Advanced Engineering Mathematics II

3 Cr.. (Hrs.:.:3 Lec.)

Studies analytic functions of a complex variable, Cauchy's Integral Theorem, harmonic functions, Taylor's and Laurent's expansions, the residue theorem and conformal mapping. **Prerequisite:** M 274 or Consent of Instructor.

M 410 Numerical Computing for Engineering & Science

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to the basic algorithms of numerical analysis and the theory behind them. Topics include systems of linear and nonlinear equations, interpolation, numerical differentiation and integration and ordinary differential equations. **Prerequisites:** M 274 or 333. **(2nd)**

M 426 Mathematical Modeling

3 Cr.. (Hrs.:.: 3 Lec)

Analysis of classical and modern applications of mathematics in the physical and life sciences. Emphasis on problem formulating, modeling, solving, simulating, and analyzing results. One or more programming languages will be used to analyze models. **Prerequisite**: M 274 **(1st)**

M 435 Advanced Calculus I

3 Cr.. (Hrs.:.:3 Lec.)

Introduction to the concepts and methods basic to real analysis. Topics such as the real number system, limits, continuity, uniform continuity, differentiation, and the integral are discussed. **Prerequisites:** M 242 and 333 or Consent of Instructor. **(1st)**

M 436 Advanced Calculus II

3 Cr.. (Hrs.:.:3 Lec.)

A continuation of M 435, including the study of functions of several variables, theorems of partial differentiation, implicit and inverse function theorems, vector fields, double, triple, line and surface integrals. **Prerequisite:** M 435. **(2nd)**

M 411 Advanced Differential Equations

2 Cr.. (Hrs.:.:2 Lec.)

Studies matrices and systems of linear first-order equations, nonlinear equations and stability, power series solutions and special functions, and calculus of variations. **Prerequisites:** M 274 and 333. **(On Dem.)**

STAT 421 Probability Theory

3 Cr.. (Hrs.:.:3 Lec.)

Studies probability, random variables, expected values, discrete and continuous probability distributions, multivariate probability distributions, generating functions, sums of independent random variables, and the Central Limit Theorem. **Prerequisite:** STAT 332 or Consent of Instructor. **(1st, alternate years w/ STAT 441)**

STAT 422 Mathematical Statistics

3 Cr.. (Hrs.:.:3 Lec.)

Studies the theory behind point estimation, tests of hypotheses, confidence intervals, and decision theory. Topics discussed include statistics, order statistics, method of moment estimation, maximum likelihood estimation, decision theoretic estimation, Neyman-Pearson testing, likelihood ratio testing, and confidence interval procedures. **Prerequisite:** STAT 421. **(2nd, alternate years w/ STAT 432)**

STAT 432 Regression & Model Building

3 Cr.. (Hrs.:.:3 Lec.)

Studies concepts and applications of the analysis of properly collected data. Methods for fitting simple linear and multiple regression models, regression diagnostics, model building techniques, and logistic regression are discussed. **Prerequisite:** STAT 131 or 216 or 332. **(2nd, alternate years w/ STAT 442)**

STAT 441 Experimental Design

3 Cr.. (Hrs.:.:3 Lec.)

Studies concepts and applications of the collection of data and proper design of experiments. Aspects of design, sampling principles, exploratory data analysis, confidence intervals and hypothesis testing and basic experimental designs will be taught. The importance of randomization, replication, and methods for reducing experimental error will be emphasized. **Prerequisite:** STAT 131 or 216 or 332. **(1st)**

STAT 435 Statistical Computing & Exploratory Data Analysis

3 Cr.. (Hrs.:.:3 Lec.)

Techniques available to the statistician for efficient use of the computer to perform data management and exploratory statistical analyses. Programming statistical software for the import and export of data, variable sorting, creation of new variables, descriptive statistics and displaying data efficiently are discussed. Special modern statistical topics including bootstrapping and nonparametric modeling are discussed. **Prerequisites:** STAT 131, 216, 332, or a first course in statistics. **(2nd)**

M 498 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the mathematics degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

M 494 Senior Seminar

1 Cr.. (Hrs.:.:1 Lec)

This seminar will discuss topics such as the history of modern mathematics and statistics, areas of research in mathematics and statistics, and placement options available to students upon completing their degree. Faculty members will discuss their experiences as a mathematician/statistician/math educator. Placement opportunities including graduate school and job opportunities in the mathematical sciences will be presented. The students enrolled in this class will be required to give at least one presentation; students who are taking or have taken undergraduate research for credit (M 490) must prepare and present a paper on their research project. Outside speakers may occasionally be brought in to give talks. **Prerequisite:** M 323 and senior standing in the mathematics curriculum. **(1st)**.

M 491 Special Topics

Variable Credit

Courses not required in any curriculum for which there is a special demand or courses given on a trial basis to determine demand. Subjects covered may include number theory, abstract algebra, topology, and/or partial differential equations. **Prerequisite:** Consent of Instructor. This course may be repeated for credit up to a maximum of 15 hours. **(On Dem.)**

M 490 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

M 591 Special Topics

Variable Credit(1-4)

Covers selected topics in advanced mathematics or statistics. Some graduate students may attend a 4000 level course and be asked to do extra problems, projects, or reports. **Prerequisite:** Enrollment in a graduate program and consent of the instructor. **(On Dem.)**

METALLURGICAL & MATERIALS ENGINEERING

METE 1940 Freshman Seminar

1 Cr.. (Hrs.:.: .5 Lec, 1.5 Lab)

Metallurgical and materials engineering pervades everyday life, but its practice is not common experience. This course provides exposure to and the context of mineral processing, extractive metallurgy, physical metallurgy, welding metallurgy and materials science. This is accomplished through directed field trips and lectures from selected guest speakers. The importance of safety, quality, and economics is introduced and emphasized. Students will write a series of short reports and conclude the course by giving oral presentations on a metallurgical & materials engineering topic of their interest. **(1st)**

M&ME 2020 Survey of Metallurgical & Materials Engineering

3 Cr.. (Hrs.:.:3 Lec)

This course is designed to provide General Engineering majors with a broad introduction to metallurgical engineering and materials science. The course surveys the engineering principles and key unit processes associated with the production of several of the materials that are commonly used in mechanical, civil, and construction engineering applications. These materials include steel, aluminum, aggregate, portland cement, concrete, and asphalt. The fundamental characteristics and properties of the four main classes of materials (metals, ceramics, polymers, and composites) are described and compared. The course introduces students to corrosion and to process engineering fundamentals such as process flow diagrams, material and energy balances for nonreactive and

reactive process, and simple combustion calculations. **Prerequisite:** CHMY 143 or Consent of Instructor. **(1st)**

METE 2320 Processing of Particulate Systems

2 Cr.. (Hrs.:.:2 Lec)

An introduction to processing methods and equipment, particularly those utilized in the mining industry. Topics include material balances, size analysis, crushing, grinding, classification, flotation, leaching, magnetic, gravity and electrostatic separations. Applications to recycling and aggregate/concrete industries are discussed. A major design problem is given to cover process design and material balances. **Corequisites:** CHMY 141 or Consent of Instructor. **(2nd)**

METE 2330 Design of Particulate Systems

2 Cr.. (Hrs.:.:2 Lec)

Size reduction processes of crushing and grinding, particle sizing methods of screening and classifying, and solid/liquid separations of thickening and filtering are detailed. Types of equipment, methods for sizing equipment, prediction of energy requirements, flowsheet development, and safety considerations are examined. Design problems are given throughout. **Prerequisite:** METE 2320 or Consent of Instructor. **(1st)**

METE 2340 Particulate Systems Processing Lab I

1 Cr.. (Hrs.:.:3 Lab.)

Students conduct laboratory exercises in sieve analysis, sampling, specific gravity determination, sizing by beaker decantation, jaw crushing, circulating load calculations, gravity separations, flotation and hydrocycloning. **Corequisites:** METE 2320. **(2nd)**

METE 2350 Particulate Systems Processing Lab II

1 Cr.. (Hrs.:.:3 Lab.)

Students conduct laboratory exercises in sizing by Andreasan pipette, selective flotation, rod milling, electrostatic separation, enhanced gravity separation, thickening, circulating load in industrial setting, magnetic separation, and Bond work index measurement. **Corequisites:** METE 2330. **(1st)**

METE 2500 Transport Phenomena & Design

2 Cr.. (Hrs.:.:2 Lec.)

Momentum and heat transfer principles are covered with illustrations and problem solving to metallurgical processes. Momentum transfer topics include laminar flow, turbulent flow, and kinetic/potential energy equations. Heat transfer topics include conduction, convection, and radiation under steady-state and transient conditions. Design projects will be assigned to groups for solving engineering problems. **Prerequisites:** M 172, PHYS 2076. **(2nd)**

M&ME 2510 Material Structures & Properties

2 Cr.. (Hrs.:.: 2 Lec.)

The structure and bonding within metals, ceramics, and polymers are reviewed and their impact on various physical and mechanical properties are explored. The types of defects at the atomic to micron length scales are described. Their impact on material properties and performance is reviewed and how this relationship is exploited in engineering described. Attention is paid to photonic, magnetic, electronic and thermal properties of materials. **Prerequisites:** CHMY 143; **Corequisites:** M 172, or Consent of Instructor. **(2nd)**

M&ME & METE 2910 Internship

0 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience and related to the Metallurgical & Materials Engineering degree program. Students should consult with their faculty coordinator to determine the availability of appropriate work experiences which includes undergraduate research and temporary (e.g., summer) employment. Students have interned with numerous companies including ASARCO, Barrick Gold, INEEL, Kaiser Aluminum, MSE-TA, NASA, Newmont, Phelps Dodge, and Stillwater Mining. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

M&ME 3220 Metallurgical & Materials Thermodynamics

3 Cr.. (Hrs.:.:3 Lec.)

Basic thermodynamic principles are presented. The application of thermodynamics and physical chemistry to chemical, metallurgical and environmental processes is illustrated. Industrial examples are presented. **Prerequisite:** CHMY 143; **Corequisites:** M 172; or Consent of Instructor. **(2nd)**

METE 3400 Mass Transfer & Chemical Kinetics

3 Cr.. (Hrs.:.:3 Lec.)

Principles and applications of mass transfer and chemical kinetics to both extractive and physical metallurgy problems are discussed. Reaction rate theory is developed for both homogeneous and heterogeneous reactions. The operating characteristics of batch, continuous-stirred and plug flow reactors are developed and applied to metallurgical systems. Diffusion mechanisms and transformation rates in the solid state are examined. **Prerequisites:** CHMY 143; M 273. **(1st)**

M&ME 3510 Materials Processing & Performance

2 Cr.. (Hrs.:.:2 Lec.)

The course starts with a review of the structure and bonding within materials. The various mechanical tests that characterize material properties are then presented. The lectures then focus on the strength and the unique ductility of metals and how these properties can be influenced by processing. The use of phase diagrams and phase transformations in materials processing are described. Structure-property-processing-performance relationships are then examined in engineering alloys, ceramic materials, polymers and composites. **Prerequisite:** M&ME 2510 or MetE 2020 or Consent of Instructor. **(1st)**

M&ME 3520 Materials Engineering & Design

2 Cr.. (Hrs.:.:2 Lec.)

Students apply principles learned to the selection of materials and fabrication methods for the manufacture of components. Several case studies are drawn from engineering alloys, ceramics, polymers, composites, and natural materials. The course culminates in a design report, which is reviewed by the instructor during the semester and submitted by the student as a final design document prior to semester's end. **Prerequisite:** M&ME 3510 or Consent of Instructor. **(2nd)**

M&ME 3530 Microstructural Interpretation

1 Cr.. (Hrs.:.:1 Lec; 2 Lab)

A laboratory course designed to develop skills, experience and knowledge of metallographic preparation and analysis. Simple metal systems are analyzed with the metallurgical microscope complemented by other tools. Applications of phase diagrams, hardness and other data to interpretation of microstructures. Laboratory experiments are performed requiring engineering reports. Laboratory safety is emphasized. **Corequisites:** M&ME 3510. **(1st)**

M&ME 3540 Materials & Physical Metallurgy Lab

1 Cr.. (Hrs.:.:1 Lec; 2 Lab)

This is a continuation of Microstructural Interpretation but includes applications to ceramic and polymeric systems. Experiments are performed in heat treating, casting, working, and mechanical testing of materials. Evaluation and interpretation of the materials are incorporated. Laboratory safety is emphasized. **Corequisites:** M&ME 3520. **(2nd)**

METE 4010 Processing of Aqueous Systems

3 Cr.. (Hrs.:.:3 Lec.)

Chemistry and operating principles related to hydrometallurgical and electrometallurgical unit operations are illustrated and discussed for industrial processes. Acid rock drainage formation and treatment methods are examined. Physical and chemical principles as well as design criteria are discussed and examined from an operational approach throughout. Hydrometallurgical processes commonly used for concentrating include traditional leaching (dump, heap, vat and agitation), bacterial leaching, solvent extraction, ion exchange, and reduction (cementation, electrowinning and gaseous reduction). Electrometallurgical processes commonly used for purifying include electrothermic, electrolytic, electrowinning and electrorefining methods. **Prerequisites:** M&ME 3220 or Consent . **(1st)**

M&ME 4020 Processing of Elevated Temperature Systems

3 Cr.. (Hrs.:.:3 Lec.)

Basic engineering principles are used to explain the production of metals from ores by high temperature processes. Topics include drying, calcining, roasting, sintering, agglomeration, smelting, converting and refining. Applications to lime and cement manufacturing are covered in detail and include heat balances and field trips. Waste production, waste treatment and environmental controls are illustrated and discussed. **Prerequisite:** M&ME 3220 or Consent of Instructor. **(1st)**

METE 4050 Aqueous and Elevated Temperature Processing Lab

1 Cr.. (Hrs.:.:3 Lab)

Experiments are performed in pyrometallurgy, hydrometallurgy and electrometallurgy. Labs include acid leaching of oxide ores, autoclaving of

sulfide ores, diagnostic leaching, solvent extraction (loading and stripping), resin adsorption (loading and stripping), electrowinning, cementation, roasting, and smelting. Safety procedures are emphasized. **Corequisites:** METE 4010 and M&ME 4020. **(1st)**

M&ME & METE 4210 Selected Topics

2 to 4 Cr.. (Variable)

Variety of course topics are covered annually. Examples during the last several years include Industrial Minerals Processing; Construction of Stability Diagrams; Modeling of Aqueous Systems, and Material Selection for the Extractive Industries. **Prerequisite:** Junior or Senior standing and Consent. **(On Dem.)**

M&ME 4230 Multi-Component Phase Diagrams

3 Cr.. (Hrs.:.:3 Lec.)

One- and two-component systems are reviewed; however, three-component systems are emphasized and four-component systems are discussed. Isothermal sections, crystallization paths, and vertical sections are covered for a variety of metallic and ceramic systems. **Prerequisite:** M&ME 3220 or CHMY 371. ***Cross listed.*** **(2nd, even yrs)**

M&ME 4410 Flowsheet Development & Design

3 Cr.. (Hrs.:.:3 Lec)

The course presents the fundamentals of process development from the perspective of balancing the technical and economic viability with sustainable materials and natural resource management. Emphasis is placed on process design techniques that achieve efficient and economic utilization of raw materials, water, and energy and thereby conserve natural resources and minimize waste production. Each student selects a specific process and develops an interactive spreadsheet model that incorporates the flow sheet, mass and energy balances, equipment sizes, and first order capital and operating cost estimates. Students are welcome to choose from chemical (organic or petroleum, in particular), environmental (pollution control and/or waste treatment), manufacturing, materials, mineral processing, metallurgical, recycling, and other commercially relevant processes Students taking this course for graduate credit must satisfactorily complete a term project in addition to fulfilling the requirements for 4410. (Formerly METE 4410) **Prerequisite:** Consent of Instructor. ***Cross listed.*** **(2nd, odd yrs)**

M&ME 4500 Advanced Transport Phenomena & Design

2 Cr.. (Hrs.:.: 2 Lec.)

A continuation of MetE 2500 but more detailed with applications in materials and processing systems. **Prerequisite:** METE 2500. **(2nd)**

M&ME 4510 Process Instrumentation and Control

3 Cr.. (Hrs.:.:3 Lec)

Examines how process instrumentation such as sensors, controllers, error detectors, transmitters, activators, and FCE's are used on-line and off-line to measure and control process variables like temperature, pressure, pH, level, flowrate, density, viscosity, etc. Control loop types (feed forward and feed back) and modes (discrete and PID) are covered along with state-of-the-art strategies (fuzzy logic and object-oriented simulation). Emphasis is placed on understanding the various sensors. **Prerequisites:** METE 2500, CHMY 371 or ENGR 3340; or Consent of Instructor. **(2nd)**

M&ME 4620 Ceramic Materials

2 Cr.. (Hrs.:.:2 Lec.)

Deals with processing and properties of ceramic solids pertinent to there use as engineering materials, thermal, mechanical, and electrical properties and there relationships to microstructure, crystal structure and phase equilibria. **Prerequisite:** M&ME 3510 or Consent of Instructor. **(2nd)**

M&ME 4710 Materials Characterization & Analysis

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course provides an introduction to the theory of X-ray Diffraction (XRD), Inductively Coupled Plasma (ICP) Spectrometry, and Scanning Electron Microscopy/Energy Dispersive X-ray (SEM/EDX) Microanalysis and includes a laboratory component where the techniques for data collection and data interpretation are demonstrated and discussed. *Students must register for METE 4710 Lab.* **Prerequisite:** Senior standing or Consent of Instructor. **(2nd)**

M&ME 4750 Environmental Degradation of Materials

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to the study of the degradation of materials and how it may be retarded or prevented. Applications to metals (i.e., corrosion) as well as to plastics and coatings are detailed. The student will be required to submit a report identifying an industrial corrosion problem, the form of the degradation, collecting literature concerning recent research dealing with the particular form, formulating a recommended solution to the problem, providing an estimate of the cost of the proposed solution, and reporting the results in an acceptable final report. **Prerequisites:** M&ME 3320 or CHMY 371 or Consent of Instructor. **(1st)**

M&ME 4860 Polymeric Materials

2 Cr.. (Hrs.:.:2 Lec.)

Covers chemical structure, mechanical and other properties related to the use of polymeric materials for engineering applications. Design considerations unique to polymeric materials are presented and applied. **Prerequisite:** M&ME 3510 or Consent of Instructor. **(1st)**

METE 4880 The Metallurgy of Ferrous Welds

3 Cr.. (Hrs.:.:3 Lec.)

Course covers arc welding processes, including physics of the arc, heat flow, chemical reactions in the weld metal, weld pool mechanics, and residual stresses. Microstructures within the various zones in a weld (weld metal, partially melted zone, and heat-affected zone) are characterized for ferrous alloys (carbon, alloy, and stainless steel). Weld defects are characterized and weldability tests are examined. **Prerequisite:** M&ME 3510 or Consent of Instructor. **(2nd, odd yrs)**

M&ME & METE 4910 Internship

0 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Metallurgical & Materials Engineering degree program. Students should consult with their faculty coordinator to determine the availability of appropriate work experiences which includes undergraduate research and temporary (e.g., summer) employment. May be repeated once for credit. Companies offering internship include ASiMI, BHP, Kennecott, Placer Dome, Stillwater BMR & Refinery, and Western Zirconium. **Prerequisites:** Junior or Senior Standing and Consent of Instructor. **(On Dem.)**

METE 4920 Senior Design I

1 Cr.. (Hrs.:.:3 Lab)

This course requires students to form teams and solve real world engineering problems. Teams must design a system, component or process; design and conduct experiments in the laboratory to test the concept; collect and evaluate data; perform first order cost analysis; and communicate a first class final report (both spoken and written). Examples of past projects include: development of a beneficiation process including sizing of equipment, selection of an extraction process or unit operation, evaluation of an industrial failure and material selection for casting molds. **Prerequisite:** Metallurgical & Materials Engineering major. Must be within three semesters of graduation. **(1st)**

METE 4930W Senior Design II

2 Cr.. (Hrs.:.:6 Lab)

Continuation of METE 4920. **Prerequisite:** METE 4920. **(2nd)**

METE 4940W Senior Seminar

1 Cr.. (Hrs.:.:1 Recitation)

Senior Seminar is designed to improve the oral and written presentation skills of seniors in Metallurgical & Materials Engineering. Students give an oral presentation on a topic of metallurgical importance. All students are expected to participate in ensuing discussions and turn in a written report within a certain time of their oral presentation. May be taken twice. **Prerequisites:** Metallurgical & Materials Engineering major. Senior standing. **(1st, 2nd)**

M&ME & METE 4950 Special Topics

1 to 4 cr.. (Variable Credit)

Covers topics of specific interest in the field of Metallurgical & Materials Engineering. Recent examples included Recovery of Nickel-Cobalt; Nuclear Reactor Materials; Chemical Equilibrium and Speciation; and JKSimMet Modeling of Comminution. May be repeated more than once. **Prerequisites:** Junior or Senior Standing and Consent of Instructor. **(On Dem.)**

M&ME & METE 4980 Undergraduate Research

1 to 6 cr.. (Variable Credit)

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number

of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

METE 5010 Advanced Extractive Metallurgy I

3 Cr.. (Hrs.:.:3 Lec.)

A detailed study of the design, simulation and analysis for metallurgical and mineral processing unit operations and research including problems and treatment methods associated with mine waste. **Prerequisite:** Consent of Instructor. **(2nd, even yrs)**

METE 5020 Advanced Extractive Metallurgy II

3 Cr.. (Hrs.:.:3 Lec.)

Continuation of MetE 5010 but can be taken out of sequence. **Prerequisite:** Consent of Instructor. **(1st, even yrs)**

METE 5040 Fire Assay

2 Cr.. (Hrs:1.5 Lec.;1.5 Lab)

This laboratory/lecture course covers the art and science of assaying for precious metals. Procedural differences are discussed for various ore types as well as the precious metal being assayed. In this regard, gold, silver, rhodium, platinum and palladium assay methods are compared. Field trips to area mines and smelters will be made. *Students must register in MetE 5040 Lab.* **Prerequisite:** Consent of Instructor. **(1st, 2nd, Summer)**

METE 5110 Materials Handling Design

3 Cr.. (Hrs.:.:2 Lec.;3 Lab.)

A design-oriented course covering belt conveyors, feeders, storage facilities, slurry pipelines and pumps. Spreadsheet calculations are used to design belt conveyors and slurry pipelines based on laboratory data obtained from samples collected at industrial sites. **Prerequisite:** Consent of Instructor. **(2nd, even yrs)**

M&ME 5200 Physical Chemistry of Iron & Steelmaking

3 Cr.. (Hrs.:.:3 Lec.)

Physical chemistry principles are utilized to describe iron and steel production including refining as well as slag/refractory selection and stability. Environmental issues are emphasized. **Prerequisites:** Consent of Instructor. **(1st, 2nd, Summer)**

M&ME 5230 Multi-Component Phase Diagrams

3 Cr.. (Hrs.:.:3 Lec.)

One- and two-component systems are reviewed; however, three-component systems are emphasized and four-component systems are discussed. Isothermal sections, crystallization paths, and vertical sections are covered for a variety of metallic and ceramic systems. Students taking this course are held to a higher standard than MetE 4230. **Prerequisite:** Consent of Instructor. ***Cross listed.*** **(2nd, even yrs)**

METE 5250 Computer Applications for Process Engineers

3 Cr.. (Hrs.:.:2 Lec.:3 Lab)

An application of computer techniques to processes engineering including optimizations, mass balances, energy balances, thermodynamics, and simulations. **Prerequisites:** Consent of Instructor. **(1st, odd yrs)**

METE 5260 Thermodynamic Modeling of Aqueous Systems

3 Cr.. (Hrs.:.:3 Lec.)

Reviews principles of thermodynamics appropriate for aqueous systems. The course then focuses on obtaining and measuring thermodynamic data, making the information consistent with various data bases, and using the data for modeling environmental, geochemical and metallurgical systems. **Prerequisites:** Consent of Instructor. **(2nd, odd yrs)**

METE 5310 Hazardous and Toxic Species Remediation

3 Cr.. (Hrs.:.:3 Lec.)

Fundamental considerations and current industrial unit operations used in treating solutions and solids that contain toxic and hazardous constituents, e.g., arsenic, selenium, thallium, mercury, and heavy metals are reviewed. Students will be able to: describe the fundamental basis for currently used industrial treatment processes for removing toxic and hazardous constituents from solutions and/or stabilizing solids; describe the unit operations utilized in the treatment of toxic and hazardous constituents; select the best unit operations for the processing of waste solutions and solids; and describe, compare and suggest possible alternative treatment processes to presently used industrial processes. **Prerequisite:** Consent of Instructor. **(1st, odd yrs)**

METE 5340 Processing of Primary and Secondary Resources

3 Cr.. (Hrs.:.:2 Lec.:3 Lab.)

This course describes the physical and chemical processes involved in separations. Flotation, the most commonly used separation, is discussed in detail. Gravity, magnetic and electrostatic separations are also described. Strategies involving non-mineral systems (recycling and waste minimization) are introduced and corresponding laboratory exercises are conducted. Students must register for METE 5340 Lab. **Prerequisites:** Consent of Instructor. **(1st, even yrs)**

M&ME 5410 Flowsheet Development & Design

3 Cr.. (Hrs.:.:2 Lec, 3 Lab)

The course presents the fundamentals of process development from the perspective of balancing the technical and economic viability with sustainable materials and natural resource management. Emphasis is placed on process design techniques that achieve efficient and economic utilization of raw materials, water, and energy and thereby conserve natural resources and minimize waste production. Each student selects a specific process and develops an interactive spreadsheet model that incorporates the flow sheet, mass and energy balances, equipment sizes, and first order capital and operating cost estimates. Students are welcome to choose from chemical (organic or petroleum, in particular), environmental (pollution control and/or waste treatment), manufacturing, materials, mineral processing, metallurgical, recycling, and other commercially relevant processes Students taking this course for graduate credit must satisfactorily complete a term project in addition to fulfilling the requirements for 4410. (Formerly METE 5410) **Prerequisite:** Consent of Instructor. ***Cross listed.*** **(2nd, odd yrs)**

M&ME 5440 Casting & Solidification

3 Cr.. (Hrs.:.:3 Lec)

Theory of solidification is reviewed including heat flow, nucleation and growth kinetics, solute distribution, constitutional undercooling, and grain and sub-grain structure. Both micro and macro forms of segregation are examined. Different casting methods and molding materials are characterized and compared. Casting concerns and special handling techniques for particular alloys systems are discussed. Methodologies for mold design are covered. Feeding, gating and risering systems are studied with the aid of fluid dynamics. Models regarding the formation of casting defects, porosity and hot-tearing, are outlined. Student must prepare an extensive literature review on a select topic. **Prerequisites:** Consent of Instructor. **(1st, odd yrs)**

METE 5550 Advanced Flotation

3 Cr.. (Hrs.:.:3 Lec.)

Deals with the development of the theoretical basis of the flotation process. The surface chemistry of collector and frother action under modification is quantitatively presented. Modern theories of adsorption are critically examined. **Prerequisites:** Consent of Instructor. **(On Dem.)**

METE 5690 Failure Analysis & Design Life

3 Cr.. (Hrs.:.:3 Lec.)

Application of the principles of physical and mechanical metallurgy to failure analysis. Methodologies are developed to solve failures including an analysis of stress state and loading. Fractography is characterized for different types of failures. Models for crack initiation and crack propagation are presented. Fatigue S/N curves and fracture mechanics are used to predict design life. The role of corrosion on design life is considered. Principles of nondestructive evaluation are introduced. Case histories of past failures are reviewed and analyzed. Student must prepare an extensive literature review on a select topic. **Prerequisites:** Consent of Instructor. **(1st, even yrs)**

M&ME 5700 Mechanical Behavior of Materials

3 Cr.. (Hrs.:.:3 Lec.)

Treats mechanical properties and behavior of materials with regard to stress and strain. Plastic deformation of crystalline materials is considered. Relationships between microstructure and mechanical strength are developed. Mechanisms for fracture, creep and fatigue are examined. **Prerequisites:** Consent of Instructor. **(1st, odd yrs)**

M&ME 5710 SEM/EDX

2 Cr.. (Hrs.:.:1 Lec.;3 Lab)
Continuation of MetE 4710 with a complete focus on materials characterization and analysis by Scanning Electron Microscopy and Energy Dispersive X-ray (SEM/EDX). Theory, principles and techniques are presented in detail. Enrollment will be limited. **Prerequisites:** Consent of Instructor. **(1st, even yrs)**

M&ME 5800 Nanoscale Materials & Technology
3 Cr.. (Hrs.:.:2.5 Lec.; 1.5 Lab)
Examines the technology and creation of functional materials, devices and systems through the control of matter on the nanometer scale (1-100 nm) from the top down as well as the bottom up including the exploitation of novel phenomena and properties (physical, chemical, biological, mechanical, and electrical). **Prerequisites:** Consent of Instructor. **(2nd, odd yrs)**

METE 5820 Processing of Energy Resources
3 Cr.. (Hrs.:.:2.5 Lec.;1.5 Lab)
Focuses on the coal and uranium processing including discussions on environmental issues. Coal topics include genesis, macerals, properties, washability analysis, beneficiation principles, levels of preparation, beneficiation equipment, preparation economics, power plant operations, blending, and fractionation. Spreadsheet calculations involving comminution modeling and coal drying are developed. Labs on maceral identification, hardness, washability, carbon/sulfur analysis, and BTU measurement are conducted. Uranium topics include mineralogy, leaching practices, solution concentration and purification. Nuclear power plant operations are touched upon. Students will conduct library searches and write reports on other energy resources excluding oil. **Prerequisites:** Consent of Instructor. **(2nd, odd yrs)**

METE 5830 Processing of Precious Metal Resources
3 Cr.. (Hrs.:.:2.5 Lec.;1.5 Lab)
An introduction to the processing and hydrometallurgy of precious metal ores with a focus on gold. Lectures cover crushing, grinding, autoclaving, agglomeration, roasting, concentration, leaching, solution purification, recovery, cementation, electrowinning and recycling. Environmental concerns and industrial solutions are emphasized. The laboratory experience consists of visiting gold processing facilities, collecting processing data from each plant, and writing summary trip reports. **Prerequisite:** Consent of Instructor. **(1st, odd yrs)**

M&ME 5840 Electrical, Optical & Magnetic Properties of Materials
2 Cr.. (Hrs.:.:2 Lec.)
Concepts introduced at the undergraduate level are expanded upon relative to the electrical, magnetic and optical properties of materials. Topics include the electron as a particle and wave, bonding, free electron theory, bond theory of solids, semiconductors, dielectric materials, magnetic materials, lasers, superconductivity, optical properties. **Prerequisite:** Consent of Instructor. **(2nd, odd yrs)**

METE 5870 Design of Weldments
3 Cr.. (Hrs.:.: 3 Lec.)
The origin, measurement, and mitigation of weld residual stresses will be examined. Standard guidelines for weld design will be covered with regard to strength, toughness, and fatigue. Design allowables will be considered. The effect of microstructure, joint design, bead shape, distortion, and defects on the tensile strength of weldments will be characterized. Application of fracture mechanics will be discussed. **Prerequisite:** Consent of Instructor. **(On Dem.)**

METE 5890 Metallurgy of Non-Ferrous Welds
3 Cr.. (Hrs.:.:3 Lec.)
Course covers welding processes applicable to aerospace materials such as titanium, aluminum, refectory metals, and super-alloys. Applicability of Soldering, Brazing, Electron Beam, and Laser Beam techniques to various alloy systems are discussed, with emphasis on control of thermal cycles, dilution, and weld contamination. Metallurgical fundamentals of the alloy systems are emphasized with extensive use of phase diagrams. **Prerequisite:** Consent of Instructor. **(On Dem.)**

METE 5940 Graduate Seminar
1 Cr.. (Hrs.:.:1 Recitation)
Meets with METE 4940. Graduate Seminar is a weekly course designed to improve the written and oral presentation skills of graduate students in metallurgical engineering. Students give an oral presentation on a topic of metallurgical importance. All students are expected to participate in ensuing discussions and turn in a written report within a certain time of their oral presentation. Must be taken twice. **Prerequisite:** Metallurgical & Materials Engineering student. Graduate standing. **(1st & 2nd)**

M&ME & METE 5950 Special Topics
1 to 4 Cr.. (Variable Credit)
Covers selected topics of specific interest in the field of metallurgical engineering. The topic will be designated at the time it is offered. May meet with METE 4950. **Prerequisite:** Consent of Instructor. **(On Dem.)**

M&ME & METE 5970 Metallurgical & Materials Engineering Problems
1 to 4 Cr.. (Variable Credit)
An individual laboratory, library or design problem is assigned which requires reports on some phase of metallurgical & materials engineering. May be repeated more than once. **Prerequisite:** Graduate Standing and Consent of Instructor. **(On Dem.)**

M&ME & METE 5990 Thesis Research
1 to 8 Cr.. (Variable Credit)
To do this, we need to change the name of our MS. An original problem selected by the student and the advisor requiring the writing and submission of a thesis. **Prerequisite:** Graduate Standing and Consent of Instructor. **(On Dem.)**

M&ME & METE 6970 Special Problems
Variable Credit
Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

M&ME & METE 6990 Dissertation
Variable Credit
Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(On Dem.)**

METALS FABRICATION

MFAB 0105 Welding Methods I
3 Crs (Hrs.:.:1 Lec, 4 lab)
A study of beginning welding practices. OFW OFC (Oxy-Fuel Welding and Cutting), SMAW (Shielded Metal Arc Welding). Includes safety precautions in welding, electrode classifications, PPE (personal protective equipment). Students will learn and practice welding techniques used to pass the AWS entry-level welder examination. **(1st)**

MFAB 0110 Machine Shop I
3 Crs (Hrs.:.:1 Lec, 4 lab)
Introduction to machine shop practices. Course covers hand tools, precision measuring tools, taps & dies, layout. Beginning use of drilling machines, lathes, pedestal grinders, drill bit and lathe tool sharpening. Speeds and feed rates. Shop safety and PPE **Prerequisite:** MFAB 0125 **(2nd)**

MFAB 0125 Blueprint Reading & Production
3 Crs (Hrs.:.:3 Lec)
This class is an introduction to the development of blueprints for Metal Fabrication Industries. Students will learn to read and interpret blueprints, welding and machining symbols and nomenclature; and also work with surface developments while learning and utilizing conventional drafting and AutoCAD drafting techniques. **(1st)**

MFAB 0135 Basic Welding for Automotive (Lecture/Lab)
Credits: 1
This beginning welding course is designed to be a basic introduction to oxyacetylene cutting and arc welding. It is structured to give the auto mechanic student a basic knowledge and skill of welding and cutting in the flat position. All safety practices and procedures will be followed. **(1st, 2nd)**

MFAB 0140 Basic Welding (Lecture/Lab)
Credits: 2
This beginning welding course is designed to be a basic introduction to oxyacetylene cutting and arc welding. It is structured to give the auto mechanic student a basic knowledge and skill of welding and cutting in the flat position. All safety practices and procedures will be followed. **(2nd)**

MFAB 0201 Welding Metallurgy

3 Crs (Hrs.:.:3 Lec)

Study of metal classifications, heat treatment processes. Properties of metals, hardness, strength, ductility, etc. and the effects of welding processes on them. **Prerequisite:** MFAB 0105& 0110 **(1st)**

MFAB 0205 Welding Methods II

4 Crs (Hrs.:.:1 Lec, 6 lab)

Course covers GMAW (Gas Metal Arc Welding), GTAW (Gas Tungsten Arc Welding) FCAW (Flux Core Arc Welding), Plasma cutting and Air arc gouging. Students will learn and practice welding techniques used to pass the AWS entry-level welder examination. **Prerequisite:** MFAB 0105 **(1st)**

MFAB 0210 Machine Shop II

3 Crs (Hrs.:.:1 Lec, 4 lab)

Advanced lathe operations, cutting threads, tapers, and parting tools. Use of milling machines and grinding machines, cutting keyways, precision movements using X,Y,Z, coordinate system, and indexing. **Prerequisite:** MFAB 0110 **(1st)**

MFAB 0215 Metals Fabrication I

4 Crs (Hrs.:.:1 Lec, 6 lab)

An introduction to fabrication and manufacturing of products produced using welding technology. Use of metal shears, chop saws, band saws, rollers, and punch machines. Layout and metal preparation for welding processes. Work includes instructor assigned fabrication projects. **Prerequisite:** MFAB 0105, MFAB 0110 **(1st)**

MFAB 0218 CNC Machining I

3 Crs (Hrs.:.:3 Lec)

This course is designed to expose the students to the basics of Computer Numerically Controlled (CNC) programming. Programming will begin at entry level using G-Codes and M-Codes. MDI (Manual Data Input) will be used to generate programs. Fixtures, jigs, and proper tool selection will be covered. Programs will be written and used on a Haas Mini Mill. **Prerequisites:** MFAB 0110, 0210

MFAB 0219 CNC Machining II

3 Crs (Hrs.:.:3 Lec)

This Class is a continuation of MFAB 0218 CNC Machining I. Master CAM software will be used to generate programs and parts. Fixtures, jigs, and proper tool selection will be covered. Programs will be written, and then communicated to the Haas Mini Mill. Four axis milling and contouring will be used. **Prerequisite:** MFAB 0218

MFAB 0220 Metal Fabrication II

4 Crs (Hrs.:.:1 Lec, 6 lab)

Advanced fabrication projects to include design and fabrication of a utility trailer. Other topics include repair welding and machine design. Work includes instructor assigned fabrication projects. **Prerequisite:** MFAB 0105, 0205, & 0210 **(2nd)**

MFAB 0235 Advanced Machining & Manufacturing

4 Crs (Hrs.:.:2 Lec, 4 lab)

Students will learn advanced lathe and millwork and track costs associated with the manufacturing of the part. Each part will be manufactured to specified tolerances. Quality Assurance records developed by each student will be used to ensure quality control. A team project will be to develop a manufacturing plan for the production of fabricated parts. This will include employee management, time management, cost management, part development, and quality assurance records. The plan will be implemented using local are high school students as employees and a short run production part will be manufactured. **Prerequisites:** Enrolled in MFAB program and 4th semester standing.

MFAB 0299 Special Projects

3 Crs (Hrs.:.:6 lab)

Students will use materials learned in prior MFAB courses to build a project of their choice. Students will also use lab time to finish any welding tests needed for entry-level welder certification. **Prerequisite: Fourth Semester Standing Only (2nd)**

MFAB 0916 Internship

1 to 6 Cr.. (Variable)

Combines academic work with an approved work experience related to the Metals Fabrication Technology degree program. Students should consult with their faculty advisor and/or departmental Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

MINERAL ECONOMICS

Mineral Economics deals with the influence of short and long term economic forces on the supply and demand for minerals and energy. The courses also deal with the application of economic theory and analytical methods in understanding the role of mineral resources in the economies of nations.

M.EC 3630 Engineering Economy

3 Cr.. (Hrs.:.:3 Lec.)

Covers the time value of money and financial calculations. Provides a basis for the economic evaluation of engineering projects. Problems assigned deal with the methods of determining returns on engineering investments, comparing alternatives, and determining the economic life of equipment. **Prerequisite:** Junior standing. **(1st, 2nd)**

M.EC 4000 Economics of the Mineral Industries

3 Cr.. (Hrs.:.:3 Lec.)

Examines market structure, supply and demand for mineral and energy commodities, economic costs, government mineral policy, mineral resource categories, current issues and future trends. **Prerequisite:** ECNS 201 or 203. **(1st)**

M.EC 4010 The Metals Market

3 Cr.. (Hrs.:.:3 Lec.)

Examines the market structures of the base metals, iron, aluminum and strategic minerals, supply and demand, pricing, and uses, and economic trends. Operation of London and New York metals markets are reviewed. **Prerequisite:** Junior standing. **(On Dem.)**

M.EC 4020 The Energy Minerals Market

3 Cr.. (Hrs.:.:3 Lec.)

Examines the market structures, supply, demand and pricing of coal, energy, gas and uranium. Reviews energy imports and public utility market. **Prerequisite:** Junior standing. **(On Dem.)**

M.EC 4030 The Precious Metals & Diamond Market

3 Cr.. (Hrs.:.:3 Lec.)

Examines the roles of the precious metals in industry, investments and monetary reserves, the market structure and trading methods. Examines commercial and investment role of diamonds, and market structure and control. **Prerequisite:** Junior standing. **(On Dem.)**

M.EC 4040 The Industrial Minerals Market

3 Cr.. (Hrs.:.:3 Lec.)

Rounds out the series of courses dealing with the mineral commodity markets, (see M.EC 4010, 4020, 4030). Deals with the supply, demand, industry structure, and trends in the major industrial rocks and minerals and non-metallics, such as sand and gravel, limestone, cement, gypsum, sulfur, fluorspar, feldspar, clays, barite, potash, phosphate, soda ash, boron, mica, salt and silica. **Prerequisite:** Senior standing. **(On Dem.)**

M.EC 4100 Minerals & Economic Development

3 Cr.. (Hrs.:.:3 Lec.)

Applies basic economic principles to examining the role of minerals in the economies of various nations, particularly the LDC's. Market structures, mineral ownership and tax policies and development objectives are studied. Prerequisites: Senior standing or Consent of Instructor; ECNS 201; M.EC 3630. **(On. Dem.)**

M.EC 5000 Advanced Studies in Mineral Economics

3 Cr.. (Hrs.:.:1 Lec., 5 Lab)

Economic studies of selected mineral commodities and related policy issues. Intended to allow advanced students the opportunity to pursue topics of particular interest, under guidance, but emphasizing self-initiative. **Prerequisite:** Consent of Instructor. **(On Dem.)**

M.EC 5010 Advanced Readings in Mineral Economics

3 Cr.. (Hrs.:.:1 Lec., 6 Lab)

Selected intense readings on topics in mineral economics in the area of economic theory, mineral policy, mineral exploration and development, mineral market behavior. **Prerequisites:** ECNS 201 or 203, and Consent of Instructor. **(On Dem.)**

M.EC 5020 Mineral Forecasting & Econometrics

3 Cr.. (Hrs.:.:3 Lec.)

Examines the techniques commonly used in forecasting the supply, demand and price of mineral commodities, such as least-squares regressions, moving averages, curve smoothing, etc. Covers econometric techniques such as multiple regression and simultaneous equation models, and key factors such as auto-correlation, multi-colinearity, lagged variables, and hypothesis testing. **(On Dem.)**

M.EC 5030 International Mineral Economics

3 Cr.. (Hrs.:.:3 Lec.)

Examines the theory of international trade, growth and constraints of trade, economic integration, national accounting for balance of trade, foreign exchange and international monetary arrangements. Case studies and illustrative examples are drawn from the mineral industries. **Prerequisite:** ECNS 202, 201; M.EC 4000. **(On Dem.)**

M.EC 5040 Mineral Resource Economics

3 Cr.. (Hrs.:.:3 Lec.)

This course deals with static and dynamic theories of depletion, long and short term benefits and costs to society of mineral exploitation, and the formulation of long run costs and prices. **Prerequisites:** M.EC 4000; Senior or graduate standing; Consent of Instructor. **(On Dem.)**

M.EC 5050 Mineral Policy & Taxation

3 Cr.. (Hrs.:.:3 Lec.)

This course examines the formulation and implementation of policies towards mineral exploration, production, exports and imports. Mineral structures, including the Added Profits Tax, and their impacts are examined. Examples are drawn from the Less Developed Countries (LDC's), industrialized nations, and selected States. **Prerequisites:** M.EC 3630; 4000; Senior or graduate standing; Consent of Instructor. **(On Dem.)**

M.EC 5100 Advanced Engineering Economic Analysis

3 Crs (Hrs.:.,3 Lec)

Application of economic analysis techniques using computer spreadsheets in the comparison of engineering alternatives. Alternatives include Lease vs. buy, Major rebuild vs. new, Optimum replacement life, Project evaluation, Optimum fleet sizing. A case study approach. Prerequisite: M.EC 3630. **(On Dem.)**

MINING ENGINEERING

MIN 1010 Intro. to Engineering Calculations & Problem Solving

3 Crs. (Hrs.:.:2 Lec., 3 Lab)

An introduction to engineering calculations and problem solving using the computer. Students are taught how to solve and present engineering problems using computer software such as spreadsheets, graphics programs, and database programs. In addition, an introduction to engineering design is presented and a small design project completed. **Corequisites:** M 151 **(1st, 2nd) Cross-list with ENGR 1010**

MIN 105 Introduction to Mining

2 Cr.. (Hrs.:.:2 Lec.)

Provides a basic introduction to the elements of mining. Includes unique characteristics of the minerals industry, mining law, sampling and ore reserve estimation, mine finance, surface mining methods, underground mining methods, and the unit operations of drilling, blasting, loading and haulage. Corequisites M 121 **(1st)**

MIN 1110 Miner Safety Training

2 Cr.. (Hrs.:.: 2 Lec)

A program to provide knowledge and training under Public Law CFR 30, Part 48 Health and Safety Training and Retraining of Miners. **(2nd)**

MIN 1520 Mapping, Surface Modeling & Volumetrics

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Topics include how to draw plan maps and cross-sections for engineering projects, surface modeling techniques, and how to make basic volumetric calculations. Drawings and calculations are made both by hand and with the assistance of a CAD program **Prerequisite:** MIN 1010 **(2nd)**

MIN 2100 Plane Surveying

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Covers the basics of plane surveying. Linear measurement; errors; leveling; the use of transit, theodolite and total stations to make traverses; traverse adjustments; earthworks; and map construction. An introduction to GPS surveying. **Prerequisite:** M 151, 171 or MATH 1516. **(1st)**

MIN 2150 Mining Methods

3 Cr.. (Hrs.:.:3 Lec.)

A comprehensive examination and analysis of mining methods commonly encountered in the world's mining operations. Production equipment and support systems are noted. Rock fragmentation basics are included as appropriate to the methods. Students are required to produce reports and/or models for class. Field trips. **Prerequisite:** MIN 1050. **(1st)**

MIN 2910 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Mining Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisite:** Consent of Instructor. **(On Dem.)**

MIN 3050 Unit Mining Operation

4 Cr.. (Hrs.:.:3 Lec., 3 Lab)

Covers hoisting, rail haulage and conveyor belts. Auxiliary mining services such as pumping and compressed air distribution are studied. Laboratory sessions present design problems dealing with the material taught in the classroom. **Prerequisites:** MIN 2150, ENGR 2530 ENGR 3260. **(2nd)**

MIN 3100 Computer Aided Mine Design

2 Cr.. (Hrs.:.:1 Lec., 3 Lab)

Course teaches the student 3D design and visualization techniques for open pit and underground mines. Commercial mine planning software is used extensively. **Prerequisite:** MIN 1520. **(2nd)**

MIN 3720 Coal Mining–Techniques & Evaluation

2 Cr.. (Hrs.:.:2 Lec.)

An introduction to development and mining of coal. Topics include coal formation, exploration, evaluation, mining methods and marketing. **Prerequisite:** Junior standing or Consent of Instructor. **(On Dem.)**

MIN 4010 Mine Design–Surface

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

A senior-level design course incorporating the principles of previous mining and engineering courses. Phases of this economic design covered are development, equipment selection and productivity. Engineering economy of all designs is considered. Laboratory design problems involve the integration of the knowledge gained in previous courses within and outside the department. **Prerequisite:** MIN 3050, 3100, and M.EC. 3630; senior standing. **(1st)**

MIN 4050 Mine Design–Underground

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Incorporates the unit operations of mining into the design of mining systems. Phases of mine design covered are plant layout, planning development openings, selection of a mining method and equipment, and economic analysis. **Prerequisite:** MIN 3050, and M.EC 3630; junior or senior standing. **(2nd)**

MIN 4060 Mine Surveying

1 Cr.. (Hrs.:.:6 Lab)

The theory and practice of the techniques of mine surveying are supplemented by problems in transferring the meridian underground and survey of a mine for detail. Classroom consideration of these problems is followed by practice in a local mine. Much of the work is incorporated in a mine map. **Prerequisite:** MIN 2100. **(2nd)**

MIN 4080 Valuation of Mineral Properties

3 Cr.. (Hrs.:.:3 Lec.)

This course presents engineering principles of examining and establishing values of mineral deposits. Includes sampling, calculation of ore reserves, cost estimation, project evaluation criteria, and taxation. A mine valuation project is required. M.E.C. 3630 & Senior standing. **(2nd)**

MIN 4180 Ore Reserve Estimation

3 Cr.. (Hrs.:.:3 Lec.)

Covers classical and geostatistical ore reserve estimation methods and computerized techniques for ore body modeling. A major project is assigned for the student to make a computerized ore reserve model of a deposit suitable for mine design purposes. **Prerequisites:** STAT 332. **(2nd)**

MIN 4300 Aggregate Mine Design

3 Crs (Hrs.:.:3 Lec)

Thorough coverage of the production of aggregate, including economic considerations, aggregate properties and testing, environmental and public concerns, permitting, extraction and processing, transportation, aggregrate applications, and aggregrate sampling. **(On Dem.)**

MIN 4440 Environmental Management & Design of Mines

3 Cr.. (Hrs.:.:3 Lec)

This course covers pertinent laws and regulations pertaining to the mine permitting process. Emphasis is placed on technologies and systems design for site specific environmental protection and operations environmental management. Economic impacts will be considered as part of each design component. Electronic permitting will be incorporated into the process. **Prerequisite:** Junior standing. **(2nd)**

MIN 4500 GPS Surveying

2 Crs (Hrs.:.:2 Lec, 1 Lab)

Application of high resolution GPS for surveying. Theory and application of static GPS methods for baseline determination and real-time kinematics methods for rapid determination of position will be presented. **(On Dem.)**

MIN 4560 Mine Ventilation

3 Cr.. (Hrs.:.:3 Lec.)

Covers the study and application of the principles of environmental control in mines through design and regulation of natural and mechanical ventilation. **Prerequisites:** ENGR 3260 **(2nd)**

MIN 4580 Mine Management

3 Cr.. (Hrs.:.:3 Lec.)

Reviews the managerial functions of planning, organizing, motivating, directing and controlling. Key management concepts are considered. **Prerequisite:** Senior standing. **(1st)**

MIN 4610 Quantitative Methods for Engineering & Mgmt

3 Cr.. (Hrs.:.:3 Lec.)

An introductory course in systems analysis and operations research. Covers linear programming, CPM, PERT, inventory models, queuing theory, simulation, and time study. **Prerequisite:** STAT 332 or Consent of Instructor. **(On Dem.)**

MIN 4670 Geomechanics I

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

This course is an introduction to geotechnical engineering from a rock mechanics viewpoint. Topics of prime interest include stress-strain relationships, engineering properties of rocks and rock masses, the behavior of stresses around underground openings, field instrumentation, and basic rock mechanics design considerations for underground and surface mines. **Prerequisite:** ENGR 3350 or Consent of Instructor. **(2nd)**

MIN 4700W Mine Design Project

3 Cr.. (Hrs.:.:3 Lec.)

A capstone design course for seniors in Mining Engineering. Students will be assigned a design project related to mining to complete during the semester. The course grade will depend on the performance shown on the design project. Readings and exercises will be assigned as needed to implement design procedures needed for the design project. **Prerequisite:** ENGR 3210 and within two semesters of graduation. **(1st & 2nd)**

MIN 4910 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Mining Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

MIN 4920W Engineering Research, Development or Design

Variable Credit

Directed research on a problem in mining engineering. Classroom lectures touch on the most common research tools and techniques: use of the library, statistics, curvefitting, model theory and report writing. All work is supervised and a written report of accomplishment is required. **Prerequisites:** Senior standing and Consent of Instructor. **(On Dem.)**

MIN 4980 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

MIN 5090 Geomechanics II

3 Cr.. (Hrs.:.:3 Lec.)

Extends exposure to rock mechanics from that given in MIN 4670. Topics such as mechanical support, pillar design, subsidence, caving, blasting, and modeling in mine design are considered. **Prerequisite:** MIN 4670 or Consent of Instructor. **(1st)**

MIN 5100 Advanced Engineering Economic Analysis

3 Crs (Hrs.:.,3 Lec)

Application of economic analysis techniques using computer spreadsheets in the comparison of engineering alternatives. Alternatives include lease vs. buy, major rebuild vs. new, optimum replacement life, project evaluation, optimum fleet sizing. A case study approach. **Prerequisite:** M.EC 3630 **(On Dem.)**

MIN 5120 Simulation of Engineering Systems

3 Crs (Hrs.:.,3 Lec)

Application of computer software packages and a simulation language to evaluate system alternatives. Comprehensive evaluation of what-if alternatives such as increased and reduced required demand on the system and the overall effect to system NPV. Evaluation of the analysis tools used in the course for strengths and shortfalls, i.e., cost, learning curve and overall effectiveness. **Prerequisite:** MIN 3050 **(On Dem.)**

MIN 5180 Advanced Geostatistics

3 Cr.. (Hrs.:.:3 Lec.)

Covers advanced topics in geostatistics such as nonlinear estimation methods and conditional simulation. Includes both theory and practical application. **(On Dem.)**

MIN 5200 Finite Element Method in Geomechanics

3 Cr.. (Hrs.:.:3 Lec.)

Introduces the finite element method and elasticity as applied to underground opening design and other structural problems. The principles of elasticity are introduced and/or reviewed where appropriate, depending upon the background of the students. Various finite element codes are evaluated and utilized. **Prerequisites:** MIN 4670 or Consent of Instructor. **(2nd)**

MIN 5300 Aggregate Mine Design

3 Crs (Hrs.:.:3 Lec)

Thorough coverage of the production of aggregate, including economic considerations, aggregate properties and testing, environmental and public concerns, permitting, extraction and processing, transportation, aggregrate applications, and aggregrate sampling. **(On Dem.)**

MIN 5500 GPS Surveying

2 Crs (Hrs.:.:2 Lec, 1 Lab)

Application of high resolution GPS for surveying. Theory and application of static GPS methods for baseline determination and real-time kinematics methods for rapid determination of position will be presented. **Prerequisite:** MIN 2100. **(On Dem.)**

MIN 5610 Design & Construction of Dumps, Pads, & Impoundments

3 Cr.. (Hrs.:.:3 Lec.)

Design and construction of mine waste dumps, leach pads, tailings impoundments and similar structures. **Prerequisite:** Graduate status. **(1st)**

MIN 5750 Tunneling & Underground Construction

3 Cr.. (Hrs.:.:3 Lec.)

This course will cover the most significant aspects of tunnel and underground construction in hard rock and soft ground, including site investigation, design, construction techniques, ground support design, tunnel utilities, construction sequencing and scheduling, and costs. **Prerequisite:** Recommended preparation MIN 4670 or ENGR 4860. **(1st)**

MIN 5940 Mining Engineering Seminar

1 Cr.. (Hrs.:.:1 Lec.)

Current mining literature and mining research are discussed. Oral presentation is required. This seminar may meet with those in Metallurgy, Mineral Processing, Geology or Petroleum. **(1st, 2nd)**

MIN 5970 Special Problems

Variable Credit

A special study of a particular phase of mining engineering. Supervision is to be kept to a minimum in order to foster initiative and originality. A written report of accomplishments is required. **(On Dem., 1st & 2nd)**

MIN 5990 Thesis Research

Variable Credit

Investigation of some problems in mining engineering and their application. **(Summer, 1st, 2nd)**

MIN 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

MIN 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

ORIENTATION/STUDENT SUCCESS CLASSES

M.T. 0220 Employment Strategies

2 Crs (Hrs.:.:2 Lec)

Students learn the skills necessary to find and obtain employment. Topics will include writing resumes, letters of application, and follow-up letters; a discussion of possible job sources; and interviewing techniques.

M.T. 0100 Hazwoper (OSHA 40-Hour Certification)

3 Crs (Hrs.:.:2 Lec)

The 40-Hr. Hazwoper Certification complies with OSHA regulations 29 CFR 1910.120, the Hazwoper standard. This standard was enacted as per the SuperFund Amendments and Reauthoritization Act of 1986 which required the Secretary of Labor to issue regulations providing health and safety standards and guidelines for workers engaged in hazardous waste operations. This regulation, which is federal law, is intended to provide employees with the knowledge and skills enabling them to perform their jobs safely and with minimum risk to their personal health.

M.T. 1016 College Success

2 Cr.. (Hrs.:.:2 Lec.)

This course is designed to teach students how to have a successful college experience both academically and personally. The focus will be on the development of practical knowledge and skills to assist students towards that goal. Topics include communication skills, critical thinking skills, test taking, time planning, study techniques, community and campus resources, and managing the personal and relationship issues that face many college students. Students may use this course as free elective toward any undergraduate degree. **(1st, 2nd)**

MUSIC

MUS 1816 Chorus (R)

1 Cr.. (Hrs.:.:2 Lab)

Training is given in singing and appreciation of folk, semi-classical and classical music. May be repeated for credit. Chorus meets two hours weekly in addition to public appearances as scheduled. **(1st & 2nd)**

MUS 1836 Band (R)

1 Cr.. (Hrs.:.:2 Lab)

Offers a cultural opportunity for students with band skills to continue study in music. Approximately 20 meetings are held, half of which are devoted to study and rehearsal of swinging pop music, college songs, Dixie Land pops, and marches. The remaining meetings involve performances at ball games, convocations, concerts, and parades. May be repeated for credit. **(1st & 2nd)**

MUS 1856 Symphony Orchestra (R)

1 Cr.. (Hrs.:.:2 Lab)

String, woodwind, brass, or percussion players who are qualified to play in the Butte Symphony can receive credit by attending rehearsals (15-16) and performing in two concerts. This provides an opportunity to play standard orchestral repertory with a community group of professional and amateur musicians. **(1st & 2nd)**

NURSING

NURS 1016 Introduction to Nursing

1 crs (Hrs.:.,1 Lec.)

The intent of this course is to socialize the participant to the roles/functions/expectations of the nurse. This course provides an introduction to nursing history and current views of nursing as a discipline (including various types of nursing occupations and educational requirements). Scholastic expectations required to complete a program of study in nursing are introduced as well as professional expectations of the practicing nurse. The following core concepts related to nursing practice are presented; the caring nature of the nursing profession; the importance of critical thinking/clinical judgment; legal/ethical/cultural issues in nursing; the need to understand human motivation and behavior; and use of the nursing process. Communication in various forms is emphasizes. Students have the opportunity to interact electronically with others who are pursuing an education in nursing; are required to submit academic course work electronically (including assignments requiring APA format); and utilize online resources to research course assignments. Because of its online format, this course also provides an opportunity to use/improve essential information technology competencies.

NURS 1456 Pharmacology

3 crs (Hrs.:., 3 Lec.)

This course is designed to introduce basic pharmacological principles to nursing students utilizing the nursing process. The course is organized according to body systems and drug classifications. The course will provide a clear connection between pharmacology and content learned in medical-surgical nursing. A holistic perspective will be emphasized to clearly demonstrate special considerations in patient education. Emphasis will also be placed on how to access relevant pharmacological information to ensure patient safety in medication administration. **Prerequisite:** Acceptance into the ASN Program **(1st)**

NURS 1506 Fundamentals of Nursing

7 crs (Hrs.:., 4 Lec. 3 Lab)

Introduces learners to the clinical skills essential for the nursing role. Also includes complex concepts and behaviors of nursing roles within the context of the nursing process, holistic care and health care. Emphasizes the theoretical and practical

concepts of nursing skills required to meet the needs of clients in a variety of settings. **Prerequisite:** Acceptance into the ASN Program. **(1st)**

NURS 1556 Gerontology

2 crs (Hrs.:., 1 Lec. 1 clinical)

The intent of this course is to introduce the student to the skill and knowledge needed to provide nursing care to aging clients. Topics explored include: current trends (including legal and ethical issues) in gerontological nursing, developmental stages and transitions associated with aging, expected age-related physiological changes and assessment findings, recognition and management of acute and chronic illness that commonly occur in the older adult population, promotion of health for the older adult client, and end-of-life issues and care. **Prerequisite:** Acceptance into the ASN Program. **(1st)**

NURS 1566 Core Concepts of Adult Nursing

7 crs (Hrs.:., 4 Lec. 3 Lab)

This course prepares the student to care for clients experiencing common, well-defined health alterations in settings where stable clients are anticipated. Students are introduced to standardized nursing procedures and customary nursing and collaborative therapeutic modalities. The following body systems will be addressed: neurological, cardiac, respiratory, renal/urological, gastrointestinal, musculoskeletal, endocrine, reproductive, integumentary, sensory, and hematological. The topics of peri-operative care, pain, infection/immunity and cancer will be addressed. Additionally, recognition and emergent treatment of rapidly changing conditions will be introduced. **Prerequisite:** NURS 1456, 1506, and 1556 **(2nd)**

NURS 1576 Core Concepts of Maternal/Child Nursing

3 crs (Hrs.:., 2 Lec. 1 clinical)

Emphasizing caring, communication, professionalism, and critical thinking, the course provides information about fetal development and prenatal and postnatal care of the mother and newborn. Role of the nurse in meeting the needs of the family is emphasized. Clinical application of caring for the mother and newborn will allow the student to demonstrate acquired knowledge. The course also includes growth and development patterns as well as care of the well and sick child.
Prerequisite: NURS 2536 **(2nd)**

NURS 1586 Core Concepts of Mental Health Nursing

2 crs (Hrs.:., 2 didactic)

This course will explore physiological, psychological, sociocultural, spiritual, and environmental factors associated with mental health and mental Illness. Focus will be placed on basic concepts of psychiatric nursing, therapeutic modalities, as well as psychiatric disorders including psychopharmacological management.
Prerequisite: Successful completion of semester one. **(2nd)**

NURS 2006 Pathophysiology

3 crs (Hrs.:.3 Lec)

This course will introduce the student to the basic principles & processes of pathophysiology including cellular communication, genes, and genetic disease, forms of cellular injury, fluid, & electroytes/acid base balance, immunity, stress coping & illness, & tumor biology. Pathophysiology of the most alterations according to body systems will also be discussed as well as the latest developments in research related to each area.
Prerequisite: Acceptance into the ASN Program.

NURS 2466 Complex Care Needs of the Adult Client

4 crs (Hrs.:., 2 Lec 2 clinical)

This course prepares the student to provide nursing care to adult clients experiencing acutely changing conditions in settings were outcome is less predictable. Emphasis is placed on the nurse's response to emergent/life-threatening/rapidly changing conditions. Topics covered include collaborative therapeutic modalities related to acute/complex neurological, cardiac, respiratory, hematological, endocrinologic events, shock, sepsis/SIRS, complex burns, etc.
Prerequisite: NURS 1556, 1576, 1586, 2506.

NURS 2476 Complex Care Needs of the Maternal/Child Client

3 crs (Hrs.:., 2 Lec 1 clinical)

This course prepares the student to provide care to maternal/child clients experiencing acutely changing conditions in settings were outcome is less predictable. Topics include care of the client during childbirth, high-risk pregnancies, obstetrical emergencies, neonatal emergencies, and infants and children requiring complex collaborative care.

NURS 2486 Complex Care Needs of Mental Health Nursing

2 crs (Hrs.:., 1 Lec; 1 clinical)

This course will explore physiological, psychological, sociocultural, spiritual and environmental factors associated with Mental Health/Illness. Focus will be placed on psychotherapeutic management in the continuum of care, milieu management and special populations with emphasis on individuals, families and communities.

NURS 2506 Advanced Clinical Skills

1 crs (Hrs.:., 1 Lab)

This course prepares the student to carry out complex nursing interventions across the lifespan. Topics covered include IV therapies such as central venous therapy, parenteral nutrition, IV medication administration, complex IV infusions, blood/blood product administrations, advanced airway/ventilatory support, wound care, laboratory values, complex gastrointestinal problems, arrhythmia identification, mobility issues, disaster preparedness, and palliative care..

NURS 2806 Managing Client Care

4 crs (Hrs.:., 2 Lec. 2 clinical)

This course covers topics related to integrated nursing care of individual clients and groups of clients as well as basic principles related to leadership and management in nursing. Topics include: effective communication techniques in the employment setting; role differentiation among care providers; organization and prioritization; delegation, supervision, management of health care resources, legal and ethical issues, values clarification, conflict resolution and consensus building. The course requires students to integrate knowledge and skills learned from other nursing courses and help them transition from the role of student to that of a Registered Nurse. Licensure exam (NCLEX-RN) preparation and process are also included as a component of the course. The preceptor-based clinical component allows the student to function in the role of a registered nurse while working one-on-one with a designated RN preceptor. **Prerequisite**: NURS 2236. Corequisites; concurrent enrollment in NURS 2556, NURS 2736, NURS 2886, NURS 2896.

NURS 3036 Community Health Nursing

4 crs (Hrs.:., 2 Lec. 2 Lab)

The intent of this course is to provide the student with an opportunity to apply the nursing process to the care of communities. The course explores concepts in population-focused care, levels of prevention and levels of practice (individual/family, systems, and communities). Health status indicators for Montana counties and the Healthy People 2010 national health care agenda are researched. Basic concepts of environmental health, emergency preparedness, economics, and epidemiology are discussed. Students explore community coalitions and work groups that interface with vulnerable at risk populations in the community. Clinical experience includes community health preceptor based learning, a home visit program, and health promotion at several community sites.
Prerequisite: RN Licensure

NURS 3076 Advanced Pathophysiology

3 crs (Hrs.:., 3 Lec.)

This course will introduce the student to the basic principles and processes of pathophysiology include cellular communication, genes and genetic disease, forms of cellular injury, inflammatory process, role of the immune system in health and disease, stress, tumor spread and treatment. Pathophysiology of the most common alterations according to body system will also be discussed as well as the latest developments in research related to each area and how it influences current clinical practice. **Prerequisite:** Pathophysiology, or consent of instructor.

NURS 3096 Care of the Aging Client

3 crs (Hrs.:., 2 Lec. 1 clinical)

Through caring, communication, professionalism, critical thinking, and clinical judgment, this course focuses on developing advanced multidimensional geriatric assessment skills using research based tools. The student will incorporate evidence-based standards into a teaching plan to reduce risk and promote healthy activities in older adults. Several different clinical settings will be utilized to compare healthy, frail, institutionalized, and acutely ill aging adult populations. Model programs for geriatric nursing care will be examined and evaluated for their utility at the local, state, and national levels. **Prerequisite**: RN Licensure,

NURS 3116 Trends & Issues in Professional Nursing

2 crs (Hrs.:., 2 Lec.)

The intent of this course is to familiarize the student with current social, political,

economic, ethical, and legal issues associated with the practice of professional nursing. Topics explored include: issues in rural nursing, rural health care delivery, educational levels for entry into nursing practice, quality indicators across the health care continuum, issues in health-care financing, the position statements of national professional nursing organization, in addition to student led presentations. **Prerequisite**: Declared Nursing Major, or consent of instructor.

NURS 3126 Advanced Health Assessment

3 crs (Hrs.:., 2 Lec. 1 Lab)

Advanced Health Assessment is designed to prepare the learner to develop a nursing database at a Bachelor's of nursing level. This course builds on the education and skills gained during previous course work. Learners will enhance their assessment techniques through hands on learning experiences focusing on physical, developmental, emotional, psychosocial, cultural, spiritual, and functional assessments. The course emphasizes analysis, synthesis, and documentation of assessment data as a foundation for providing holistic nursing care. The course includes a lecture, laboratory and clinical component. **Prerequisites:** RN Licensure or consent of instructor.

NURS 3136 Family Nursing

3 cr. (Hrs.:., 2 Lec. 1 Clinical)

This course will introduce the student to Family Nursing by applying family concepts to clinical practice. Students will be introduced to theories and models to understand the impact of families on professional and personal relationships. Students will use theories and models to develop nursing strategies while promoting the health of families. **Prerequisite:** RN Licensure.

NURS 4046 Nursing Across the Health Care Continuum

3 crs (Hrs.:., 2 Lec., 1 clinical)

This course will focus on health promotion and illness management in relation to particular nursing issues. The patient experience will be examined from a holistic view point with emphasis on the patient perspective. The student will identify an area of interest, research that area, and explore the nurse's role in the current level of practice. The patient perspective will guide the student in evaluating the problem and its impact on the patient. The concepts of caring, ethics, spirituality, advocacy, culture, and patient vulnerability are examined. This course will assist the student to critically examine beginning nursing practice and the progression from the novice to expert in preparation for professional BSN practice. **Prerequisite**: RN Licensure; **Pre or Corequisites.** WRIT 322

NURS 4106 Nursing Theory

3 crs (Hrs.:., 3 Lec.)

This course is designed to introduce students to nursing theories, philosophies, and models. The student will analyze nursing theories and apply the theory to nursing practice. This course includes the credentials and background of the nurse theorist, major concepts and definitions, theoretical assertions, and critique of their work. Each theory will demonstrate proper utilization and application to current nursing practice and research. **Prerequisite:** Completion of ASN Program, or consent of instructor.

NURS 4206 Nursing Research

3 crs (Hrs.:., 3 Lec.)

This course is designed to introduce the student to the research process. Emphasis is placed on knowing how to critically read, evaluate, and apply research findings in practice. This course includes competencies as research consumers and utilizing evidence-based practice. **Prerequisite or Corequisites:** STAT 131

NURS 4306W Nursing Leadership and Management

6 crs (Hrs.:., 4 Lec. 2 clinical)

This course is designed to merge theory, research and practical application for Nursing Leadership and Management. The student is introduced to concepts of the role of the leader and manager, health care organizations, care delivery strategies and career management. Emphasis is placed on ethics and the role of the nurse leader and developing a personal leadership style.
Prerequisite: RN Licensure & WRIT 322; Pre or Co-requisite Ethics.

OCCUPATIONAL SAFETY & HEALTH

OSH 2246 Safety Administration & Programs

3 Cr.. (Hrs.:.:3 Lec.)

Examines the function of safety in industry, including the organization and application of safety programs. Methods of hazard analysis and accident prevention, correction and control are discussed and evaluated, as are accident investigation and analysis. Additionally, behavior modification, safety record keeping, motivation, workers compensation, professional ethics and disabled workers are addressed. **(1st)**

OSH 2266 Safety Engineering & Technology

3 Cr.. (Hrs.:.:3 Lec.)

Introduces system safety and safety engineering principles applied to control of hazards associated with facilities, chemical processes, materials handling, machine operation, and electricity . **(2nd)** (OSH 2256 does not meet the requirement and cannot substitute for OSH 2266).

OSH 2956 Special Topics

(2 - 4 crs.)

Presents topics not covered in any curriculum for which there is a particular need, or given on a trial basis to determine demand. Directed studies, special clinics, coaching schools, and workshops as scheduled. Study proposals must have prior departmental approval. May be repeated for maximum of 6 credits. **Prerequisite:** Consent of Instructor. **(On Dem.)**

OSH 3226 Hazardous Material Management

3 Cr.. (Hrs.:.:3 Lec.)

Provides an in-depth examination of federal, state and local regulations and requirements for hazardous materials and wastes. Includes definitions of toxic and hazardous material; storage and treatment; transportation; emergency response planning; air and water quality; community concern issues; and risk assessment. **Prerequisites:** CHMY 143, 210. **(1st)**

OSH 3236 Fire Protection

3 Cr.. (Hrs.:.:3 Lec.)

An in-depth study of recognition of fire hazards and causes, prevention and control techniques and fire detection and extinguishing systems. Numerous assignments to develop fault trees help students understand fire and grow their ability to synthesize information. The chemistry of combustion and fire codes and standards are studied in detail. **(1st)**

OSH 3246 Construction Safety

3 Cr.. (Hrs.:.:3 Lec.)

Covers construction industry safety issues involving management, legal, and engineering aspects. Major topics are planning projects, incentive programs, incident investigation, training, multi-employer responsibilities, risk management, regulations, fall protection, steel erection, scaffolding, cranes, electrical safety, demolition, concrete, and confined spaces. **Prerequisites:** OSH 2246. **(2nd)**

OSH 3266 Safety Laboratory

1 Cr.. (Hrs.:.:1 Lab.)

This course provides students with hands-on experience applying occupational safety technology, participating in group projects, observing industrial operations, conducting experiments, and preparing reports in the scientific format. Prerequisites**:** OSH 2246 & 2266, or Instructor's permission. **(2nd)**

OSH 3546 Industrial Toxicology

3 Cr.. (Hrs.:.:3 Lec.)

A course considering industrial toxicants such as chemicals, dusts, mists, fumes, ionizing and non-ionizing radiation, and heat, their effects and mode of action on man. Dose-response relationships, residence time excretion rates and detoxification processes are considered. A survey of the literature is included. **Prerequisites:** BIOL 2526; and a college chemistry course or consent of instructor. **(1st)**

OSH 4066 Small Particle Technology

3 Cr.. (Hrs.:.:2 Lec., 3 lab)

Covers physics of air, characterization of particles, aerodynamic properties, Brownian motion and diffusion, thermodynamic properties, sources, measurement of respiratory deposition, and control. **Prerequisites:** PHYS 1026 and 1036. **(1st)**

OSH 4166 Industrial Ventilation

2 Cr.. (Hrs.:.: 2 Lec)

Covers the principles of local exhaust and general (dilution) exhaust systems used to control chemical hazards. Including principles of air flow, pressure drops through duct work and hood design with simple systems progressing through more complex systems.

OSH 4216 IH I - Chemical & Biological Hazards

3 Cr.. (Hrs.:.:3 Lec.)

To provide the basis for the anticipation, recognition, evaluation and control of chemical and biological hazards in the work environment. **Prerequisites:** BIOL 1116; CHMY 143. **(1st)**

OSH 4226 IH II - Physical Hazards

3 Cr.. (Hrs.:.:3 Lec.)

To provide the basis for the anticipation, recognition, evaluation and control of physical stresses in the work environment. The development & interpretation of the exposure standards for noise, temperature extremes and nonionizing and ionizing radiation will be studied. Physical hazards associated with specific industrial processes will also be discussed. **Prerequisites:** BIOL 1116, CHMY 143, PHYS 1036. **(2nd)**

OSH 4276 Mining Safety

3 Cr.. (Hrs.:.:3 Lec.)

Covers the history and practice of mining safety. Includes materials handling, milling, hauling, ground control, electrical and fire hazards, hoisting, disaster planning, personnel protection, gassy mines, safety training, and mine ventilation. Both surface and underground mining issues are covered. **Prerequisite:** Senior standing or Consent of Instructor. **(On Dem.)**

OSH 4296 Sampling & Evaluation of Health Hazards

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Teaches sampling techniques and procedures as stipulated by occupational safety and health regulatory agencies for evaluating occupational health hazards arising from chemical and physical agents in the workplace. It includes the calibration and use of personal monitoring and direct reading instrumentation for the assessment of an employee's exposure to common industrial hygiene hazards including air contaminants, noise, nonionizing radiation and temperature extremes. **Prerequisite:** OSH 4216; PHYS 1026. **(2nd)**

OSH 4546 Ergonomics

3 Cr.. (Hrs.:.:3 Lec.)

Provides the basic understanding of ergonomic considerations necessary to design tools, workstations, facilities, and systems to match human capabilities and limitations. Particular emphasis will be placed on analysis and reduction of upper extremities cumulative trauma disorders and hazards associated with manual material handling. **Prerequisites:** Recommended Preparation BIOL 2516 and 2526. **(1st)**

OSH 4606 Systems Safety

3 Cr.. (Hrs.:.:3 Lec.)

Covers techniques of systems safety analysis, with emphasis on product and industrial applications. Techniques include identifying and controlling hazards, investigating loss incidents, providing expert testimony, and writing forensic reports. **Prerequisites:** Junior Standing **(2nd)**

OSH 4896W Occupational Safety & Health Senior Project

3 Cr.. (Hrs.:.:3 Lec.)

Allows in-depth pursuit of a safety or health topic. A comprehensive investigation of the subject includes information from extensive literature review as well as consultation with available industrial and governmental professionals. A formal paper and oral presentation are made on the research. **Prerequisite:** Senior standing or Consent of Instructor. **(1st, 2nd)**

OSH 4916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the Occupational Safety and Health degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

OSH 4956 Special Topics

(2 - 4 crs.)

Presents topics not covered in any curriculum for which there is a particular need, or given on a trial basis to determine demand. Directed studies, special clinics, coaching schools, and workshops as scheduled. Study proposals must have prior departmental approval. May be repeated for maximum of 6 credits. **Prerequisite:** Consent of Instructor. **(On Dem.)**

OSH 4986 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

PETROLEUM ENGINEERING

PET 2010 Elements of Petroleum Engineering

2 Cr.. (Hrs.:: 2 Lec.)

An introduction to the profession of petroleum engineering is covered, including the elementary and technical aspects of petroleum recovery from the initial geophysical survey through acquisition of leases, drilling, production, secondary recovery, and treatment. Rock properties, reservoir trap configuration, petroleum distribution and accumulation, and properties of petroleum reservoir fluids will also be covered. **Prerequisite:** M 095. **Corequisites:** M 121 **(1st, 2nd)**

PET 2020 Petroleum Field Practices

1 Cr..

The course is a one-week, intensive orientation for early stage Petroleum Engineering students, to observe and experience a full range of oil and gas field operations in an actual field setting. A Petroleum Department instructor will lead the travel week, which will normally be scheduled one week before the start of Fall semester classes. **Prerequisites:** PET 2010 **(1st)**

PET 2050 Petroleum Engineering Lab I

1 Cr.. (Hrs.:: 1 Lec. 2 Lab)

Experiments are conducted using fundamental core analysis techniques, which determine porosity, gas and liquid absolute and relative permeabilities, fluid saturation's, hydrocarbon gravities & viscosities of fluids. Description of cores is covered. Lab reports required. **Prerequisites:** M 095. **Corequisites:** PET 2010, M 121 **(1st, 2nd)**

PET 2060 Petroleum Engineering Lab II

1 Cr.. (Hrs.:: 1 Lec. 2 Lab)

Elements of various land coordinate systems and the basics of petroleum engineering mapping are taught. Methods for determining volumetric estimates of oil and gas in place are an integral part of the course. Mapping software is also taught. **Prerequisites:** PET 2010; MIN 1010. **(1st, 2nd)**

PET 2910 Internship

1 to 2 Cr.. (Variable)

Credit is given for academic work done in conjunction with an approved off campus work experience related to the Petroleum Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. **Prerequisites:** Completion of one year of course work and Consent of Instructor. **(1st)**

PET 3010 Drilling Engineering

3 Cr.. (Hrs.:: 3 Lec.)

Introduction to drilling through the study of equipment functions and performance, drilling fluids, wellbore hydraulics and pressure losses in circulation systems, buoyancy, well control, rotary drilling bits, and directional drilling methods. **Prerequisites:** PET 2010, 2020. **(1st)**

PET 3020 Petroleum Production Engineering

3 Cr.. (Hrs.:: 3 Lec.)

Survey and design of oil and gas well production systems, including: well

casing and cementing design, well completion methods, subsurface and surface production equipment, artificial lift systems, well test analysis, and well stimulation methods. **Prerequisites:** PET 3010; 3040; 3720. **(1st)**

PET 3030 Drilling Fluid Lab

1 Cr.. (Hrs.:: 3 Lab.)

Mud characteristics determination and measurement, effects of clays, solids, and various additives on mud properties, design of the properties of drilling fluids. **Corequisites or Prerequisite:** PET 3010. **(1st, 2nd)**

PET 3040 Introduction to Rock Properties

3 Cr.. (Hrs.:: 3 Lec.)

The geological and petrophysical properties of oil and gas reservoir rocks will be studied. Topics will include porosity, permeability, wettability, capillarity, compressibility, and strength relationships. The use of cores, logs and lab test procedures to determine rock properties will be reviewed. Basic concepts of Darcy flow for oil and gas fluids in porous rocks will also be studied. **Prerequisites:** GEO 257; PET 2010; 2020; 2050. **(1st, 2nd)**

PET 3070 Petroleum Production Lab

1 Cr.. (Hrs.:: 1 Lec. 2 Lab)

Special problems relating to oil and gas production will be simulated and studied. Typical problems will include: multiphase fluid flow in piping, rheology and properties of fracturing fluids, separator designs sizing, problems from subsurface well pumping conditions, production software. Laboratory reports are required. **Corequisites or Prerequisite:** PET 3020. **(1st, 2nd)**

PET 3480 Petroleum Well Logging

3 Cr.. (Hrs.:: 3 Lec.)

Interpretation of open hole logging tools, including electrical, nuclear, and sonic devices will be studied. Also, a review of basic cased hole logging tools will be conducted. Included in the study will be the operating theories, log presentations, computation methods for basic reservoir properties, and the use of practical log examples and methods. **Prerequisites:** GEO 257; PET 3010; 3040. **(2nd)**

PET 3720 Petroleum Fluids & Thermodynamics

3 Cr.. (Hrs.:: 3 Lec.)

The course covers fluid properties of multi-component hydrocarbon systems, vapor-liquid equilibria, fugacity, and other thermodynamics topics. Advanced computer methods in phase behavior calculations are included. **Prerequisites:** PET 2010, 2050; PHYS 2076 **(1st, 2nd)**

PET 4010 Advanced Drilling

3 Cr.. (Hrs.:: 3 Lec.)

The study of special drilling topics and new technology applications in drilling engineering. Guest lectures from industry will be invited to present the latest in technology and case history information. Students are assigned to write reports demonstrating an understanding of the various topics studied. **Prerequisite:** PET 3010. **(2nd)**

PET 4020 Artificial Lift Design

3 Cr.. (Hrs.:: 3 Lec.)

The design and operation of well fluid artificial lift systems, including: sucker rod pumping, progressing cavity pumps, submersible electric pumps, down hole hydraulic pumps, gas lift, and plunger lift. **Prerequisites**: PET 3020. **(1st)**

PET 4040 Reservoir Engineering

3 Cr.. (Hrs.:: 3 Lec.)

Reservoir Engineers assess and optimize the recovery of oil and natural gas. This course builds on the fundamental rock and fluid property concepts to derive and apply material balance equations, fluid flow in porous media equations, and pressure transient theory. **Prerequisites:** PET 3040, 3720, GEOE 457. **Corequisites:** M 274 **(1st, 2nd)**

PET 4100 Reservoir Simulation

3 Cr.. (Hrs.:: 3 Lec.)

Reservoir simulation is used to investigate petroleum reservoir characteristics and behavior, including: pore volume, fluid distribution and movement, and recovery. The result of simulation studies include optimized field development and management plans which maximize the value and/or reserves of producing properties. The course covers finite difference approximations to the diffusixity equation and the application of those approximations for reservoir simulations. Practical use of reservoir simulation is also covered through application to common reservoir engineering problems. **Prerequisites:** PET 4040, 4260, M 274. **(1st, 2nd)**

PET 4260 Reservoir Characterization

3 Cr.. (Hrs.:: 2 Lec., 1 Lab)

Reservoir analysis using concepts and data from traditional reservoir engineering, geology, hydrology, petrophysics, geophysics and geostatistics. The tools necessary to obtain a quantitative model of the reservoir are developed. **Prerequisites:** PET 2060, 3480, 4040, GEOE 457. **(1st, 2nd)**

PET 4420 Thermal Recovery Operations

3 Cr.. (Hrs.:: 3 Lec.)

Thermal properties of rocks and fluids along with the surface equipment design for steam injection; oil well design and steam injection are included in this course. The course extends its investigation to include in situ combustion processes, hot water injection and alkaline steam combination flood. **Prerequisite:** Consent of Instructor.

PET 4440 Water flooding and Enhanced Oil Recovery

3 Cr.. (Hrs.:: 3 Lec.)

Study of the immiscible displacement of oil by water in reservoir systems. Included in the study are a review of viscous and gravity forces, relative permeability effects, fluid mobility effects and sweep efficiencies. Basic displacement and prediction methods are addressed, and water flood design methods. Also, a review of enhanced oil recovery methods and applications is conducted, including chemical, miscible, and thermal methods. **Prerequisites:** PET 4040. **(2nd)**

PET 4460 Petroleum Project Evaluation

3 Cr.. (Hrs.:: 3 Lec.)

The study of petroleum project evaluation from the standpoint of the underlying land ownership and contract obligations. Class study includes: conformance to regulations, designation of reserve types and estimation of the future production performance, cost estimating and price forecasting, cash flow analysis with consideration to the time value of money, and economic sensitivity and risk factors. **Prerequisites:** M.EC 3630; PET 4040. **(2nd)**

PET 4520 Natural Gas Engineering

3 Cr.. (Hrs.:: 3 Lec.)

Analysis of four-point gas deliverability tests and gas well pressure transient tests are presented. Methods for determining wet gas and condensate reserves in volumetric and water drive reservoirs are studied. Gas inflow performance equations and methods of forecasting future production rates are discussed. Essential surface facilities and methods for handling sour gas and hydrates are studied. **Prerequisites:** PET 4040. **(1st)**

PET 4530 Natural Gas Lab

1 Cr.. (Hrs.:: 1 Lab/Lec.)

The physical properties of natural gas are measured using fundamental gas analysis techniques. Laboratory exercises include measurements of gas specific gravity, BTU content, molecular composition, and flow rates. Laboratory reports are required. **Corequisites:** PET 4520. **(1st)**

PET 4910 Internship

1 to 3 Cr.. (Variable)

Credit is given for academic work done in conjunction with an approved off campus work experience related to the Petroleum Engineering degree program. Students should consult with their faculty advisor and/or department Internship Coordinator to determine the availability of appropriate requirements for receiving credit. **Prerequisites:** Junior or Senior standing and Consent of Instructor. **(1st)**

PET 4920 Petroleum Engineering Project Design

3 Cr.. (Hrs.:: 3 Lec.)

A capstone senior-level design course requiring teams to merge diverse information to solve an advanced field development design problem in all areas of petroleum engineering. The problem integrates reservoir, drilling, completion, and production aspects of petroleum engineering. Students must take the Fundamentals of Engineering exam to complete the course requirements. ***The course must be taken during the student's last semester prior to graduation.*** **(1st, 2nd)**

PET 4950 Special Topics

Variable Credit

Selected topics of specific interest in the field of petroleum engineering will be covered. The name of the special topic will be designated at the time the class is scheduled. **(On Dem. and Consent of Instructor)**

PET 4980 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

PET 5010 Advanced Drilling Design

3 Cr.. (Hrs.:: 3 Lec.)

Independent design of a drilling well plan from actual field geologic data, to include: mud program, casing and cementing design, BHA and bit program, directional program, formation evaluation, drilling regulatory permits and cost analysis. Design project is completed with a verbal presentation of the well plan to an instructor/student audience. **Prerequisite:** Senior Standing & Consent of the instructor. **(1st, 2nd)**

PET 5020 Petroleum Operations Design – Stimulation

3 Cr.. (Hrs.:: 3 Lec.)

This course is an intermediate level study of oil and gas well stimulation. Included in the course are hydraulic fracturing theory, matrix acidizing and matrix chemical treatments. An outcome of this course will be a series of spreadsheet programs for the design of hydraulic fracturing treatments. **Prerequisite:** Consent of Instructor. **(2nd)**

PET 5030 Surface Production Facilities

3 Cr.. (Hrs.:: 3 Lec.)

Equipment used to process and transport produced oil, gas, and water is studied in this course. Process equipment includes separators, heat exchangers and line heaters, heater-treaters, tanks and gun barrels, gas dehydrators and sour gas sweeteners, and condensate stabilizers. Equipment, such as aerators and settling tanks used to clarify produced water, is also covered. Liquid and gas piping and pipelines are studied in conjunction with pumps and gas compressors, and prime movers. **Prerequisite:** Consent of Instructor. **(2nd)**

PET 5040 Advanced Reservoir Engineering

Variable Credit

Special topics in reservoir engineering. **Prerequisite:** Consent of Instructor.

PET 5050 Pressure Transient Analysis

3 Cr.. (Hrs.:: 3 Lec.)

Application of pressure transient theory to the design and interpretation of well tests. Topics include derivation and application of oil and gas transient flow equations. Analysis of pressure build up and pressure derivation test data using analytical and type curve methods. **Prerequisite:** Consent of Instructor. **(1st)**

PET 5080 Thermal Recovery Methods

3 Cr.. (Hrs.:: 3 Lec.)

Special topics of specific interest in the subject of thermal recovery methods will be studied.. **Prerequisite:** Consent of Instructor.

PET 5110 Advanced Reservoir Simulation

3 Cr.. (Hrs.:: 3 Lec.)

Development of the equations for multi-phase multidimensional flow in porous media and the numerical solution techniques employed in their solution. Applications to reservoir simulation. **Prerequisite:** Proficiency in a programming language and Consent of Instructor.

PET 5440 Advanced Enhanced Oil Recovery

Variable Credit

An advanced treatment of the principle enhanced oil recovery mechanisms including water flooding and chemical, miscible and thermal methods. **Prerequisite:** Consent of Instructor.

PET 5920 Eng Research, Development or Design

Variable Credit

An investigation of a field or laboratory petroleum engineering problem not directly related to thesis work. The field problem is to be performed in liaison with the petroleum industry. All the laboratory work must be originally planned and performed by the student. **Prerequisite:** Graduate standing. **(1st, 2nd)**

PET 5940 Graduate Seminar

1 Cr.. (Hrs.:.: 1 Lec.)

Current petroleum related literature and research. Oral presentation is required. **Prerequisite:** Graduate standing. **(1st, 2nd)**

PET 5970 Special Problems

Variable Credit

The student will select a topic in drilling, reservoir engineering, economics of oil production, or petroleum operations of current interest. **Prerequisite:** Graduate standing and Consent of Instructor. **(1st, 2nd)**

PET 5990 Thesis Research

Variable Credit

A specific field or laboratory research problem in petroleum engineering is selected by the student and the department staff. **Prerequisite:** Graduate standing. **(1st, 2nd)**

PHYSICS

PHYS 1016 Beginning College Physics

3 Cr.. (Hrs.:.:3 Lec.)

Beginning college physics course that includes topics in mechanics, thermodynamics, optics, and electromagnetism. **Prerequisite:** M 121. **(1st)**

PHYS 1026 College Physics

4 Cr.. (Hrs.:.:4 Lec.)

First course of a two-semester sequence dealing with the basic principles of physics. Covers mechanics, thermodynamics, fluid mechanics, and wave motion. Credit in this course does not count toward an engineering degree at Montana Tech. **Prerequisite:** M 121. **(1st)**

PHYS 1036 College Physics

4 Cr.. (Hrs.:.:4 Lec.)

A continuation of PHYS 1026 dealing primarily with electricity, electric circuits, optics and nuclear physics. Credit in this course does not count toward an engineering degree at Montana Tech. **Prerequisite:** PHYS 1026. **(2nd)**

PHYS 1046 General Physics-Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

First course in the calculus-based introductory physics sequence. Includes the study of kinematics, dynamics, and the conservation laws. Emphasizes the development of problem-solving skills fundamental to all branches of engineering. **Prerequisite:** M 171. **Corequisites:** M 172. **(1st, 2nd)**

PHYS 2076 General Physics–Heat, Sound, & Optics

3 Cr.. (Hrs.:.:3 Lec.)

Second course in the calculus-based physics sequence. Includes the study of heat, sound, and optics. Emphasizes problem-solving. **Prerequisite:** M 172; PHYS 1046. **Corequisites:** M 273. **(1st, 2nd)**

PHYS 2086 General Physics-Electricity, Magnetism, & Wave Motion

3 Cr.. (Hrs.:.:3 Lec.)

Third course in the calculus-based physics sequence. Covers electricity, magnetism, and electromagnetic waves. **Prerequisites:** M 273; PHYS 1046, PHYS 2076. **Corequisites:** M 274. **(1st, 2nd)**

PHYS 2096 Physics Lab –Heat, Sound, & Optics

1 Cr.. (Hrs.:.:3 Lab)

Typical topics for this course include: Force, Torque, Motion in 2 dimensions, Friction, and Buoyancy. Laboratory exercises include measurements of forces,

torques, energy, work, optics, thermal properties and resonance. Stresses good laboratory techniques and analysis of experimental errors. Laboratory reports are required. **Engineering Students Prerequisite:** PHYS 1046. **Corequisites:** PHYS 2076. **Non-Engineering Students: Prerequisite:** PHYS 1026 **(1st)**

PHYS 2106 Physics Lab -Electricity, Magnetism, & Wave Motion

1 Cr.. (Hrs.:.:3 Lab)

Typical topics for this course include: Heat, Sound, Optics, Electricity, and Magnetism. A continuation of PHYS 2096 with experiments involving electrical measurements, optics and thermal expansion. **Engineering Students: Prerequisite:** PHYS 2076. **Corequisites:** PHYS 2086; **Non-Engineering Students: Prerequisite:** PHYS 1036. **(2nd)**

PHYS 3016 Atomic Physics

3 Cr.. (Hrs.:.:3 Lec.)

A mathematical treatment of traditional modern physics topics including special relativity, interaction of radiation and matter, Schroedinger equation, spectra of simple atoms, and quantum phenomena in solids. **Prerequisites:** PHYS 2076 and 2086; M 274. **(On Dem.)**

PHYS 3036 Elementary Electronics

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Introduces integrated circuits and transistors. The first half of the semester deals with analog devices, the second half with digital techniques. Allows students to design functional circuits from integrated circuit building blocks. **Prerequisites:** PHYS 2086 and PHYS 2106. **(1st)**

PHYS 3046 Holography

1 Cr.. (Hrs.:.:3 Lab)

A laboratory course in optical holography. Three-dimensional pictures are made using a Helium-Neon laser. A non-mathematical course for both engineering and non-engineering students. Students must assume film costs. **Prerequisite:** Junior standing or Consent of Instructor. **(On Dem.)**

PHYS 4056 Electricity & Magnetism

3 Cr.. (Hrs.:.:3 Lec.)

Considers the calculus of vectors and fields; basic laws of electrostatics and magnetostatics; boundary value problems; derivation of capacitance and inductance; non-time varying Maxwell's equations; relationship between force, charge and motion in electric and magnetic fields. Extension to time varying electric and magnetic field, time varying Maxwell's equations, derivations of the wave equation for time harmonic fields, the plane wave solution of the wave equation, interaction of plane electromagnetic waves to dielectric boundaries, perfect conducting boundaries, and lossy media boundaries. **Prerequisites:** M 274; PHYS 2086 & 2106. **Corequisites:** ENGR 3550 or M 405 or PHYS 4536 or Consent of Instructor. **(2nd)**

PHYS 4066 Electrodynamics

3 Cr.. (Hrs.:.:3 Lec.)

Considers time-dependent phenomena of electromagnetic theory and includes studies of the wave equation, fields of uniformly charged particles, radiation from an accelerated charge, and the motion of charged particles in electromagnetic fields. **Prerequisite:** PHYS 4056. **(On Dem.)**

PHYS 4196 Intermediate Dynamics

3 Cr.. (Hrs.:.:3 Lec.)

A study of particle dynamics, rigid body motion, small oscillations, and an introduction to the Lagrangian and Hamiltonian formulation of mechanics. **Prerequisites:** PHYS 2076 and 2086; M 274. **(On Dem.)**

PHYS 4296 Quantum Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

A study of the Schroedinger wave equation and perturbation theory, operational methods, matrix mechanics treatment of the hydrogen atom, and potential barrier problems. **Prerequisites:** PHYS 3016 and adequate preparation in Mathematics. **(On Dem.)**

PHYS 4536 Methods of Theoretical Physics

3 Cr.. (Hrs.:.:3 Lec.)

Concepts of complex variables, integral transforms, partial differential equations, Green's Functions, and their applications to physical problems. **Prerequisites:** PHYS 2086; M 274, or Consent of Instructor. **(1st)**

PHYS 5516 Theoretical Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

Covers topics from classical mechanics including Lagrange's and Hamilton's equations. **Prerequisite:** PHYS 4196 or Consent of Instructor. **(On Dem.)**

PHYS 5526 Quantum Mechanics

3 Cr.. (Hrs.:.:3 Lec.)

Covers solutions of the Schroedinger equation, approximation methods, linear vector spaces, matrix mechanics and symmetry, and other topics. **Prerequisite:** PHYS 4296 or Consent of Instructor. **(On Dem.)**

PHYS 5536 Mathematical Methods in Physics

3 Cr.. (Hrs.:.:3 Lec,)

Topics covered include linear vector spaces, calculus of variations, Sturm-Liouville problem, Green's functions, integral equations and transform methods. **Prerequisite:** Consent of Instructor. **(On Dem.)**

PHYS 5546 Electromagnetic Theory

3 Cr.. (Hrs.:.:3 Lec.)

Covers the Mathematical treatment of electromagnetic fields. **Prerequisite:** PHYS 4056 or Consent of Instructor. **(On Dem.)**

PRE-PROFESSIONAL HEALTH

PPH 1006 Freshman Preprofessional Health Seminar

1 Cr.. (Hrs.:.: 1 Lec.)

Designed to prepare students interested in careers in the health sciences for entrance into health school. Course will consist of a series of lectures, presentations by health professionals, reading and discussion of topical health issues, and summary writings.

PPH 1946 Current Topics in Health Care

1 Cr.. (Hrs.:.: 1 Lec.)

This course is designed to provide students interested in careers in professional health care, a background in current health care topics, enhance their verbal and written communication skills, and increase their verbal reasoning skills. These goals will be accomplished through reading of typical health issues followed by in-class discussions and summary writings, an in-depth written report and oral presentation on an instructor approved health topic, and critical evaluations of published and in-class papers. Grading is Pass/Fail. **(2nd)**

PPH 2916 Internship

1 - 6 Cr.. (Variable.)

For academic work done in conjunction with an approved work experience related to a professional health career. Students should consult with their faculty advisor, pre-professional health advisor, and the pre-professional health internship coordinator to determine the availability of appropriate work experience and the specific academic requirements for receiving credit. The work experience and the academic requirements will be developed in conjunction with the health care providers that are supervising the student. May be repeated for credit. **Prerequisites:** One semester of course work and consent of instructor.

PPH 2946 Current Topics in Health Care

1 Cr.. (Hrs.:.: 1 Lec.)

This course is designed to provide students interested in careers in professional health care, a background in current health care topics, enhance their verbal and written communication skills, and increase their verbal reasoning skills. These goals will be accomplished through reading of typical health issues followed by in-class discussions and summary writings, an in-depth written report and oral presentation on an instructor approved health topic, and critical evaluations of published and in-class papers. Grading is Pass/Fail. **(2nd)**

PPH 3006 Professional Health Entrance Exam Preparation

2 Cr.. (Hrs.:.: 2 Lec.)

This course is designed to improve the problem solving and comprehension capabilities of the student. The first half of the semester will focus on material that is common to professional health school and graduate school entrance exams, such as the GRE, MCAT, DAT, VCAT, etc. Topics to be addressed include: the brain, right brain vs. left brain thinking, problem-solving methods, error in reasoning, myths about reading, verbal reasoning problems, using and forming analogies in problem solving, using relationship sentences, analysis of trends and patterns, and deductive and hypothetical thinking. These materials are geared towards the Verbal Reasoning Section of the exams. The second-half of the semester will be designed as an independent study, where the student focuses on the exam

sections pertinent to their chosen professional school, such as, chemistry, biology, physics, etc. Practice exams will be given throughout the semester. The final will be given under real exam conditions. **Prerequisites:** Junior standing or consent of the instructor.

PPH 3946 Current Topics in Health Care

1 Cr.. (Hrs.:.: 1 Lec.)

This course is designed to provide students interested in careers in professional health care, a background in current health care topics, enhance their verbal and written communication skills, and increase their verbal reasoning skills. These goals will be accomplished through reading of typical health issues followed by in-class discussions and summary writings, an in-depth written report and oral presentation on an instructor approved health topic, and critical evaluations of published and in-class papers. Grading is Pass/Fail. **(2nd)**

PPH 4916 Internship

1 - 6 Cr.. (Variable.)

For academic work done in conjunction with an approved work experience related to a professional health career. Students should consult with their faculty advisor, pre-professional health advisor, and the pre-professional health internship coordinator to determine the availability of appropriate work experience and the specific academic requirements for receiving credit. The work experience and the academic requirements will be developed in conjunction with the health care providers that are supervising the student. May be repeated for credit. **Prerequisites:** Junior standing and consent of instructor.

PPH 4946 Current Topics in Health Care

1 Cr.. (Hrs.:.: 1 Lec.)

This course is designed to provide students interested in careers in professional health care, a background in current health care topics, enhance their verbal and written communication skills, and increase their verbal reasoning skills. These goals will be accomplished through reading of typical health issues followed by in-class discussions and summary writings, an in-depth written report and oral presentation on an instructor approved health topic, and critical evaluations of published and in-class papers. Grading is Pass/Fail. **(2nd)**

PROFESSIONAL & TECHNICAL COMMUNICATION

PTC 1146 Visual Communication

2 Cr.. (Hrs.:.:1 Lec., 3 Lab)

This course is about the practice of using visual signs and symbols in the dissemination of information and ideas. Knowledge and skills are gained through experiential learning. (*Credit limitation:* May be repeated for credit as often as desired. Only those grade points and credits earned the first two times the course is taken will be counted toward graduation requirements in any degree program.) **(2nd)**

PTC 1946 PTC Freshman Seminar

1 credit

Required introduction to the Professional and Technical Communication program. **(1st)** This course introduces students to PTC faculty and their diverse expertise, educational options and opportunities available at Tech, pre-professional club activities, effective learning skills, and the PTC curriculum. By semester's end, students will know their advisor, formulate a curriculum plan, and be aware of the many opportunities available to them at Tech. **(2nd)** Introduces students to technical communication professionals, career planning, effective employment skills, and career opportunities. By semester's end, students will know professionals in their field, understand how to obtain an internship, formulate a career plan, and be aware of how a Tech education prepares them for rewarding employment. **(1st & 2nd) (Both semesters are required of all PTC majors)**

PTC 2446 Professional Communications Consulting

1 Cr.. (Hrs.:.:1 Lec.)

This 1-credit course presents the issues associated with establishing and running a successful communication consulting business. Topics covered include establishing a small business, legal issues, attracting business, bidding and contracting, keeping the books, and special topics related to professional communications consulting.

PTC 2506 Webpage Design

3 Cr.. (Hrs.:.:3 Lec.)

Provides students with the fundamentals of contemporary WebPage Design. Covers the principles of graphic design, layout, and electronic document production. Reviews current web development technologies. Required lab provides hands-on production skills using current-generation hardware and software.

PTC 2766 Intro. to Education

3 Cr.. (Hrs.:.:3 Lec.)

Studies theories of learning, models of instruction, and principles of teaching effectiveness. Designed for future educators, course content is also appropriate for parents, tutors, and youth-group volunteers. Includes K - 12 classroom observation. **(On Demand) (formerly HSS 2766)**

PTC 2886 Digital Imaging

3 cr. (2 Lec; 3 Lab)

This course focuses on communicating effectively with digital images. Students from all disciplines will learn to create and manipulate digital images for use in a variety of media using technologies standard within the communications industry. **Prerequisite:** Current computer skills.

PTC 2916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the PTC degree program. Students should consult with their faculty advisor to determine the availability of appropriate work experience and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Completion of one semester of course work and Consent of Instructor. **(On Dem.)**

PTC 2956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of communication not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Current computer skills. **(1st, 2nd)**

PTC 3106 Gender & the Rhetoric of Science & Technology

3 Cr.. (Hrs.:.:3 Lec.)

In this course, gender will be viewed as a social construct. Students will examine how cultural gender roles are affected by science and technology. The course focuses on the influence of gender roles on scientific and technological thinking (e.g., communication strategies, language, image). Students will explore the values and goals of past and present scientific and technological communities in terms of the issues related to gender roles in these communities as they are reflected in the profession of technical communication. **(On Dem.)**

PTC 3156 Digital Video Production

3 Cr.. (Hrs.:.:2 Lec., 3 Lab)

Introduces the fundamental principles and practices of digital video production. Skills are acquired through the study and application of theory and project-based experience. Course emphasizes scriptwriting, videography, editing, and delivery. **Prerequisite:** Sophomore standing or Consent of Instructor. (C) **(1st)**

WRIT 321 Advanced Technical Writing

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes effective, clear and accurate scientific and technical communication. Focuses on writing theory and on the process approach to writing. Rewriting is stressed. Written work integrated with major fields. (C) **Prerequisite:** Advanced standing or Consent of Instructor. **(1st, 2nd)** (Formally PTC 3216W.

WRIT 325 Writing in the Sciences

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes research strategies, including electronic searching and retrieval, to write, format, and polish action-oriented, ethical documents focusing on the profession that student is preparing to enter. Collaborative writing and incorporation of computerized capabilities for documents are course expectations. (C) **Prerequisite:** Senior level or Consent of Instructor, and current computer-usage skills **(1st)**

PTC 3406W New Media Design I

3 Cr.. (Hrs.:.:3 Lec.)

Provides a survey of new media theory, applications, practices, and design principles. Students explore current communication technologies and trends. **Prerequisite:** PTC 2506, PTC 2886 and Junior standing or consent of instructor, or sophomore standing in Computer Science or Software Engineering.**(1st)**

PTC 3416W Usability Testing

3 Cr.. (Hrs.:.:3 Lec.)

Principles/concepts of usability testing, including human factors and software psychology. Text-based, expert-based, reader-based, and prototype-based user

testing. An introduction to user-centered product-development, and hands-on step-by-step discussion of test design augmented by discussion and strategy. Developing objectives, criteria, and measures. Conducting usability test in lab, field, and virtual environments. Using usability testing software programs to analyze qualitative/quantitative data. **Prerequisite:** PTC 3406 or consent of instructor.

PTC 3476W Intro. to Desktop Publishing

3 Cr.. (Hrs.:.:3 Lec.)

Immerses students in both concepts and skills of contemporary PC-based electronic publishing. Covers principles of document design, graphic design, layout, and typography. Reviews publishing technologies, systems, and business/legal issues. Required lab session ensures development of hands-on skills using current-generation publishing hardware and software. **Prerequisite:** PTC 1146, Consent of Instructor, and current computer-usage skills.

PTC 3506 Intercultural Communication

3 Cr.. (Hrs.:.:3 Lec.)

This course prepares students for global communication, as it focuses on communication principles and processes in cross-cultural environments. Norms are explicated through contrasts between Western and non-Western modes of communication. **(1st)**

PTC 3616W Intro. to African Studies

3 Cr.. (Hrs.:.:3 Lec.)

This course will provide students with basic scholarly tools and information concerning Africa in order that they can better understand and analyze past and current African affairs. The course is designed to bolster the student's main area of expertise by allowing supervised exploration of areas of individual interest and concern. The course will stimulate student interest in Africa and act as a catalyst for further African study. **Prerequisite:** Consent of Instructor. **(On Demand)**

WRIT 322 Advanced Business Writing

3 Cr.. (Hrs.:.:3 Lec.)

Provides strategies for effective communication used in business, engineering and other professions, such as correspondence, interagency communication, reports and proposals. Emphasizes audience-oriented, clear, concise writing; techniques of research; formats; and electronic communication (sometimes offered electronically) (C) **Prerequisite:** Junior standing or Consent of Instructor, and current computer-usage skills. **(1st, 2nd)**

PTC 3966 Independent Study

Variable Credit

Conference, research and independent reading in a field of special interest arranged with an instructor in the PTC Department. Reading and research may be oriented to concurrent work, but must not replace subject matter of regularly scheduled courses. May be repeated a maximum of four times for credit. **Prerequisites:** Junior standing, Consent of Instructor, and prior departmental approval. **(1st, 2nd)**

WRIT 350 Technical Editing

3 Cr.. (Hrs.:.:3 Lec.)

Participating actively, students learn strategies and practice skills in editing their own writing and the writing of peers and professionals. Learning, using, and developing style guidelines, as well as practicing organizational strategies, provide students the tools to add value to their written products. **Prerequisite:** Senior standing or instructor consent, and current computer-usage skills. **(2nd)**

PTC 4126W Advanced Writing

3 Cr.. (Hrs.:.:3 Lec.)

An advanced writing workshop in which students identify audience, perform appropriate research, and develop successful communication strategies. As a holistic course, emphasis includes the effective use of photographs, graphics, and other illustrations that facilitate the writer's task. Topics vary and may focus on such tasks as software documentation, environmental writing, technical manual preparation, or science writing. **Prerequisite:** WRIT 321 or 322 or 325 or ENGR 3210 **(2nd)**

WRIT 415 Writing Winning Proposals

3 Cr.. (Hrs.:.:3 Lec.)

Preparation of written proposals requires specialized knowledge and skill that goes well beyond the generalized prerequisite skill of being able to communicate effectively in a professional environment. Students will learn how to identify and characterize the specific problem or opportunity that triggers a proposal-preparation process; they will learn how to seek, select, and effectively interact with audiences of proposals; they will learn how to optimize their chances of creating a successful proposal by assessing the audience's needs and concerns, the competition's strengths and weaknesses, and the uniqueness of their own offering; they will learn how to develop a logical and convincing plan for dealing with the problem or opportunity at hand—this encompasses the project-management as well as the technical and cost-proposal planning skills; they will learn how to develop budgets as part of the overall persuasive proposal strategy; and they will learn how to adapt to specific source-selection processes in competitive bidding cycles. **Prerequisites:** a junior-level business, technical, or scientific writing course, or permission of instructor. **(2nd)**

PTC 4406 New Media Design II

3 Cr.. (Hrs.:.:3 Lec.)

Emphasizes the effective use of new media forms. Students will apply knowledge gained in PTC 3406 while exploring the use of a variety of new media production tools. Students learn professional-level design skills using at least one major production technology. **Prerequisite:** PTC 3156 & 3406 and Senior standing or Consent of Instructor. **(2nd)**

PTC 4416W Rhetorical Theories & Professional Communication

3 Cr.. (Hrs.:.:3 Lec.)

Students examine the rhetorical theories of communication that have existed since classical times and those that have been developed in modern times, as these theories continue to inform effective decision-making strategies in professional communication. This course prepares students to view professional communication broadly as a culturally situated form of social action and production. Students integrate the discipline of rhetoric with the contemporary practice and academic field of professional communication, as they analyze contemporary issues, debates, and achievements in rhetorical theories relating to current professional communication practices. **Prerequisite** *Junior standing for undergraduates; graduate standing or permission of instructor for MSTC students.* **(2nd)**

PTC 4426W History, Technology, & Communication

3 Cr.. (Hrs.:.:3 Lec.)

Technical communication involves both the communication of technical information and the use of technologies to communicate. As civilizations change over time, increasing demands are placed on the ability to manipulate information. In this course, we shall examine both the cognitive maps cultures construct to communicate and the manner in which these maps profoundly alter human nature. (STET) **Prerequisite:** Senior standing; STS 1396 or STS 2016, or Consent of Instructor. **(2nd)**

PTC 4916 Internship

1 to 6 Cr.. (Variable)

For academic work done in conjunction with an approved work experience related to the PTC degree program. Students should consult with their faculty advisor to determine the availability of appropriate work experiences and the specific academic requirements for receiving credit. May be repeated once for credit. **Prerequisites:** Junior standing and Consent of Instructor. **(On Dem.)**

PTC 4956 Special Topics

Variable Credit

Specific topic is to be determined by faculty member offering the course. Deals with some aspect of English/Communication not covered by an existing course. Designed to complement present departmental offerings. **Prerequisite:** Advanced standing. **(1st, 2nd)**

PTC 4986 Undergraduate Research

Variable Credit

This course is designed for students involved in directed research projects and is required for participants in the Undergraduate Research Program (URP). This course can be repeated. Students will be required to prepare a formal paper and present their results. A faculty member must advise the project. Pending the number of credits taken, graduation requirements, and as demanded of the research advisor, other requirements may be needed. To participate in URP, students must submit a proposal for a research project to the Undergraduate Research Committee and meet other requirements as listed in URP guidelines. Proposals are evaluated competitively and winners will receive a stipend. URP participants must register for this class in the Spring for at least one credit in order to present their findings in the annual Undergraduate Research Conference. A call for proposals is made at the beginning of the Spring Semester. Another call may be offered in the Fall Semester. **(1st, 2nd, Summer)**

PTC 4996W Senior Thesis/Project

2 + 2 cr.. (Hrs.:.:2 Lec.)

Senior thesis is a capstone PTC course that demonstrates a culmination of student communication skills. The completed project represents (minimally) a 200-hour project, approved by Department faculty and completed independently while relying on college resources. Normal assignment of credit is two credits for fall semester when project proposals are prepared and approved and two credits for spring semester, when projects are completed and presented, and when final student portfolios are also presented. **(1st, 2nd)**

PSYCHOLOGY

PSYX 100 Introduction to Psychology

3 Cr.. (Hrs.:.:3 Lec.)

An introductory survey of the scientific study of behavior presenting the theory, applications and research findings of modern academic psychology. Both human and non-human specials are covered. (SS) **(1st, 2nd)**

PSYX 230 Developmental Psychology

3 Cr.. (Hrs.:.:3 Lec.)

An overview of the research findings on development throughout the life-span, with emphasis on application. (SS) **Prerequisite:** PSYX 100 or its equivalent or Consent of Instructor. **(1st)**

PSYX 272 Educational Psychology

3 Cr.. (Hrs.:.:3 Lec.)

The psychological foundation of educational theory and practice dealing with learning and human abilities are covered. (SS) **Prerequisite:** PSYX 100. Freshman require Consent of Instructor. **(On Dem.)**

PSYX 305 Evolutionary Psychology

3 Cr.. (Hrs.:.:3 Lec.)

This course will sample the broad diversity of animal behavior and the behavioral adaptations of animals to the environments in which they live. This will include discussion of both field observations and controlled laboratory experiments. Particular emphasis will be placed on the comparison of behavior within an evolutionary framework.(SS) **Prerequisite:** PSYX 100 or BIOL 1016 or 1026 or consent of the instructor. **(2nd)**

PSYX 340 Abnormal Psychology

3 Cr.. (Hrs.:.:3 Lec.)

Description and classification of abnormal orientations, with emphasis on their psychological dynamics. (SS) **Prerequisite:** PSYX 100. **(2nd)**

PSYX 360 Social Psychology

3 Cr.. (Hrs.:.:3 Lec.)

A study of the relationship of the individual to society, including attitudes, motivations, process of interaction, group processes and conflicts. (SS) **(2nd)**

PSYX 361 Industrial & Organizational Psychology

3 Cr.. (Hrs.:.:3 Lec.)

The application of psychological principles to problems and situations found in modern business and industry. Attention is given to research of employer-employee relations, plant management and productivity. (SS) **Prerequisites:** Junior Standing or Consent of Instructor. **(2nd)**

RADIOLOGIC TECHNOLOGY

RAD 0110 Introduction to Imaging

3 Cr.. (Hrs.:.:2 Lec., 1 Lab.)

Introductory course to Radiologic Technology. Course includes introduction to patient care, transportation, ethical and legal issues and various modalities available to technologists after completing the registry. The class will also include 4-8 hours / week for 4 weeks of lab for orientation to the hospital and clinical settings. Assisting patients and patient transfers, proper handling of cassettes, darkroom procedures and clinical setting office procedures. **(2nd)**

RAD 0111 Radiographic Procedures I

3 Cr.. (Hrs.:.:2 Lec., 1 Lab.)

Detailed instruction of bony anatomy as it relates to radiography. Instruction on patient positioning chest, abdomen, upper extremities, lower extremities, spine, skull, and fluoroscopic procedures. **(2nd)**

RAD 0121 Radiographic Imaging Physics

4 Cr.. (Hrs.:.:3 Lec., 1 Lab.)

Course is a basic physics course that educates the students on Einstein's theory of relativity, Newton's Laws, the electromagnetic spectrum, basic laws of speed, velocity and attenuation. This course is designed to teach students the basic fundamentals of how x-rays are produced and how they interact with matter. Continuation of the study of fundamental physical principles from mechanics to electromagnetism. Application of these principles to the construction and operation of fundamental x-ray equipment. Analysis of basic x-ray circuit, construction and operation of tomographic, mobile and fluoro equipment. **(2nd)**

RAD 0122 Radiographic Imaging II

3 Cr.. (Hrs.:.:2 Lec., 1 Lab.)

Continuation from Radiographic Imaging I; Survey of specialty areas, including Ultrasound, MRI, CT, and Nuclear Medicine. Provide information required to analyze radiographic images for accuracy

RAD 0141 Radiation Protection

2 Cr.. (Hrs.:.:2 Lec.)

Learn and understand the concepts of radiobiology and radiation protection, as it relates to general radiography. Includes cell biology and the effects of radiation on cells, causing genetic damage and how this can be passed onto future generations. Radiation protection as it relates to workers in the radiology field and patients. **Prerequisite:** RAD 0110, 0111. **(1st)**

RAD 0151 Radiographic Clinical Ed I

4 Cr.. (Hrs.:.:4 Lab)

16 hours/week/4 credit hours supervised clinical practice. Rotating shifts and assignments including competency evaluations on routine exams. Active participation in radiology departments, radiographic and fluoroscopic rooms with elementary safety practices. Anatomy and positioning all standard radiographic procedures. **(2nd)**

RAD 0161 Radiographic Clinical ED II

10 Cr.. (Hrs.:.:10 Lab)

Clinicals 40 hours/week/10credits. Rotating shifts and assignments including competency evaluations on routine exams. Active participation in radiology departments, radiographic and fluoroscopic rooms with elementary safety practices. Competency evaluation of all standard radiographic procedures including surgery. **(Summer)**

RAD 0211 Radiographic Procedures II

3 Cr.. (Hrs.:.:2 Lec., 1 Lab.)

Nursing procedures and medical care in an imaging department including, vital signs, venipuncture and contrast interactions. Ethics and law as it relates to the hospital and imaging department. Review of the ARRT code of ethics. **(1st)**

RAD 0219 Radiographic Imaging III

2 Cr.. (Hrs.:.:1 Lec., 1 Lab.)

Continuation from Radiographic Imaging II, analyze radiographic images for accuracy and to know how to adjust mispositioning or technical factors for an optimum radiograph. **Prerequisite:** BIOL 2016 & 2026, RAD 0122, 0151, 0161, 0211,0251. **(2nd)**

RAD 0245 Radiographic Analysis

2 Cr.. (Hrs.:.:1 Lec., 1 Lab.)

This course provides an online and classroom review for the ARRT certification examination. The course will consist of readings, multiple testing, testing strategies, and review utilizing multiple, published radiology review texts. **(2nd)**

RAD 0251 Radiographic Clinical Ed III

8 Cr.. (Hrs.:.:6 Lab.)

32 hours/week. 8 credits. Clinical practice with less assistance to foster increased proficiency and responsible decision-making in a variety of situations. (1st)

RAD 0261 Radiographic Clinical Ed IV

6 Cr.. (Hrs.:.:6 Lab.)

24 hours /week/6 credits. Clinical practice with less assistance to foster increased proficiency and responsible decision-making in a variety

of situations. Clinical experience with advanced modalities, CT, MRI, mammography, vascular procedures and nuclear medicine are optional. **(2nd)**

RAD 0311 Introduction to Sonographic Imaging

3 Cr.. (Hrs.:.:3 Lec.

This course will prepare the student for his or her clinical rotation in the Diagnostic Medical Sonography Program. Students will learn sonographic scan planes, fundamental instrumentation, image acuisiton, and basic cross-sectional anatomy as it relates to geinnign sonographic abdominal scanning. The history and physics of ultrasound, its bioeffects, and the basic principles of Apmode, M-mode, B-mode, real-time, and Doppler imaging will be explored. Professional attitudes, ethics, and scanning ergonomics will be discussed. ***Prerequisites: Acceptance into DMS program; or Consent of Instructor. (1st)***

RAD 0312 Sonographic Physics and Instrumentation I

3 Cr.. (Hrs.:.:3 Lec.)

This is an entry-level course for students entering the DMS program. Students will learn basic acoustic physics including the mechanisms of ultrasound transmission, propagation principles, transducer construction, scan planes, fundamental instrumentation, and image acquisition. The history and physics of ultrasound, its bioeffects, and the basic principles of A-mode, M-mode, B-mode, real-time, and Doppler imaging will be explored. Professional attitudes, ethics, and scanning ergonomics will be discussed. Correct anatomical positioning, appropriate sonographic instrumentation and transducer selection, and correlating exam findings with other diagnostic procedures will be stressed. **Prerequisite:** Acceptance into DMS program, or Consent o*f* Instructor. **(1st)**

RAD 0313 Sonographic Interpretation I

4 Cr.. (Hrs.:.:4 Lec.)

This course will prepare the student for his or her clinical rotation in the Diagnostic Medical Sonography Program. How to properly schedule sonographic exams, prepare patients for scanning, and obtain and record adequate patient histories will be discussed. Detailed cross-sectional anatomy and scan protocols related to sonographic scanning of the abdomen, pelvis, and gravid uterus are presented. Specific attention will be given to normal anatomy and physiology as it appears during scanning. Vascular anatomy and the normal flow patterns encountered during Doppler interrogation of the abdominal, pelvic, and fetal environment will also be discussed. Invasive procedures and intra-operative protocols and techniques will be studied. The student will be expected to present a case study to fellow students of a patient he or she has scanned during the semester, explaining the findings encountered, clinical correlation, and patient outcome. **Prerequisite:** Acceptance into DMS program, or Consent of Instructor. **(1st)**

RAD 0314 Clinical Education I

6 Cr.. (Hrs.:.:6 Lab.)

The student will receive supervised clinical work experience in an approved clinical site. The affiliate clinical education center will instruct the student in proper patient care, patient interview techniques, professional attitudes, ethics, and provide basic scanning opportunities under the personal supervision of a registered diagnostic medical Sonographer (RDMS). The student will be required to demonstrate the basic techniques necessary to initiate and complete diagnostic scans of the abdomen, pelvis, and gravid uterus. A minimum of 360 clinical hours is required to complete this course, and documentation of professional and technical scanning proficiency is mandatory. **Prerequisite:** Acceptance into DMS program**. (1st)**

RAD 0322 Sonographic Physics and Instrumentation II

2 Cr.. (Hrs.:.:2 Lec.)

This course is a continuation of RAD 0312 and involves an intensive study of general diagnostic ultrasound physics. Topics covered will include 2D, 3D, and 4D real-time pulse echo image formation and instrumentation, image storage and display, artifacts, preventative maintenance, quality assurance, and sonographic bioeffects. Students will learn the principles of basic hemodynamics, spectral Doppler physics, color flow imaging, and Doppler instrumentation. **Prerequisite**: RAD 0312, or Consent of Instructor**. (2nd)**

RAD 0323 Sonographic Interpretation II

4 Cr.. (Hrs.:.:4 Lec.)

This course concentrates on advanced cross-sectional anatomy, pathology, and pathophysiology as related to sonographic scanning of the normal and abnormal abdomen, pelvis, gravid uterus, and small parts. Specific attention will be given to identifying laboratory and clinical signs and symptoms of disease, and differentiating normal anatomy from pathology as it appears on the sonogram. The student will learn use appropriate levels of real-time and Doppler exploration to differentiate and clarify normal and disease states. Normal fetal development, fetal anomalies, and abnormal pre-natal and maternal conditions will be discussed. Each student will present a case study to fellow students of a patient he or she has scanned during the semester, explaining the disease process diagnosed, clinical correlation, and patient outcome. **Prerequisite:** RAD 0313, or Consent of Instructor. **(2nd)**

RAD 0324 Clinical Education II

8 Cr.. (Hrs.:.:8 Lab.)

The student will continue to receive supervised clinical experience in an approved clinical site. Advanced scanning techniques to appropriately demonstrate normal anatomy, and differentiate between normal and abnormal findings will be emphasized. Focused attention will be given to abdominal and pelvic organs and their sonographically relevant vasculature as it relates to the scanning and interpretation of sonographic images. The performance of normal obstetrical sonograms will be stressed. Students will develop their critical thinking skills as they evaluate sonographic findings and correlate them with the patient's clinical history. It is expected that the student perform a complete abdominal, routine first trimester, and routine second trimester examination independently as a regular portion of this course. After the student has passed the competency evaluation for a given procedure, he or she may begin scanning under the direct supervision of an RDMS. A minimum of 480 clinical hours is required to complete this course, and documentation of professional and technical scanning proficiency is mandatory. **Prerequisite:** RAD 0314. **(2nd)**

RAD 0333 Sonographic Interpretation III

(*3 Cr.. (Hrs.:.:3 Lec.)*

This course is a continuation of RAD 0323 and continues the discussion of the abnormal pathophysiology as related to sonographic scanning of the abdomen, pelvis, gravid uterus, and small parts. Specific attention will be given to identifying laboratory and clinical signs and symptoms of patients with abnormal obstetrical findings. Abnormal fetal development, fetal anomalies, and abnormal pre-natal and maternal conditions will be discussed. Each student will present an obstetrical case study to fellow students of a patient he or she has scanned during the semester, explaining the disease process diagnosed, clinical correlation, and patient outcome. **Prerequisite:** RAD 0323 or Consent of Instructor. **(SUM)**

RAD 0334 Clinical Education III

9 Cr.. (Hrs.:.:9 Lab.)

Supervised clinical experience in an approved clinical site will develop advanced scanning techniques and methods to appropriately demonstrate anatomy and pathology of disease and traumatic states, improve clinical judgment, and focus upon abnormal abdominal, pelvic, and obstetrical sonograms. Under direct supervision of an RDMS, the student is expected to initiate, independently perform, and complete most required sonographic procedures. A minimum of 360 clinical hours is required to complete this course, and documentation of professional and technical scanning proficiency is mandatory. **Prerequisite:** RAD 0324. **(SUM)**

RAD 0342 Sonographic Physics Review

1 Cr.. (Hrs.:.:1 Lec)

A comprehensive review of all general sonographic physics is presented in preparation for the ARDMS physics board exam. **Prerequisite** RAD 0322 or Consent of Instructor. **(1st)**

RAD 0343 Sonographic Interpretation IV

3 Cr.. (Hrs.:.:3 Lec)

This course includes advanced abdominal, pelvic, and obstetrical scanning practices, and introduces the student to pediatric neursonography, peripheral vascular and carotid duplex examinations. A comprehensive review of all facets of abdominal, gynecological, and obstetrical sonography is included in preparation for the ARDMS board exam. The student will be expected to develop and submit a written case study that includes a comparison of sonographic results with an alternative or correlating diagnostic imaging modality. **Prerequisite:** RAD 0333 or Consent of Instructor. **(1st)**

RAD 0344 Clinical Education IV Special Project

8 Cr.. (Hrs.:.:8 Lab.)

Under direct supervision of an RDMS, the student is expected to initiate,

independently perform, and complete all required sonographic procedures. The student will also be expected to perform basic peripheral venous and carotid duplex exams. Sonographic vascular diagnoses are correlated with alternate imaging studies to clarify patient disease processes. For a portion of this rotation, the student will focus upon an area of diagnostic sonography that is of special interest to him/her and submit clinical proficiency related to the area of specialization, including a written summarization of this work experience and the impact it made upon the student. A minimum of 480 clinical hours is required to complete this course, and documentation of professional and technical scanning proficiency is mandatory. ***Prerequisite: RAD 0334.*** **(1st)**

RAD 353 Vascular Sonographic Interpretation

3Cr. (Hrs.:.: 3 Lec)

A continuation of vascular technology that provides didactic instruction for students who choose the vascular clinical tract. This course provides students with course work and in-depth didactic instruction that covers the material outlined in the vascular technology content outline. The didactic instruction is required by ARDMS for candidates taking their vascular specialty boards to obtain their RVT.

SOCIAL SCIENCES

SOCI 101 Introduction to Sociology

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to sociology, covering its basic concepts, theories and methods. **(1st, 2nd)**

PSCI 101 Intro. to Political Science

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to the study of the nature of politics and the field of political science. Provides a fundamental understanding of the nature and basis of politics and government and the role of politics in human society. Emphasizes the structures, functions, operations, inputs, constraints and outputs of the political system. **(2nd)**

GPHY 121 Human Geography

3 Cr.. (Hrs.:.:3 Lec.)

An introduction to the distribution of nature and human patterns of the world. **(1st)**

SOCS 1956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of social sciences not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

SOCS 2486 General Anthropology

3 Cr.. (Hrs.:.:3 Lec.)

An overview of the origin and evolution of man, culture and society, including an introduction to the four major fields of anthropology: physical anthropology, cultural anthropology, linguistics and archaeology. **(2nd)**

SOCI 201 Social Problems

3 Cr.. (Hrs.:.:3 Lec.)

A survey of selected social problems in contemporary society. The course involves the orderly study of these problems in terms of definitions, statistics, theories, related variables, treatment and prevention. **(1st)**

PSCI 210 Introduction to American Government

3 Cr.. (Hrs.:.:3 Lec.)

Covers the background and characteristics of the American Constitution, the federal system, political behavior, political parties, the presidency and the national administration, and the operations of the legislative and judicial branches of the national government. **(1st)**

PSCI 260 Intro. to State & Local Government

3 Cr.. (Hrs.:.:3 Lec.)

Examines the federal system, its relationships, and the operation of the state and local government units in the United States. **Prerequisite:** PSCI 210 or Consent of Instructor. **(2nd)**

SOCS 2956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of social sciences not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

PSCI 341 Political Parties & Elections

3 Cr.. (Hrs.:.:3 Lec.)

Deals with the structure and function of political parties at the local, state and national levels with an analysis of the formation, functions and activities of interest groups in the United States. Prerequisite: PSCI 101 or Consent of Instructor. **(Every other Fall)**

SOCI 332 Sociology of the Family

3 Cr.. (Hrs.:.:3 Lec.)

Examines the family as an organization which functions as a unit in society. Various interrelationships of the family and society are examined according to their influences on behavior patterns. **Prerequisite:** SOCI 101 or Consent of Instructor. **(On Dem.)**

SOCS 3956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of social sciences not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

PSCI 456 Public Administration & Policy

3 Cr.. (Hrs.:.:3 Lec.)

Covers the role of administrative agencies in the formulation and implementation of public policy. Topics include the structure, function and organization of bureaucratic bodies, dynamics of administration, budgeting, federal-state administrative relations, the relation of administrative agencies to interest groups and political parties and the administrative structure as a reflection of the culture and the political regime. Emphasizes the politics of administration. (Formerly HSS 4516) **Prerequisite :**PSCI 101 or Consent of Instructor. **(2nd)**

PSCI 438 International Relations

3 Cr.. (Hrs.:3 Lec.)

A study of factors that influence the relationships between states. Emphasizes theories of international relations with respect to the following components of national interest: the concept of power; capability analysis; the balance of power and the balance of terror; collective security and collective defense; nationalism and imperialism; political ideologies; contributions for political philosophy and the behavioral sciences. **Prerequisite** :PSCI 101 and PSCI 210 or Consent of Instructor. **(1st)**

SOCS 4956 Special Topics

Variable Credit

Specific topic is to be determined by individual faculty member offering the course. Topic will deal with some aspect of social sciences not covered by an existing course. This course is designed to complement present department offerings. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

SOCIETY & TECHNOLOGY STUDIES

STS 1396 Introduction to Logic

3 Cr.. (Hrs.:3 Lec.)

A thorough grounding in logic is the hallmark of all educated persons. This course surveys the role of logic in language, Mathematics, and science. It serves as an introduction to Argumentation/Persuasion, Philosophy of Science, and Science & Technology Studies. (SS) **(On Dem.)**

STS 2016 Technology & Society

3 Cr.. (Hrs.:3 Lec.)

Since the Enlightenment, Western Culture has looked to technology as the key to social progress. In recent years, such optimism has fallen on hard times. This is an interdisciplinary course; it draws on history, literature, film, philosophy, and sociology in order to evaluate and explain the changing relationship between society & technology. Specifically, we explore this relationship as: 1) systematization & standardization; 2) technology as solution to social problems; 3) technology as a social problem. This course serves as an introduction to Science & Technology Studies. (SS) **Prerequisite:** Sophomore standing. **(1st)**

STS 3596W Politics of Technical Decisions

3 Cr.. (Hrs.:3 Lec.)
Politics and technology interact in unique ways. The focus is on understanding both the context of and the conflicts engendered by technical decisions. As an active-learning course, students will learn research, writing, and presentation skills by developing and presenting a case study. (SS) **Prerequisite:** STS 2016. **(1st)**

SOFTWARE ENGINEERING

S.E. 1000 Computer Science & Software Engineering Freshman Seminar

1 Cr.. (Hrs.:1 Lec.)
Required introduction to the Computer Science and Software Engineering programs. Students will discuss what it means to be a professional in the fields of computer science and software engineering, meet professionals in these fields, and hear about the wide range of employment opportunities. Throughout the course students will meet the faculty of the Computer Science Department and learn of their diverse expertise. By the end of the course, each student will have developed a resume and a career plan and will have learned how a Tech education prepares them for rewarding employment. **(1st)**

S.E. 3250W Software Engineering I

3 Cr.. (Hrs.:3 Lec.)
Studies the process of developing large software systems. Development process models, software quality, software metrics, code reviews, change management, and professionalism will be discussed. **Prerequisite:** C.S. 2106 & Junior standing or Consent of Instructor. **(1st)**

S.E. 3260 Software Engineering II

2Cr. (Hrs.:2 Lec.)
Students apply the principles covered in S.E. 3250W by doing a full software development life cycle maintenance project for an external client. This includes creating or updating all the standard life cycle documents as well as coding and testing bug fixes and enhancements. **Prerequisite:** S.E. 3250W. **(2nd)**

S.E. 3280 Software Requirements & Specification

3 Cr.. (Hrs.:3 Lec.)
Concentrates on the development of requirements for software systems. Topics: elicitation and definition of requirements, documentation of requirements, representations of requirements, and specification of reengineering changes. **Corequisites:** S.E. 3250W. **(2nd)**

S.E. 3300 User-Interface Design

3 Cr.. (Hrs.:3 Lec.)
Provides an introduction to designing user interfaces for a variety of interactive systems. The design process emphasizes the development of software systems from a user, rather than system-oriented, perspective. The course focuses on using real users to complete the specification, design, evaluation, and testing of the interface. Students will learn both human (cognitive) and technological tools for designing and building interfaces. The course also presents human-computer interaction concepts and theory, which involves computer science, psychology, social behavior, and other human factors associated with computer use. **Corequisites:** S.E. 3250W. **(1st)**

S.E. 4270 Principles of Software Architecture & Design

3 Cr.. (Hrs.:3 Lec.)
Builds on the student's existing knowledge of and experience designing software. This course focuses on high level design of software systems so that those systems satisfy quality attributes such as security, availability, performance, and modifiability. Students will learn the importance of developing, documenting, communicating, and adhering to a software architecture that achieves not only the functional but also the non-functional requirements of a software system. By the end of the course, students will understand the importance of early stakeholder involvement, an early focus on quality attributes, design trade-offs that must be negotiated, and how to evaluate a software architecture in terms the resulting system's ability to achieve quality attributes. **Prerequisite:** S.E. 3280 & 3300. **(1st)**

S.E. 4920W Senior Design Project

3 Cr.. (Hrs.:3 Lec.)
This sequence is the capstone project for the Software Engineering degree. Students will work in teams of two or three of their own choosing under the direction of the instructor to either develop or reengineer a complex software product. **Prerequisite:** S.E. 3280 & S.E. 3300. **(1st, 2nd) Need a total of 6 credits and have to do 3 credits at a time.**

S.E. 4940 Senior Seminar

1 Cr.. (Hrs.:1 Lec.)
Investigations in the Computer Science and Software Engineering fields. Students will report on their internship experience, present their senior design projects, and/or present their undergraduate research. Faculty and guest speakers will discuss current issues in computer science and software engineering. Students will take an exam covering their computer-related course work. Students will demonstrate their ability to apply a computer-related code of ethics (ACM, IEEE, or SE). This is a required seminar for computer science and software engineering seniors. **Prerequisite:** Senior standing or Consent of Instructor. **(2nd)**

SUSTAINABLE ENERGY TECHNOLOGY

SET 100 Introduction to Sustainable Energy

3 Cr.. (Hrs.: 3 Lec)
This course provides an overview of sustainable energies, including solar, wind, hydro, biomass and geothermal. Students will learn the basic principles of each technology. Students will also investigate renewable resources and their associated technologies.

SET 110 Introduction to Electricity

3 Cr.. (Hrs.: 2 Lec, 2 Lab)
This course is an introduction to basic direct current (DC) and alternating current (AC) theory, properties, components and the proper use of related testing equipment. Basic circuits, electrical components and their applications, capacitive and inductive circuits will also be covered. **Corequisites:** M 095

SET 120 Introduction to Programmable Logic Controllers (PLC)

3 Cr.. (Hrs.: 1 Lec, 4 Lab)
This course focuses on basic, essential features of Programmable Logic Controllers (PLCs) which are used fro the control and operation of industrial automated equipment and machinery. Various types of PLCs and their uses in industrial environments including basic concepts, programming, applications, troubleshooting of ladder logic, and interfacing of equipment will also be covered. **Prerequisite:** M 095, SET 110

SET 130 Advanced Electrical Applications

4 Cr.. (Hrs.: 2 Lec, 4 Lab)
This course is a continuation of SET 110. Students will explore the topics such as the link between generators, converters and inverters. Learn methods of, and explain power collection and the distribution of high voltage via overhead and underground transmission lines and sub-stations. Learn proper methods of inspecting electrical control system components. Describe low voltage power distribution and transformers. Students will also learn proper methods of documentation and utilize manufacture documentation and software, schematics and wiring diagrams, flow charts. **Prerequisite:** M 095, SET 110. **Corequisites:** M 121

SET 140 Motors, Generators & Transmissions

3Cr. (Hrs.: 2 Lec, 2 Lab)
This introductory course will familiarize students with the terminology and basic principles of D/C and A/C motors and generators and associated controls. Students will also be introduced to typical transmission systems that may be used.

TECHNICAL COMMUNICATION

T.C. 5016 Professional Presentations

1 Cr.. (Hrs.:1 Lec.)
Core course designed to prepare students for designing and delivering formal presentations in professional settings. Students will learn the basics of the visual aspects of oral presentations, including the use of PowerPoint and graphics, and they will practice giving oral presentations. **Prerequisite:** Graduate Standing in an on-campus program **(1st)**

T.C. 5056 Technical Writing & Editing

3 Cr.. (Hrs.:3 Lec.)
Advanced (core) course in writing and editing for publication in professional, scientific and technical journals and/or participation in major industry-projects.

Students will edit work of peers and others and prepare their own technical or scientific pieces in a form suitable for publication. Emphasizes discipline-specific style guides and editorial policies. Undergraduate requirements continue as they presently exist (ENGL 4056). Requirements for graduate students will be more intense than requirements for undergraduates. **(2nd)**

T.C. 5106 Gender & the Rhetoric of Science & Technology

3 Cr.. (Hrs.:3 Lec.)

In this course, gender will be viewed as a social construct. Students will examine how cultural gender roles are affected by science and technology. The course focuses on the influence of gender roles on scientific and technological thinking (e.g., communication strategies, language, image). Students will explore the values and goals of past and present scientific and technological communities in terms of the issues related to gender roles in these communities as they are reflected in the profession of technical communication. **(On Dem.)**

T.C. 5150 Graduate Writing Seminar

1 Cr. (Hrs: 1 Lec)

This course or T.C. 5160 is required of all Science & Engineering graduate students in both the thesis and the non-thesis options; this course complements but does not cover bibliography. Course emphasis is on thorough review of basic writing mechanics, on organization of thinking, on these and report format, and on oral presentations to committees and seminars. Students are encouraged to enroll in this courses sooner rather than later in their graduate studies. Grading is by Pass/Fail only. **Prerequisite: Graduate** Standing in an on-campus program. **(1st)**

T.C. 5160 Technical Writing & Publishing Seminar

1 Cr. (Hrs: 1 Lec)

This course or 5150 is required of all Science & Engineering graduate students in both the thesis and the non-thesis options. This one-credit course will provide a practical guide for improving all technical writing, with a special emphasis on preparing documents for publication in peer-reviewed journals. This course is taught over a single weekend and includes in-class lecture-discussion followed by out-of-class writing assignments due within one month of the completion of the lecture portion of the course. Final grades will be based on class attendance, class participation, and the writing assignments. Grading is by Pass/Fail only. Prerequisite: Graduate standing in an on-campus program. **(2nd)**

T.C. 5206 Communicating Environmental and Health Risk

3 Cr.. (Hrs.:3 Lec.)

Both corporations and the government find it necessary to manage environmental and human health risk. Developing risk communication is a blend of communication and technical strategies that incorporate an understanding of public perception and an appreciation for public influence. Problems such as global climate change or toxic chemicals in the environment, as well as radon in the home and workplace, underscore the importance of environmental and human health risk communication. Students will learn to consult with technical experts and the public, promote public awareness, create documents and other mediums of communication, and develop emergency and crisis response plans. **Prerequisite:** WRIT 322 or WRIT 321.

T.C. 5376 Ethics Proseminar

1 Cr. (Hrs: 1 Lec)

Ethics is fundamental to precise, accurate, and clear technical communication. This course examines various ethical dimensions of technical communication including client-professional relations, audience definition, research, gender, medium choice, and social construction. Practical assignments will utilize projects and other elements of the MSTC curriculum as examples for moral reflection.

T.C. 5416W Rhetorical Theories & Professional Communication

3 Cr.. (Hrs.:3 Lec.)

Students examine the rhetorical theories of communication that have existed since classical times and those that have been developed in modern times, as these theories continue to inform effective decision-making strategies in professional communication. This course prepares students to view professional communication broadly as a culturally situated form of social action and production. Students integrate the discipline of rhetoric with the contemporary practice and academic field of professional communication, as they analyze contemporary issues, debates, and achievements in rhetorical theories relating to current professional communication practices. **Prerequisite** *Junior standing for undergraduates; graduate standing or permission of instructor for MSTC students.* **(2nd)**

T.C. 5426 Seminar in Technology, Communication, & Culture

3 Cr.. (Hrs.:3 Lec.)

From the cuneiform tablets of the Assyrians to our own multi-media hypertext, the technology of communications has redefined the human experience. As Martin Luther realized, technologies possess their own cultural politics. In this seminar, we shall research and discuss technologies and communications as ontogenetic processes. **Prerequisite:** Admission to MSTC graduate program. **(1st)**

T.C. 5476, 5486 Print Production/Multimedia Production

3 Cr.. (Hrs.:3 Lec.)

This two-semester core course enables students to become practitioners of the technologies associated with electronic publishing. The course will provide students with a strong grounding in both conventional desktop publishing and audio/video production, and it will devote special attention to emerging publishing technologies, such as computer to plate printing, digital audio/video production, and publishing for on-line and other screen-based documents. Students will attain mastery of at least one major aspect of electronic publication technology each term; they will learn how to select appropriate publishing technologies for specific needs; and they will develop professional-level design skills. **Prerequisite:** Graduate standing, instructor consent, or PTC 3476.

T.C. 5506 Intercultural Communication

3 Cr.. (Hrs.:3 Lec.)

This core course prepares students for global communication, as it focuses on communication principles and processes in cross-cultural environments. Norms are explicated through contrasts between Western and non-Western modes of communication. **(1st)**

T.C. 5616 Research Methods

3 Cr.. (Hrs.:3 Lec.)

Emphasis on the philosophy and practice of qualitative and quantitative inquiry, the development and use of descriptive frameworks, and the gathering and testing of data. **Prerequisite:** Graduate standing or instructor consent. **(1st)**

T.C. 5916 Internship

1 to 6 Cr.. (Variable)

Internship in a business, organization, or agency for 12-15 hours (weekly) of focused communication responsibilities. Weekly conference to discuss work-related journal with supervising instructor and/or other interns. **Prerequisite:** Graduate standing.

T.C. 5946 Graduate Seminar

1 Cr.. (Hrs.:1 Lec.)

Designed for new students in the Master's program in Technical Communication, this course will examine the gamut of opportunities available to technical communicators. The course will be coordinated by one faculty member. Participation of other faculty and of community professionals is anticipated, as is discussion and critique of student research. **Prerequisites:** Admission into MSTC graduate program or instructor consent.

T.C. 5956 Special Topics-Communication or Multi-Media

1-3 Cr.. (Hrs.: vary.)

Offerings based on the needs of several students as determined by the faculty steering committee. Course topics include, but are not limited to Organizational Communication, Project Information Management, Technical Communication and the Public, and Usability Testing. **Prerequisite:** Graduate standing or instructor consent. **(On Dem.)**

T.C. 5996 Thesis/Graduate Project

3 Cr.. (Hrs.:3 Lec.)

Course will be individualized to student need to complete a written or multimedia project as a capstone. Student Advisory Committee will assist and guide the process. **Prerequisite:** Graduate standing and Advisory Committee approval. **(Summer, 1st, 2nd) Need a total of 6 credits and have to do 3 credits at time.**

T.C. 6970 Special Problems

Variable Credit

Individual problems suitable for graduate study are assigned. Students submit written and oral reports for each problem. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

T.C. 6990 Dissertation

Variable Credit

Doctoral dissertation research activities. **Prerequisite:** Consent of Instructor. **(1st, 2nd)**

HUMAN & COMMUNITY SCIENCES courses offered through Univ. of Nevada - Reno on-line. To sign up for these courses see Dr. Jack Crowley, Dept. Head of Liberal Studies, Main Hall 105A or (406) 496-4462.

HCS 3006 Problems of Substance Abuse & Addiction

3 Cr.. (Hrs.:3 Lec.)

Overview of how involvement with alcohol, tobacco and other drugs can affect health, personal and social development. Related social, philosophical, cultural, prevention and treatment issues. (UN-R course #HCS 154)

HCS 3016 Bio/Psycho/Social Factors in Addiction

3 Cr.. (Hrs.:3 Lec.)

Theories and models of alcohol and other drug addiction with emphasis on the signs and symptoms of problematic use and abuse. **Prerequisite:** HCS 3006. (UN-R course #HCS 254)

HCS 3026 Substance Abuse Prevention

3 Cr.. (Hrs.:3 Lec.)

A basic overview of substance abuse prevention with emphasis on scientifically defensible substance abuse prevention research and practices. **Prerequisite:** (HCS 3006). (UN-R course #HCS 255)

HCS 3530 Substance Abuse Prevention Theory & Praxis

3 Cr.. (Hrs.:3 Lec.)

Theoretical and application tools for the administration, coordination, and supervision of science-based substance abuse prevention strategies. **Prerequisite:** HCS 1540 and HCS 2550.

HCS 3540 Addiction Treatment I

3 Cr.. (Hrs.:3 Lec.)

Overview of philosophical and procedural components for providing addictions services; professional characteristics, ethical/legal issues, helping process and initial assessment. Motivational interviewing practiced. **Prerequisite:** HCS 2540 and acceptance into the minor or certificate program in Addiction Counseling and Prevention Services.

HCS 3550 Individual & Group Addiction Treatment

3 Cr.. (Hrs.:3 Lec.)

Strategies and core competencies for treating addicted individual and group counseling. Experiential learning is the primary approach utilized in this class. **Prerequisites:** HCS 2540, 3540, and acceptance into the minor or certificate program in Addiction Counseling and Prevention Services.

HCS 4540 Addiction Treatment II

3 Cr.. (Hrs.:3 Lec.)

Practical application of providing addiction services; assessment, placement, treatment planning, ethical/legal issues, and case management. **Prerequisite:** HCS 2540, 3540, and acceptance into the minor or certificate program in Addiction Counseling and Prevention Services.

HCS 4956 Special Topics in Addiction

1 to 3 Cr.. (Variable)

Subjects related to alcohol and drug addition and other compulsive behaviors. Topical areas may include perinatal substance abuse, women's issues, and co-occurring disorders. Max of 9 credits. (HCS 459)

HCS 4916 Internship in Addiction Treatment & Prevention

1 to 6 Cr.. (Variable)

Placement in an accredited substance abuse treatment program or a prevention program site with an opportunity to apply skills and knowledge learned in previous CEP courses. Max of 6 credits. **Prerequisite:** HCS 4540. (HCS 464)

MILITARY SCIENCE LEADERSHIP (MSL)
Courses offered through UM ARMY ROTC/UM

MSL 3010 Leadership and Problem Solving

3 cr..

Developing a personal leadership philosophy; through the learning and application of various small unit leadership techniques. Fundamentals of leadership development, land navigation, troop leading, small units tactics, rappelling, rifle marksmanship and physical fitness. Study of the organization and operation of the U.S. Army as a profession. Students are required to attend one weekend field exercise during the semester. **Prerequisite:** Consent of Instructor. **Corequisites;** MSL 303 **(1st)**

MSL 3020 Leadership and Ethics

3 cr..

Continuation of the study and application of small unit leadership tasks. Advanced leadership skills taught including medical evacuation procedures, radio procedures, and increased involvement in planning and executing military operations in preparation for attendance at the National Advanced Leadership Camp at Fort Lewis, Washington. Students participate in rifle marksmanship instruction including qualification with the M16A2 rifle, rappel, and attend one weekend exercise with students from other universities in the area and the Montana Army National Guard. **Prerequisite:** Consent of Instructor. **Corequisites**; MSL 303. **(2nd)**

MSL 3030 Leadership Laboratory

1 cr.. (R 4)

Practical application of skills learned in the classroom. **Prerequisite:** Consent of Instructor. Corequisites;., MSL 301, 302, 401, or 402E. **(1st, 2nd)**

MSL 3150 Drill and Conditioning

1 cr.. (R 4)

The study and application of military drill and ceremony: formation, ceremonies, and marching; the study of the fundamentals of the military physical conditioning program, and the practical application of skills learned. Physical education activity course; a maximum of four credits of activity courses may be counted toward graduation. **Prerequisite:** Need Instructor's Approval. **(1st, 2nd)**

MSL 3950 Special Topics

Variable cr.. (R 9)

Experimental offerings of visiting professors, experimental offerings of new courses, or one time offerings of current topics. **(1st, 2nd)**

MSL 4010 Leadership and Management

3 cr..

The application of leadership principles and techniques involved in leading young men and women in today's Army. Students explore training management. Methods of effective staff collaboration and development counseling techniques. Develops student proficiency in planning and executing complex operations, functioning as a member of a staff and mentoring subordinates. **Prerequisite:** Consent of Instructor..; **Corequisites;** MSL 303. **(1st)**

MSL 4020E Officership and Ethics

3 cr..

Study includes case study of military law and practical exercises on establishing an ethical command climate. Examines the role communications, values and ethics play in effective leadership. Students complete a semester long Senior Leadership Project that requires them to plan, organize, collaborate, analyze and demonstrate their leadership

MSL 4040 Advanced Leadership Practicum
Variable cr.. (R-4)
Required study and internship in military tactics, leadership and organizational behavior. Supervised by active duty military officers. Prerequisite: Consent of Instructor (1st, 2nd)

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FGILMORE@MTECH.EDU
Ph: (406)496-4129/FAX: (406)496-4387

Doug Abbott, Ed.D. (Professor) — Vice Chancellor for Academic Affairs and Research
DABBOTT@MTECH.EDU
Ph: (406)496-4127/FAX: (406)496-4384

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MPETERSON@MTECH.EDU
Ph: (406)496-4613/FAX: (406)496-4387

Michael Johnson, M.B.A. — Vice Chancellor for Development & Student Services; President, Montana Tech Foundation
MJOHNSON@MTECH.EDU
Ph: (406)496-4804/FAX: (406)496-4387

Joseph F. Figueira, Ph.D. — Associate Vice Chancellor for Academic Affairs and Research; Dean of Graduate School
JFIGUEIRA@MTECH.EDU
Ph: (406)496-4456/FAX: (406)496-4334

Paul Beatty, M.S. — Associate Vice Chancellor of Student Affairs; Dean of Students
PBEATTY@MTECH.EDU
Ph: (406)496-4198/FAX: (406)496-4757

Edmond G. Deal, Ph.D. — Director of Montana Bureau of Mines and Geology; State Geologist
EDEAL@MTECH.EDU
Ph: (406)496-4181/FAX: (406)496-4451

DEANS

Douglas Coe, Ph.D. (Professor) — Dean, College of Letters, Sciences, & Professional Studies
DCOE@MTECH.EDU
Ph: (406)496-4207/FAX: (406)496-4135

John Garic, M.S., J.D. — Dean, College of Technology
JGARIC@MTECH.EDU
Ph: (406) 496-3714/FAX: (406) 496-3710

H. Peter Knudsen, Ph.D. (Professor) — Dean, School of Mines & Engineering
PKNUDSEN@MTECH.EDU
Ph: (406)496-4395/FAX: (406)496-4260

Other Administrative Officers

Alumni Affairs, Director — Peggy McCoy, B.S.
PMCCOY@MTECH.EDU
Ph: (406)496-4402/FAX: (406)496-4334

Athletic Director — Joe McClafferty, B.S.
JMCCLAFFERTY@MTECH.EDU
Ph: (406)496-4301/FAX: (406)496-4711

Bookstore, Manager — Jeni Luft, B.S.
JLUFT@MTECH.EDU
Ph: (406)496-4119/FAX: (406)496-4761

Budgets & Purchasing, Assoc. Director — Dhann Faught, M.B.A.
DFAUGHT@MTECH.EDU
Ph: (406)496-4377/FAX: (406)496-4387

Career Services, Director — Sarah Raymond, B.A.
SRAYMOND@MTECH.EDU
Ph: (406)496-4384/FAX: (406)496-4104

Controller/Business Manager — John Badovinac, B.S.
JBADOVINAC@MTECH.EDU
Ph: (406)496-4249/FAX: (406)496-4710

Counselor — Joyce O'Neill, M.Ed.
JONEILL@MTECH.EDU
Ph: (406)496-4429/FAX: (406)496-4757

Counselor/Disability Services Coordinator — Cricket Pietsch, M.S.
CPIETSCH@MTECH.EDU
Ph: (406)496-4218/3730/FAX: (406)496-4757/3710

Enrollment Management — Tony Campeau, B.S.
TCAMPEAU@MTECH.EDU
Ph: (406)496-4178/FAX: (406)496-4710

Enrollment Processing, Associate Director — Kathy Williams, M.S.
KWILLIAMS@MTECH.EDU
Ph: (406)496-4266/FAX: (406)496-4710

Enrollment Services, Associate Director — Leslie Dickerson, B.A.
LDICKERSON@MTECH.EDU
Ph: (406)496-4879/FAX: (406)496-4710

Environmental Health & Safety, Director — Marilyn Cameron, M.S.
MCAMERON@MTECH.EDU
Ph: (406)496-4463/FAX: (406)496-4135

Financial Aid, Director — Michael Richardson, B.S.
MRICHARDSON@MTECH.EDU
Ph: (406)496-4213/FAX: (406)496-4705

Foreign Student Advisor — Margie Pascoe
MPASCOE@MTECH.EDU
Ph: (406)496-4477/FAX: (406)496-4757

Head Football Coach — Robert Green, Jr., M.A.
RGREEN@MTECH.EDU
Ph: (406)496-4292/FAX: (406)496-4711

Head Men's Basketball Coach — Nate Larson, M.B.A.
NLARSON@MTECH.EDU
Ph: (406)496-4205/FAX: (406)496-4711

Head Women's Basketball Coach — Kerie DePell, B.A.
KDEPELL@MTECH.EDU
Ph: (406)496-4766/FAX: (406)496-4711

Head Women's Volleyball Coach — Marilyn Tobin, M.S.
MTOBIN@MTECH.EDU
Ph: (406)496-4337/FAX: (406)496-4711

HPER Super./Campus Rec Dir. — Rufus Whitaker
RWHITAKER@MTECH.EDU
Ph: (406)496-4211/FAX: (406)496-4711

Information Services, Director — Holly Hansen, B.S.
HHANSEN@MTECH.EDU
Ph: (406)496-4270/FAX: (406)496-4700

Institutional Research, Director — Melissa Harrington, M.S.
MHARRINGTON@MTECH.EDU

Libraries, Director — Ann St. Clair, MLS.
ASTCLAIR@MTECH.EDU
Ph: (406)496-4283/FAX: (406)496-4133

Network Computer Services, Director — Mike Kukay, B.S.
MKUKAY@MTECH.EDU
Ph: (406)496-4673/FAX: (406)496-4700

New Media Project Manager — Jennifer Simon, B.S.
JSIMON@MTECH.EDU
Ph: (406)496-4307/FAX: (406)496-4700

Physical Facilities, Director
Ph: (406)496-4168/FAX: (406)496-4701

Public Relations Director — Amanda Badovinac, M.S.
ABADOVINAC@MTECH.EDU
Ph: (406)496-4828/FAX: (406)496-4710

Residence Life, Director — Jacob Floch, B.S.
JFLOCH@MTECH.EDU
Ph: (406)496-4500/FAX: (406)496-4774

Sponsored Programs & Grant Acc., Dir — Carleen Cassidy, B.S.
CCASSIDY@MTECH.EDU
Ph: (406)496-4176/FAX: (406)496-4451

SUB, Student Activities, Director — Chris Van Nuland, M.Ed.
CVANNULAND@MTECH.EDU
Ph: (406)496-4466/FAX: (406)496-4702

Tech Learning Center, Director; Pre-Engineering & Science Program, Director — Keri Petritz, M.S.
KPETRITZ@MTECH.EDU
Ph: (406)496-4125/FAX: (406)496-4757

Tech Learning Center Director - COT — Kathleen Reick, B.S.
KREICK@MTECH.EDU
Ph: (406)496-3737/FAX: (406)496-3710

Technical Outreach, Director — Amy Verlanic, B,S,
AVERLANIC@MTECH.EDU
Ph: (406)496-4289/FAX: (406)496-4696

U.M. Food Service, Director — Mike Spencer
MSPENCER@MSO.UMT.EDU
Ph: (406)496-4590/FAX: (406)496-4511

FACULTY

ACKERMAN, FRANK (2006)
Associate Professor of Computer Science
B.S., University of Chicago, 1961
Ph.D., University of North Carolina, 1972
FACKERMAN@MTECH.EDU
Ph: (406)496-4858/FAX: (406)496-4756

AMTMANN, JOHN A. (1991)
Professor of Safety, Health and Industrial Hygiene
B.S., Illinois State University, 1988
M.S., E Stroudiburg University, 1990
Ed.D., University of Montana, 2000
JAMTMANN@MTECH.EDU
Ph: (406)496-4346/FAX: (406)496-4711

AMTMANN, KELLY (1997)
Associate Professor of Nursing
B.A. Carroll College,1988
MSN Gonzaga University, 1997
KAMTMANN@MTECH.EDU
Ph: (406)496-3721/FAX: (406)496-3710

ANDERSON, CORBY G. (1997)
Director, Center for Advanced Mineral & Met Processing
Research Faculty of Met. & Materials Engr.
B.S. Chem. ENGR. MSU 1979
M.S. Met. ENGR. Montana Tech 1984
Ph. D. Met. ENGR. University of Idaho 1987
Ph: (406)496-4794/FAX: (406)496-4512
CANDERSON@MTECH.EDU
Web Page: www.mtech.edu/camp

APPLE, MARTHA (2003)
Associate Professor, Biological Sciences
B.A., M.A., Univ. of Montana, 1981, 1985
Ph.D., University of Rhode Island, 1994
MAPPLE@MTECH.EDU
Ph: (406)496-4575/FAX: (406)496-4650

APPLEMAN, RICHARD A. , P.E. (1980)
Professor of Environmental Eng
B.S., M.S., Ph.D., Univ. of CA-Irvine, 1970, 1971, 1978
RAPPLEMAN@MTECH.EDU
Ph: (406)496-4448/FAX: (406)496-4650

ARMSTRONG, DAVID W. (2007)
Dept. Head/Associate Professor of Mining Engineering
B.S., Colorado School of Mines, 1970
M.S., Colorado School of Mines, 1972
M.B.A., University of Denver, 1978
DARMSTRONG@MTECH.EDU
Ph: (406)496-4867/FAX: (406)496-4260

ASPEVIG, JAMES (2006)
Assistant Professor of Health Care Informatics
B.A., Concordia College, 1985
M.S., Univ of Montana, 1989
M.S., Univ of Illinois, 2006
JASPEVIG@MTECH.EDU
Ph: (406)496-4822/FAX: (406)496-4135

BABST, JAMES (2007)
Instructor, Electrical Lineman Program Admin
JBABST@MTECH.EDU
Ph: (406)496-3751/FAX: (406)496-3710

BARDSLEY, SALLY M. (1995)
Assistant Professor of SH/IH & Wellness Program Director
B.S., M.S., Montana Tech, 1991, 1994
SBARDSLEY@MTECH.EDU
Ph: (406)496-4290/FAX: (406)496-4650

BATTLE, LAURIE (2006)
Assist. Professor of Mathematical Sciences
B.A., Furman University, 1998
M.S., Ph.D., University of Tennessee, 2001,2003
LBATTLE@MTECH.EDU
Ph: (406)496-4857/FAX: (406)496-4756

BOSSARD, FLOYD, P.E., C.I.H. (1992)
Adjunct Professor Safety, Health and Industrial Hygiene
B.S., Montana School of Mines, 1950
M.S., University of Cincinnati, 1968
FBOSSARD@MTECH.EDU
Ph: (406)494-2280

BRAUN, JEFFREY (2001)
Assist. Professor of Computer Science
B.S., Colorado School of Mines, 1986
M.S., University of Utah, 1989
M.S., The University of Montana, 1998
JBRAUN@MTECH.EDU
Ph: (406)496-4206/FAX: (406)496-4756

BROPHY, MAUREEN (1991)
Assistant Professor of Nursing
BSN Montana State University, 1980
MN Montana State University, 1996
MBROPHY@MTECH.EDU
Ph: (406)496-3719/FAX: (406)496-3710

CAMERON, DOUGLAS (1990)
Dept. Head of Chemistry & Geochemistry
Professor of Chemistry & Geochemistry
B.S., Montana State University, 1975
M.S., Ph.D., Purdue University, 1978, 1979
DCAMERON@MTECH.EDU
Ph: (406)496-4247/FAX: (406)496-4135

CHESBRO, JON (2008)
Assistant Professor of Busnienss & Infor. Tech.
B.S. Texas A&M, 1996
M.A., University of Montana, 2001
JCHESBRO@MTECH.EDU
Ph: (406)496-4570/FAX: (406)496-4704

COE, DOUGLAS A. (1981)
Dean, College of Letters, Sciences, & Professional Studies
B.S., Montana State University, 1969
Ph.D., Oregon State University, 1974
DCOE@MTECH.EDU
Ph: (406) 496-4207/FAX: (406) 496-4758

CONRAD, PAUL (2003)
Associate Professor of Mining Eng
B.S., M.S., PA State Univ. 1975, 1982
Ph.D., Univ of Kentucky, 2002
PCONRAD@MTECH.EDU
Ph: (406)496-4620/FAX: (406)496-4260

COX, LEIF (2007)
Assistant Professor of Geophysical Engineering
B.S., Montana Tech, 2000
M.S., University of Alaska - Fairbanks, 2002
Ph.D., University of Utah, 2003
LCOX@MTECH.EDU
Ph: (406)496-4401/FAX: (406)496-4704

CROWLEY, JACK Ed.D. (1988)
Dept.. Head & Assoc. Prof. of Liberal Studies
B.A., Univ of California-Berkeley, 1978
M.A., University of Montana, 1986
Ed.D., University of Montana, 2000
JCROWLEY@MTECH.EDU
Ph: (406)496-4462/FAX: (406)496-4104

DEPELL, KERI (2007)
Head Women's Basketball Coach & Adjunct Instructor of HPER
B.A., Seattle Pacific University, 2003
KDEPELL@MTECH.EDU
Ph: (406)496-4288/FAX: (406)496-4711

DONNELLY, MATT (2009), PE
Assistant Professor of Electrical Engineering
B.S., University of Arizona, 1981
M.S., Ph.D., Montana State University, 1988, 1991
M.B.A., University of Washington, 2004
MDONNELLY@MTECH.EDU
Ph: (406) 496-4846/FAX: (406) 496-4849

DOUGLASS, RICHARD J. (1983)
Dept.. Head and Professor of Biological Sciences
B.S., M.S., University of Utah, 1968, 1970
Ph.D., Montana State University, 1973
RDOUGLASS@MTECH.EDU
Ph: (406)496-4450/FAX: (406)496-4650

DOWNEY, JEROME P., P.E. (2006)
Assistant Professor of Metallurgical & Materials Eng.
B.S., M.S. Montana Tech, 1977, 1982
Ph.D., Colorado School of Mines, 1991
JDOWNEY@MTECH.EDU
Ph: (406)496-4578/FAX: (406)496-4664

DRURY, WILLIAM J., P.E. (1992)
Professor of Environmental Eng.
B.S., Marquette University, 1978
M.S., Northwestern University, 1979
Ph.D., Montana State University, 1992
WDRURY@MTECH.EDU
Ph: (406)496-4203/FAX: (406)496-4650

EGLOFF, MATT (2007)
Instructor/Lab Director of General Engineering
B.S., SUNY Oswego, 1990
M.S., M.S., Montana St University, 1993, 1997
MEGLOFF@MTECH.EDU
Ph. (406) 496-4893/FAX: (406) 496-4849

FARRELL, RAE (2005)
Assistant Professor, Nursing
A.S. State Fair Community College, 1992
B.S. M.S., Univ of MO-Columbia, 2000, 2003
RFARRELL@MTECH.EDU
Ph: (406)496-3780/FAX: (406)496-3710

FACULTY

FAUGHT, CHARIE (2007)
Assistant Professor of Health Care Informatics
B.S., Univ of Montana,
M.S., Tulane University
CFAUGHT@MTECH.EDU
Ph: (406)496-4182/FAX (406)496-4135

FREEBOURN, JAMES D. (2006)
Instructor, Information Technology
B.S., Montana Tech, 1995
JFREEBOURN@MTECH.EDU
Ph: (406)496-3767/FAX: (406)496-3710

GAMMONS, CHRISTOPHER H. (1997)
Professor of Geological Engineering
B.S., Bates College, 1980
Ph.D., Pennsylvania State University, 1988
CGAMMONS@MTECH.EDU
Ph: (406)496-4763/FAX: (406)496-4260

GANESAN, KUMAR (1983)
Dept.. Head and Prof. of Environmental Engr.
B.S.M.S., Univ of Medusa, India, 1969, 1971
Ph.D., Washington State University, 1981
KGANESAN@MTECH.EDU
Ph: (406)496-4239/FAX: (406)496-4650

GARLISH, ELIZABETH HARPER (2006)
Reference Librarian/Assistant Professor
B.A., The Evergreen State College, 1999
M.L.I.S., University of Washington, 2001
BGARLISH@MTECH.EDU
Ph: (406)496-4839/FAX: (406)496-4133

GAZIOGLU, SUZAN (2004)
Associate Professor, Mathematical Sciences
B.S., University of Yuzuncu Yil, Turkey, 1990
M.S., University of Yuzuncu Yil, Turkey, 1993
M.S., University of Toledo, 1996
P.hD., University of Glasgow, 2002
SGAZIOGLU@MTECH.EDU
Ph: (406)496-4616/FAX: (406)496-4756

GELLER, GRETCHEN L. (2006)
Instructor, Health Programs
B.A., Hastings College, 1967
B.S., University of New Mexico, 1987
GGELLER@MTECH.EDU
Ph: (406)496-3771/FAX: (406)496-3710

GERBRANDT, BUTCH, P.E. (1993)
Dept.. Head and Professor of General Engr.
B.A., Tabor College
B.S., M.S., Ph.D., University of New Mexico, 1981, 1986, 1993
BGERBRANDT@MTECH.EDU
Ph: (406)496-4109/FAX: (406)496-4849

GETTY, JOHN
Instructor/Lab Director of Petroleum Engr
B.S., Colorado State University, 1977
JGETTY@MTECH.EDU
Ph: (406)496-4847/FAX: (406)496-4417

GIRARD, JAMES P. (1995)
Assistant Professor of Geophysical Engr.
B.S., M.S., Montana Tech, 1990, 1993
JGIRARD@MTECH.EDU
Ph: (406)496-4347/FAX: (406)496-4704

GLEASON, WILLIAM J. (2007)
Assistant Professor and Newmont Lab Dir.
Met & Mat. ENGR.
B.S., Montana Tech, 1986
M.S., Montana Tech, 1989
PhD., Montana Tech / U of Montana, 2007
WGLEASON@MTECH.EDU
Ph: (406)496-4464 / FAX: (406)496-4664

GONSHAK, HENRY (1989)
Professor of Liberal Studies
B.A., Vassar College, 1980
M.A., Ph.D., Univ of Denver, 1985, 1988
HGONSHAK@MTECH.EDU
Ph: (406)496-4310/FAX: (406)496-4104

GOOD, WILLIAM R. (2005)
Associate Professor of Biological Sciences
B.A., Linfield College, 1965
Ph.D., University of Wyoming, 1974
WGOOD@MTECH.EDU
Ph: (406)496-4538/FAX: (406)496-4650

GRANGER, LINDA (1984)
Dept.. Head and Instructor of Business Tech.
B.A. Western Montana College, 1980
LGRANGER@MTECH.EDU
Ph: (406)496-3724/FAX: (406)496-3710

GREEN, ROBERT R. JR. (1987)
Head Football Coach & Adjunct Instr. of HPER
B.A., Kearney State College, 1975
M.A., Univ of Northern Colorado, 1981
RGREEN@MTECH.EDU
Ph: (406)496-4292/FAX: (406)496-4711

HANDLEY, JAMES L. (1986)
Associate Professor of Mathematical Sciences
B.S., M.S., Michigan Tech Univ, 1979, 1983
JHANDLEY@MTECH.EDU
Ph: (406)496-4416/FAX: (406)496-4756

HART, JULIE FARONI (2000)
Associate Professor of Safety, Health and Industrial Hygiene
B.S., M.S., Montana Tech, 1989, 1991
JHART@MTECH.EDU
Ph: (406)496-4792/FAX: (406)496-4650

HEATH, LEO, P.E. (2002)
Dept. Head/Assistant Professor of Pet. Eng.
B.S., M.S., Montana Tech, 1971, 2006
LHEATH@MTECH.EDU
Ph: (406)496-4507/FAX: (406)496-4417

HOBBS, DAVID (1997)
Professor of Chemistry & Geochemistry
B.S., Sonoma State University, 1986
Ph.D., University of New Mexico, 1991
DHOBBS@MTECH.EDU
Ph: (406)496-4194/FAX: (406)496-4135

HUANG, HSIN-HSIUNG (1978)
Professor of Metallurgical & Materials Eng.
B.S., Cheng-Kung University, 1971
M.S., Ph.D., Stanford Univ, 1974, 1975
HHUANG@MTECH.EDU
Ph: (406)496-4139/FAX: (406)496-4664

JACOBSON, LARRY K. (1977)
Professor of Liberal Studies
B.S., M.S., Montana State Univ, 1960, 1961
Ph.D., University of Minnesota, 1973
LJACOBSON@MTECH.EDU
Ph: (406)496-4201/FAX: (406)496-4104

JAMES, RODNEY A., P.E. (1978)
Professor of Environmental Engineering
B.S., Ph.D., Montana State Univ, 1965, 1973
RJAMES@MTECH.EDU
Ph: (406)496-4446/FAX: (406)496-4650

JENSEN, ROGER C. (1999)
Professor of Safety, Health and Industrial Hygiene
B.S.I.E., University of Utah, 1969
J.D., North. Kentucky State College, 1974
M.S.E., University of Michigan, 1977
Ph.D., West Virginia University, 1989
RJENSEN@MTECH.EDU
Ph: (406)496-4111/FAX: (406)496-4650

JOHNSON, RICHARD F. (1981)
Associate Professor of General Engineering
B.S., M.S., Univ of WI-Stout, 1975, 1978
B.S., M.S., Montana Tech, 1985, 1988
RJOHNSON@MTECH.EDU
Ph: (406)496-4452/FAX: (406)496-4849

JOHNSTON, ANGELA L. (1997)
Instructor of BIOL. Sciences; Lab Director
B.S., Montana State University, 1998
M.S., Montana Tech, 1999
AJOHNSTON@MTECH.EDU
Ph: (406)496-4412/FAX: (406)496-4650

JUSKIEWICZ, SCOTT (2008)
Reference Librarian/Assist/ Professor
B.A., Ithaca College, 1993
M.S., University of Albany, 2005
SJUSKIEWICZ@MTECH.EDU

KALLU, REDDY R. (2009)
Assistant Professor of Mining Engineering
B.S., Kakatiya University, India, 2000
M.S., Banaras Hindu University, 2002
Ph.D., West Virginia University, 2009
RKALLU@MTECH.EDU
Ph: (406)496-4863/FAX:(406)496-4260

KASINATH, RAJENDRA (2005)
Assistant Prof. of Environmental Engr.
B.A. Sc., Ph.D., Nanyang Technological University, 1996, 2002
M.Sc., University of Manchester Institute of Science and Technology, 1997
RKASINATH@MTECH.EDU
Ph: (406)496-4835/FAX: (406)496-4650

KNUDSEN, H. PETER, P.E. (1981)
Dean, School of Mines & Enigeering/Professor of Mining Engineering
B.S., Montana Tech, 1968
M.S., Ph.D., Univ of Arizona, 1975, 1981
PKNUDSEN@MTECH.EDU
Ph: (406)496-4395/FAX: (406)496-4260

KOBER, TIMOTHY, C.P.A. (1989)
Dept. Head, Business & Information Tech.
Associate Professor of Business & Inform Tech
B.S., B.A., M.B.A., Ph.D., University of Montana, 1982, 1983, 1985, 2008
TKOBER@MTECH.EDU

FACULTY

Ph: (406)496-4457/FAX: (406)496-4704

KUENZI, AMY (2002)
Associate Prof. of Biological Sciences
B.A., University of Wisconsin-Oshkosh, 1986
M.S., University of Southern Mississippi, 1989
Ph.D., University of Arizona, 2001
AKUENZI@MTECH.EDU
Ph: (406)496-4793/FAX: (406)496-4650

KUKAY, BRIAN (2008)
Assistant Professor of General Engineering
B.S., M.S., Montana Tech, 1999, 2005
Ph.D., Utah State University, 2008
BKUKAY@MTECH.EDU
Ph: (406)496-4517/FAX: (406)496-4849

LAMIAUX, RITA (2006)
Instructor, Business
B.S., University of Montana-Western, 1995
RLAMIAUX@MTECH.EDU
Ph: (406)496-3783/FAX: (406)496-3710

LARSON, JEANNE (1990)
Instructor of Env Engr, Lab Manager
B.S., Montana Tech, 1978
JLARSON@MTECH.EDU
Ph: (406)496-4309/FAX: (406)496-4650

LARSON, NATE (2006)
Head Men's Basketball Coach & Adjunct Instructor of HPER
B.S., Montana Tech, 1999
M.B.A., University of Montana, 2006
NLARSON@MTECH.EDU
Ph: (406)496-4205/FAX: (406)496-4711

LELAND, SUSAN (1999)
Instructor of Mathematical Sciences
B.S., M.S., Montana State Univ, 1971, 1977
SLELAND@MTECH.EDU
Ph: (406)496-4364/3744/FAX: (406)496-4756

LINK, CURTIS A. (1994)
Professor of Geophysical Engineering
B.A., University of Iowa, 1971
B.S., Montana Tech, 1985
Ph.D., University of Houston, 1993
CLINK@MTECH.EDU
Ph: (406)496-4165/FAX: (406)496-4664

LUFT, STEPHEN J. (1994)
Dept.. Head & Instructor of Trades & Technical
A.S. Northern Montana College, 1991
B.T. Northern Montana College, 1991
M.S. Montana Tech, 2004
SLUFT@MTECH.EDU
Ph: (406)496-3740/FAX: (406)496-3710

MACGREGOR, WILLIAM B. (1987)
Professor of PTC
B.A., University of Redlands, 1968
Ph.D., Univ of Colorado, Boulder, 1981
WMACGREGOR@MTECH.EDU
Ph: (406) 496-4423/FAX: (406) 496-4758

MacLAUGHLIN, MARY M. (1996)
Professor of Geological Engineering
B.S., University of Minnesota, 1988
M.S., Ph.D., Univ of California-Berkeley, 1989, 1996
MMACLAUGHLIN@MTECH.EDU
Ph: (406)496-4655/FAX: (406)496-4260

MADIGAN, BRUCE R. (2003)
Associate Professor, General Engineering
B.S., M.S., Ohio State University, 1983, 1985
Ph.D., Colorado School of Mines, 1994
BMADIGAN@MTECH.EDU
Ph: (406)496-4576/FAX: (406)496-4849

MALAMA, BWALYA (2009)
Assistant Professor, Geological Engineering
B.S. University of Arizona,1999
M.S. University of Arizona, 2001
Ph.D. University of Arizona, 2006
Ph: (406)496-4272/FAX: (406)496-4260

MANNIX, GARY W. (1989)
Department Head, Health Care Informatics
Associate Professor of Computer Science
B.S., M.S., Montana Tech, 1969, 1974
GMANNIX@MTECH.EDU
Ph: (406)496-4345/FAX: (406) 496-4756

MAVROS, MICHAEL A. (1991)
Instructor of HPER; Athletic Trainer
B.S., University of Montana, 1979
M.S., Miami University, 1980
MMAVROS@MTECH.EDU
Ph: (406)496-4296/FAX: (406)496-4711

MCCLOSKEY, JAY (2008)
Project Engineer - CAMP
B.S., M.S., Montana Tech, 1983, 1991
JMCCLOSKEY@MTECH.EDU
Ph: (406)496-4875/FAX: (406)496-4512

McDONOUGH, ALICE (1985)
Instructor, Business Technology
B.A. College of Great Falls, 1970
M.Ed Northern Montana College, 1990
AMCDONOUGH@MTECH.EDU
Ph: (406)496-3723/FAX: (406) 496-3710

McINTOSH, ALLISON M. (2001)
Assistant Professor of Nursing
B.S.N., University of Iowa, 1985
M.N., Montana State University, 1991
AMCINTOSH@MTECH.EDU
Ph: (406)496-3782/FAX: (406) 496-3710

McNEARNY, RICHARD L. (1999)
Professor of Mining Engineering
B.S., B.A., M.S., University of Colorado, 1977, 1982, 1992
Ph.D., Colorado School of Mines, 1991
RMCNEARNY@MTECH.EDU
Ph: (406)496-4624/FAX: (406)496-4260

MELVIN, DANETTE D (1998)
Lab Instructor, Nursing
B.A. Carroll College, 1985
DMELVIN@MTECH.EDU
Ph: (406)496-3718/FAX: (406)496-3710

METESH, ED (1981)
Dept. Head Networking Technology/IT&D
Assistant Professor
B.S. Montana Tech, 1978
M.Ed Northern Montana College, 1991
EMETESH@MTECH.EDU
Ph: (406)496-3735/FAX: (406)496-3710

MILLEGAN, HAROLD "HAL" (2008)
Assistant Professor of General Engineering
B.S., M.S., Texas A&M University
Ph.D., University of Tennessee, 2008
HMILLEGAN@MTECH.EDU
Ph: (406)496-4184/FAX: (406)496-4849

MIRANDA, PAUL J. (2005)
Assistant Research Faculty
B.S., M.S., Montana Tech, 1992, 1996
Ph.D., University of Montana, 2005
PMIRANDA@MTECH.EDU
Ph: (406)496-4579/FAX: (406)496-4512

MITMAN, GRANT G. (1994)
Professor of Biological Sciences
B.S., Univ of MA-Dartmouth, 1980
M.S., Oregon State University, 1983
Ph.D., Dalhousie Univ, N.S., Canada, 1991
GMITMAN@MTECH.EDU
Ph: (406)496-4617/FAX: (406)496-4650

MOON, THOMAS
Assist. Professor/Lab Director of Electrical Engr
B.S., California Polytechnic State University, 1980,
Ph.D., University of Washington, 1985
TMOON@MTECH.EDU
Ph. (406)496-4516/FAX: (406)496-4849

MORRISON, JOHN, P.E. (2001)
Professor of Electrical Engineering
B.S., M.S., Univ of Connecticut, 1967, 1968
Ph.D., University of Idaho, 1992
JMORRISON@MTECH.EDU
Ph: (406)496-4515/FAX: (406) 496-4849

MUNDAY, E. PATRICK (1990)
Professor of Professional & Technical Comm.
B.S., Drexel University, 1978
M.S., Rensselaer Polytechnic Inst., 1981
M.A., Ph.D., Cornell Univ, 1987, 1990
PMUNDAY@MTECH.EDU
Ph: (406)496-4461/FAX: (406) 496-4758

MURRAY, DIANE (1972)
Instructor, Business Technology
A.A. Stephens College
B.A. University of Colorado
M.S. Montana State University
DMURRAY@MTECH.EDU
Ph: (406) 496-3727/FAX: (406) 496-3710

NOEL, DENNIS D. (2001)
Instructor, Trades & Technical
B.S., MSU Northern, 2001
DNOEL@MTECH.EDU
Ph: (406) 496-3748/FAX: (406) 496-3710

NORTH-ABBOTT, MARY (2004)
Assistant Professor, Petroleum Engineering

FACULTY

B.S., M.S., Montana Tech, 1985, 2000
MNORTHABBOTT@MTECH.EDU
Ph: (406) 496-4810/FAX: (406) 496-4417

OKRUSCH, CHAD (2005)
Assistant Professor of Professional & Technical Comm.
B.S., M.S. Montana Tech, 1997, 2000
COKRUSCH@MTECH.EDU
Ph: (406) 496-4577/FAX: (406) 496-4758

O'NEILL, TRACI (2007)
Assistant Professor of Business & Information Technology
B.S., Univ of Montana,
M.B.A., Univ of Montana,
TONEILL@MTECH.EDU
Ph: (406) 496-4892/FAX: (406) 496-4704

OTTOLINO, DAVID (2006)
Assistant Professor of Business & Information Technology
B.S., M.A., The University of Montana, 1973, 1997
DOTTOLINO@MTECH.EDU
Ph: (406) 496-4813/FAX: (406) 496-4704

OWENS, DANIEL. (2005)
Instructor Radiologic Technology
Certificate, Community College of Aurora, 1977
B.S., Montana Tech, 2004
DOWENS@MTECH.EDU
Ph: (406) 496-3761/FAX: (406) 496-3710

PARKER, STEPHEN R. (1988)
Associate Prof of Chemistry & Geochemistry
B.A., Hope College, 1970
M.S., Indiana University, 1972
Ph.D., University of Montana, 2005
SPARKER@MTECH.EDU
Ph: (406) 496-4185/FAX: (406) 495-4135
PEDULLA, MARISA (2005)
Associate Professor of Biological Sciences
B.S., Ph.D., University of Pittsburgh, 1990, 1998
MPEDULLA@MTECH.EDU
Ph: (406) 496-4835/FAX: (406) 496-4650

PETERSON, HOLLY G. (1991)
Professor of Environmental Engineering
B.S., M.S., Montana Tech, 1982, 1984
Ph.D., Washington State University, 1989
HPETERSON@MTECH.EDU
Ph: (406) 496-4339/FAX: (406) 496-4650

PETERSON, LYNNE (2001)
Assistant Professor, Nursing
B.S.N., Montana State University, 1975
LPETERSON@MTECH.EDU
Ph: (406) 496-3781/FAX: (406) 496-3710

PETRITZ, VICKIE (1989)
Instructor, Business Technology
B.S. Montana Tech, 1996
M.S., Leslie College, 2001
VPETRITZ@MTECH.EDU
Ph: (406) 496-3749/FAX: (406) 496-3710

POOLE, MICHAEL G. (1970)
Associate Professor of Mathematical Sciences
B.A., Oregon State University, 1961
Ph.D., University of Colorado, 1965
MPOOLE@MTECH.EDU
Ph: (406) 496-4362/FAX: (406) 496-4756

RAWLINS, CHARLES "HANK" (2008)
Project Engineer - CAMP
B.S., M.S., Ph.D., University of Missouri-Rolla, 1991, 1992, 2008
HRAWLINS@MTECH.EDU
Ph: (406) 496-4798/FAX: (406) 496-4512

RAY, JOHN W. (1975)
Professor of Liberal Studies
B.A., Univ of Southwest. Louisiana, 1970
M.A., Ph.D., Univ of Wisconsin-Madison, 1972, 1974
JRAY@MTECH.EDU
Ph: (406) 496-4228/FAX: (406) 496-4104

RAY, ROBERTA (1975)
Professor of Liberal Studies
B.A., California St Univ-Long Beach, 1965
M.A., Ph.D., Univ of S. CA, 1966, 1969
RRAY@MTECH.EDU
Ph: (406) 496-4110/FAX: (406) 496-4104

REICHHARDT, DAVID (2007)
Assistant Professor, Petroleum Engineering
B.S. Washington State Univ, 1990
M.S., Montana Tech, 1996
DREICHHARDT@MTECH.EDU
Ph: (406) 496-4887/FAX (406) 496-4417

REICK, KATHLEEN (2003)
Instructor and Learning Center Director
B.S. Montana State University 1969
M.Ed. University of Montana 2003
KREICK@MTECH.EDU
Ph: (406) 496-3737/FAX (406) 496-3710
RISSER, HILARY (2008)
Assistant Professor of Mathematical Sciences
B.S., B.A., M.S., Ph.D., Southern Methodist University, 2000, 2000, 2001, 2005
HRISSER@MTECH.EDU

RISSER, SCOTT (2008)
Assistant Professor of Liberal Studies
B.A., Miami University, 1999
Ph.D., University of Texas-Dallas, 2007
SRISSER@MTECH.EDU

ROSSI, RICHARD J. (1994)
Dept.. Head & Prof. of Mathematical Sciences
B.A., Sacramento State University, 1978
M.S., Iowa State University, 1980
Ph.D., Oregon State University, 1988
RROSSI@MTECH.EDU
Ph: (406) 496-4356/FAX: (406) 496-4756

SCHAHCZENSKI, CELIA (1993)
Professor of Computer Sciences
B.A., U of Cal-Santa Barbara,1978
M.S., University of Missouri, 1984
Ph.D., University of Florida, 1990
CSCHAHCZENSKI@MTECH.EDU
Ph: (406) 496-4383/FAX: (406) 496-4756

SCHLEEMAN, DOUG (1996)
Assist. Football Coach, Offensive Coordinator, and Instructor of HPER
M.S., Chadron State College, 1995
B.S., Peru State College, 1990
DSCHLEEMAN@MTECH.EDU
Ph: (406) 496-4768/FAX: (406) 496-4711

SCHRADER, SUSAN (2008)
Assistant Professor of Petroleum Engineering
B.S., Ph.D., New Mexico Tech, 1988, 2004
M.A., University of New Mexico, 1993
SSCHRADER@MTECH.EDU

SHIRK, HENRIETTA (2002)
Dept. Head & Assoc Prof of Professional & Technical Comm.
B.A., Williamette Univ, 1961
M.A., Tulane University, 1963
Ph.D., Bryn Mawr College, 1973
HSHIRK@MTECH.EDU
Ph: (406) 496-4297/FAX: (406) 496-4758

SMITH, LARRY N. (2009)
Assistant Professor of Geological Engineering
B.S., University of California-Santa Cruz, 1978
M.S., Ph.D.,University of New Mexico, 1983, 1999
LSMITH@MTECH.EDU
Ph:(406) 496-4859/FAX:(406)496-4260

SPATH, WILLIAM K. (1986)
Professor of Safety, Health and Industrial Hygiene
B.S. Ed., SE Missouri St U, 1969
Ed.M., Univ of Arizona, 1971
Ph.D., U of MO-Columbia, 1979
WSPATH@MTECH.EDU
Ph: (406) 496-4323/FAX: (406) 496-4711

SPEAR, TERRY M. (1983)
Dept.. Head & Prof of Safety, Health and Industrial Hygiene
B.A., University of MT, 1975
M.S., University of MN, 1980
Ph.D., University of MN, 1996
TSPEAR@MTECH.EDU
Ph: (406) 496-4445/FAX: (406) 496-4650

SPEECE, MARVIN A. (1992)
Professor of Geophysical Engineering
B.S., Wright St. University, 1982
M.S., Univ of Michigan, 1984
Ph.D., Univ of Wyoming, 1992
MSPEECE@MTECH.EDU
Ph: (406) 496-4188/FAX: (406)496-4664

ST. CLAIR, ANN (1999)
Library Director & Associate Prof
B.A., Saginaw Valley State College, 1994
M.L.I.S., Wayne State Univ, 1996
ASTCLAIR@MTECH.EDU
Ph: (406)496-4284/FAX: (406)496-4133

STODDEN, DON (1978)
Instructor, Trades & Technical
B.S., Northern MT College, 1984
DSTODDEN@MTECH.EDU
Ph: (406)496-3752/FAX: (406)496-3710

FACULTY

SUDHAKAR, K.V. (2008)
Assist. Professor of Metallurgical & Materials Engr.
B.S., Karnataka Regional Engr College, 1981
M.S., Indian Institute of Technology, 1991
Ph.D., Indian Institute of Science, 1997

TOBIN, MARILYN (1990)
Head Women's Volleyball Coach
Adjunct Instructor of HPER, Assistant A.D.,
B.S., Montana Tech, 1988
M.S., Wright State Univ, 1990
MTOBIN@MTECH.EDU
Ph: (406) 496-4337/FAX: (406) 496-4711

TODD, BURT (2008)
Assist. Professor of Petroleum Engineering
B.S., M.S., Montana Tech, 1979, 1985
Ph.D., University of Kansas, 1990
BTODD@MTECH.EDU

TODD, CHARLES S. (2000)
Professor of Mathematical Sciences
B.S., M.S., Ph.D., MT State University, 1988, 1989, 1995
CTODD@MTECH.EDU
Ph: (406) 496-4506/FAX (406) 496-4756

TRUDNOWSKI, DANIEL J. , P.E. (1995)
Department Head & Prof of Electrical Engr
B.S., Montana Tech, 1986
M.S., Ph.D., Montana State Univ, 1988, 1991
DTRUDNOWSKI@MTECH.EDU
Ph: (406)496-4681/FAX: (406)496-4849

VANDAVEER, KAREN (1989)
Director of Nursing/Associate Professor
BSN Montana State University, 1979
MN Montana State University, 1996
KVANDAVEER@MTECH.EDU
Ph: (406)496-3726/FAX: (406)496-3715

VAN DYNE, MICHELLE (2006)
Department Head & Assoc. Prof. of Computer Science
B.A., M.S., University of Montana, 1981, 1985
Ph.D, University of Kansas, 2003
MVANDYNE@MTECH.EDU
Ph: (406)496-4855; FAX:(406)496-4756

WAHL, NEIL K., P.E. (1988)
Professor of General Engineering
B.S., M.S., Ph.D., MSU, 1973, 1974, 2001
NWAHL@MTECH.EDU
Ph: (406)496-4120/FAX: (406)496-4849

WALKER, SUSAN
Instructor, Mathematical Science
B.S., Montana Tech, 1972
M.Ed., Lesley College, 1998
SWALKER@MTECH.EDU
Ph: (406)496-4364/FAX: (406)496-4756

WARING, GEORGE H. (1967)
Professor of Liberal Studies
B.A., M.A., Univ of Wash., 1964, 1967
GWARING@MTECH.EDU
Ph: (406) 496-4333/FAX: (406) 496-4104

WOLFGRAM, DIANE, P.E. (1992)
Prof of Geological Engineering
B.S., SD School of Mines and Technology, 1962
M.A., Ph.D., Univ of CA-Berkeley, 1974, 1977
DWOLFGRAM@MTECH.EDU
Ph: (406) 496-4353/FAX: (406) 496-4260

YOUNG, COURTNEY A. (1995)
Dept.. Head & Prof of Metallurgical & Materials Engr.
B.S., Montana Tech, 1984
M.S., VA. Polytech. Inst & St Univ, 1987
Ph.D., University of Utah, 1995
CYOUNG@MTECH.EDU
Ph: (406) 496-4158/FAX: (406) 496-4664

YOUNG, MIRIAM (2003)
Assistant Professor, Nursing
B.S. University of San Carlos, Philippines, 1975
M.S.N., University of Utah, 1995
MYOUNG@MTECH.EDU
Ph: (406) 496-3787/FAX: (406) 496-3710

ZHOU, XIAOBING (2005)
Assistant Professor Geophysical Engineering
B.Sc., Hunan Normal University, 1986
M.Sc., Sichuan University, 1989
Ph.D., University of Alaska, 2002
XZHOU@MTECH.EDU
Ph: (406) 496-4/FAX: (406) 496-4664

ZIEGLER, ROBERT E. (1974)
Professor of Liberal Studies
B.A., Stanford University, 1969
Ph.D., Cornell University, 1974
RZIEGLER@MTECH.EDU
Ph: (406) 496-4240/FAX: (406) 496-4510

MONTANA BUREAU OF MINES AND GEOLOGY ADMINISTRATION

Edmond G. Deal, Ph.D.
Director and State Geologist
EDEAL@.MTECH.EDU
Ph: (406) 496-4181
Ph: (406) 496-4179

Marvin Miller
Assistant Director of Programs
MMILLER@MTECH.EDU
Ph: (406) 496-4155

John Metesh
Chief, Research Division
JMETESH@MTECH.EDU

Carleen Cassidy B.S.
Director, Sponsored Prog&Grant Acc.
ccassidy@MTECH.EDU
Ph: (406) 496-4159

Bureau Fax: 496-4451

MONTANA BUREAU OF MINES AND GEOLOGY

ABDO, GINETTE (1990)
Senior Research
B.A., Long Island Univ, 1981
M.S., Penn. St Univ, 1989

AHERN, JULIE (2008)
Assistant Research Hydrogeologist
M.S., University of Massachusetts

BARTH, SUSAN (2004)
Publications Editor
B.A., Univ. of California Davis, 1992

BERG, RICHARD B. (1966)
Research Professor
Senior Geologist & Museum Curator
B.S., Beloit College, 1959
Ph.D., University of Montana, 1964

BERGANTINO, ROBERT N. (1974)
Associate Research Professor
Assc. Research Hydrogeologist
B.A., University of Montana, 1967

BERZEL, MATTHEW (2009)
Professional Scientist
B.S., Montana Tech, 2001

BOBST, ANDREW (1997-2000)
Associate Research Hydrogeologist
B.A.,University of Minnesota
M.A., Binghamton University

BOWLER, TOM (1994)
Field Remediation Engineer
B.S., Montana Tech 1988

CASSIDY, CARLEEN (1996)
Director, Sponsored Programs& Grant Accounting
B.S., Montana Tech, 1990

CARSTARPHEN, CAMELA (1994)
Assistant Research Professor, Hydro-geologist
B.A., Univ of North Carolina, 1989
M.S., Oregon State Univ, 1991

DEAL, EDMOND G. (1998)
Director and State Geologist
A.B., Catawba College
M.S., Arizona State University
Ph.D., University of New Mexico

DUAIME, TERENCE E. (1985)
Associate Research Hydrogeologist
Assistant Research Professor
B.S., Montana Tech, 1978

ELLIOTT, COLLEEN (2007)
Associate Research Professor
B.Sc., Univ. Saskatchewan, 1982
Ph.D., Univ. of New Brunswick, 1988

FOLEY, JOHN (2006)
Museum Assistant
B.S., University of Montana, 1981

GUNDERSON, JAY (2006)
Coal Resources Geologist, Research Professor
B.S., University of Minnesota, 1984
M.S., University of Montana, 1989

HARGRAVE, PHYLLIS A. (1997)
Assistant Research Hydrogeologist
Assistant Research Professor
B.S., St. Lawrence Univ, 1978
M.S., Montana Tech, 1990

ICOPINI, GARY (2005)
Associate Hydrogeologist
Associate Research Professor
B.A., University of Montana, 1990
M.S., University of Nevada - LV, 1993
Ph.D., Michigan State University, 2000

KERSHEN, MICHAEL D. (1999)
Hydrogeologist
B.S., Mesa State College, 1983

KUZARA, SHAWN (2005)
Professional Scientist
B.A., Montana State University, 2000

LaFAVE, JOHN I. (1993)
Hydrogeologist
Senior Research Professor
B.S., Univ of Wisconsin-Madison, 1983
M.A., Univ of TX-Austin, 1987

LONN, JEFFREY D. (1991)
Assistant Research Geologist
Assistant Research Professor
B.S., Colorado College, 1979
M.S., University of Montana, 1985

McCULLOCH, ROBIN B. (1988)
Associate Mining Engineer and Staff
Field Agent
Assistant Research Professor
B.S., North Dakota State, 1974
B.S., University of Idaho, 1979
M.S., Montana Tech, 1999

MCDONALD, CATHERINE (1997)
Associate Research Professor
B.Sc., University of Washington
M.S., University of California

McGRATH, STEVE (2005)
Organic Chemist, Associate Research Professor
B.A., University of Montana, 1974
B.S., M.S., M.S., Montana Tech 1980, 1983, 1992

MEREDITH, ELIZABETH (2007)
Assistant Research Professor
B.A., Whitman College, 1998
Ph.D., University of Wyoming, 2007
Ph: (406)657-2929

METESH, JOHN (1990)
Research Division Chief
Hydrogeologist
Sr. Research Professor
B.S., Montana State Univ, 1986
M.S., Montana Tech, 1990
Ph.D., University of Montana, 2004

MICHALEK, THOMAS (2008)
Senior Research Hydrogeologist
B.S., University of Wyoming, 1991
M.S., University of Montana, 2001

MILLER, MARVIN (1967)
Research Professor
Assistant Director of Programs
Senior Hydrogeologist
B.A., University of Montana, 1963
M.S., Indiana University, 1965

PATTON, THOMAS W. (1978)
Senior Hydrogeologist
Research Professor
Program Manager
Groundwater Assessment Program
B.A., Valparaiso Univ, 1973
M.S., Montana Tech, 1987

REITEN, JON (1985)
Hydrogeologist
Research Professor
B.S., M.S., Univ. of North Dakota, 1973, 1983

SANDAU, KEN (2000)
Geographic Information Systems Specialist
A.A.S., COT, Montana Tech, 1999

SCHMIDT, FRED (1974)
Asst Research Hydrogeologist
Assistant Research Professor
B.S., Montana Tech, 1973

SMITH, DEBORAH (2008)
Professional Scientist
Seismic Analyst
B.S., M.S., Montana Tech, 1996, 2006

SMITH, SUSAN M. (1998)
Geologic Cartographer
B.S., Montana State Univ, 1970

STICKNEY, MICHAEL C. (1980)
Geologist, Director
Office of Earthquake Studies
Sr. Research Professor
B.A., M.S., University of Montana, 1978, 1980

SUTHERLAND, MARY (2003)
Assistant Research Hydrogeologist
B.S., James Madison University
M.S., University of Montana

THALE, PAUL (1999)
Geographic Info Systems Specialist
B.S., MSU-Bozeman, 1987

TUCCI, NICK (2006)
Hydrogeologist
B.S., Youngstown State Univ, 2002
M.S., Montana Tech, 2005

VUKE, SUSAN (1981)
Associate Research Geologist
Assistant Research Professor
B.S., Indiana University, 1972
M.S., University of Montana, 1981

WAREN, KIRK (2007)
Senior Research Hydrogeologist
B.A., Univ. of MT, 1985
M.S., Wright State Univ., 1988

WHEATON, JOHN (1988)
Senior Research Hydrogeologist
B.A., M.S., University of Montana, 1980, 1987

FACULTY EMERITI

AHMED, TAREK (1980-2002)
Professor Emeritus (Petroleum Engineering)

BEUERMAN, DONALD (1971-1990)
Professor Emeritus (Chemistry & Geochemistry)

BISHOP, JEAN (1974-1999)
Professor Emeritus (Library)

BRADLEY, DAN (1979-2001)
Professor Emeritus (Petroleum Engineering)

BROGAN, JUDY
Professor Emeritus (Business Technology)

BROWER, JOHN C. (1982-2007)
Professor Emeritus (Mining Engineering)

BURT, VICTOR D. (1957-1988)
Vice-President of Fiscal Affairs
and Administrative Services Emeritus,
and Professor Emeritus (Business)

CARTER, DAVID S. (1980-2008)
Professor Emeritus (Professional and Technical Communication)

CORTESE, JOANNE G. (1981-2001)
Professor Emeritus (Technical Communications, Humanities and Social Sciences)

COX, WILLARD E. (1957-1994)
Professor Emeritus (Geological Engineering)

DIEBOLD, FRANK (1967-1997)
Professor Emeritus (Chemistry & Geochemistry)

DREW, DOUGLASS A. (1977-2009)
Professor Emeritus (Chemistry & Geochemistry)

DRESSER, HUGH W. (1965-1995)
Professor Emeritus (Geological Engineering)

EARLL, FRED (1957-1988)
Professor Emeritus (Geological Engineering)

FINCH, THOMAS E. (1966-1999)
Professor Emeritus (Mining Engineering)

FRIEL, LEROY L., P.E. (1976-2008)
Professor Emeritus (General Engineering)

GLESS, ELMER E. (1968-94)
Professor Emeritus (Biological Sciences)

GOEBEL, JACK B. (1967-1994)
Professor Emeritus (Mathematics and C.S.)

GRIFFITHS, VERNON (1959-1999)
Professor Emeritus (Metallurgical & Materials Engineering)

GROFF, SIDNEY L. (1957-1983)
Professor Emeritus (MBMG)

HALEY, DENNIS (1969-2004)
Professor Emeritus (Mathematical Sciences)

HESS, LINDSAY L. (1983-1996)
Professor Emeritus (Engineering Science)

HILPERT, CONRAD R, P.E. (1981-2001)
Professor Emeritus (General Engineering)

HOLDSWORTH, BOB (1965-2007)
Professor Emeritus (Liberal Studies)

KASPERICK, JOSEPH E. (1968-2000)
Professor Emeritus (Business and Information Technology)

LESTER, THOMAS F. (1966-1997)
Professor Emeritus (Humanities and Social Sciences)

LUPKIEWICZ, NINA (1976-2006)
Professor Emeritus (Mathematical Sciences)

MCGUIRE, JOHN (1970-2005)
Professor Emeritus (General Engineering)

MICHELOTTI, JAMES F. (1974-2001)
Professor Emeritus (Computer Science)

NORMAN, JULIE (1984-2000)
Professor Emeritus (SHIH)

RIVERS, LUKE (1968-1984)
Professor Emeritus (Business and Econ.)

SATTER, ELIZABETH S. (1957-1971)
Professor Emeritus (Mathematics)

SAWYER, PAUL T. (1969-2002)
Professor Emeritus (Biological Sciences)

SILL, WILLIAM R. (1983-2005)
Professor Emeritus (Geophysical Engineering)

SONDEREGGER, JOHN L. (1974-1996)
Professor Emeritus (Geological Engineering)

STOLZ, GUSTAV, JR. (1955-1983)
Professor Emeritus (Petroleum Engineering)

STUDEBAKER, IRVING G. (1982-1996)
Professor Emeritus (Mining Engineering)

TOIVONEN, VIRGINIA (1978-2008)
Professor Emeritus (Mathematical Sciences)

TWIDWELL, LARRY G. (1969-2005)
Professor Emeritus (Metallurgical & Materials Engineering)

VOLBORTH, ALEXIS (1979-1992)
Professor Emeritus (Geological Engineering and Chemistry & Geochemistry)

WARING, GEORGE H. (1967-2009)
Professor Emeritus (Liberal Studies)

WARING, THOMAS (1974-2004)
Professor Emeritus (Environmental Engineering)

WEIGHT, WILLIS (1988-2008)
Professor Emeritus (Geological Engineering)

WIDEMAN, CHARLES J. (1968-2000)
Professor Emeritus (Geophysical Engineering)

ZUCKER, GORDON L. . (1975-1994)
Professor Emeritus (Metallurgical & Materials Engineering)

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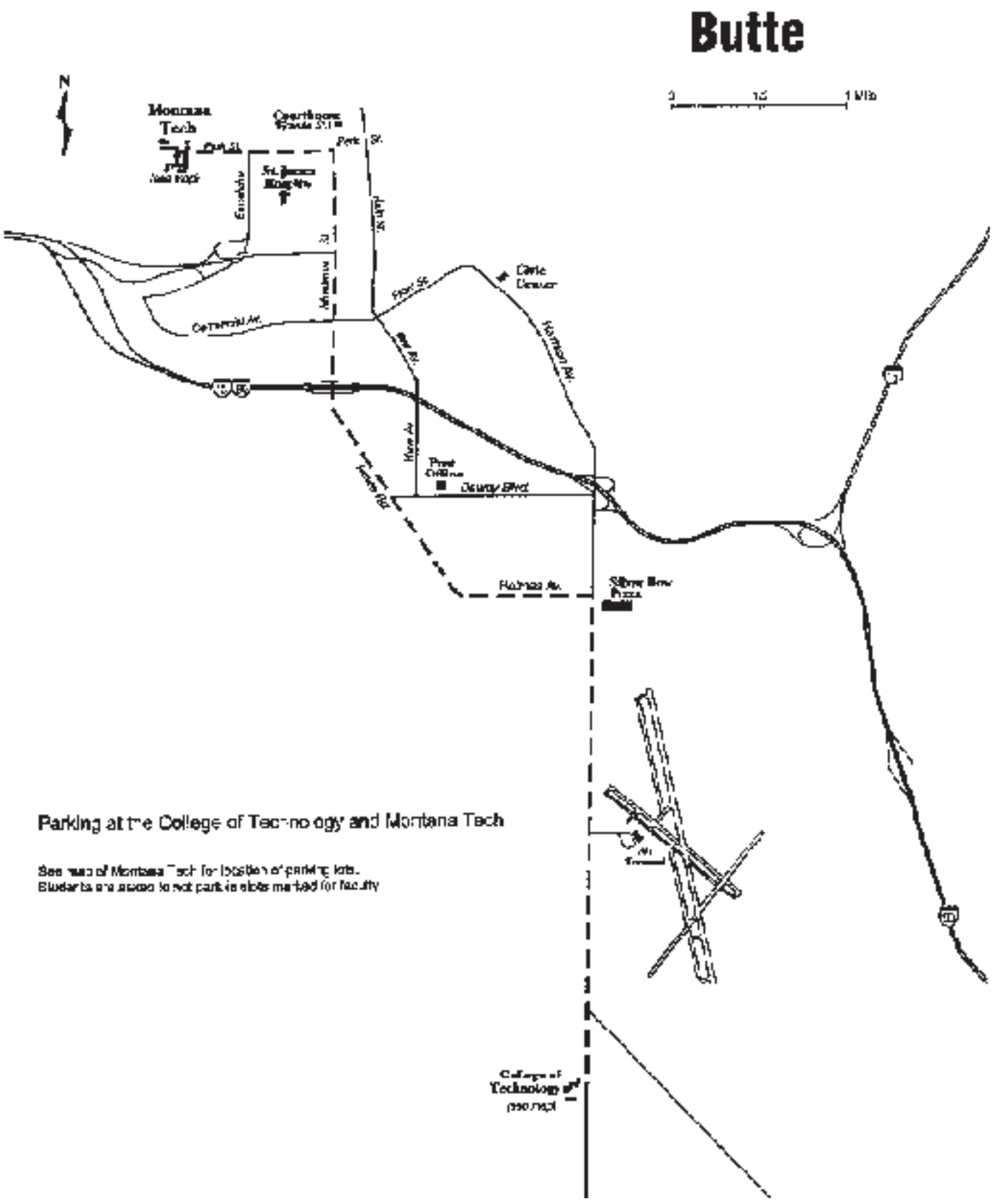

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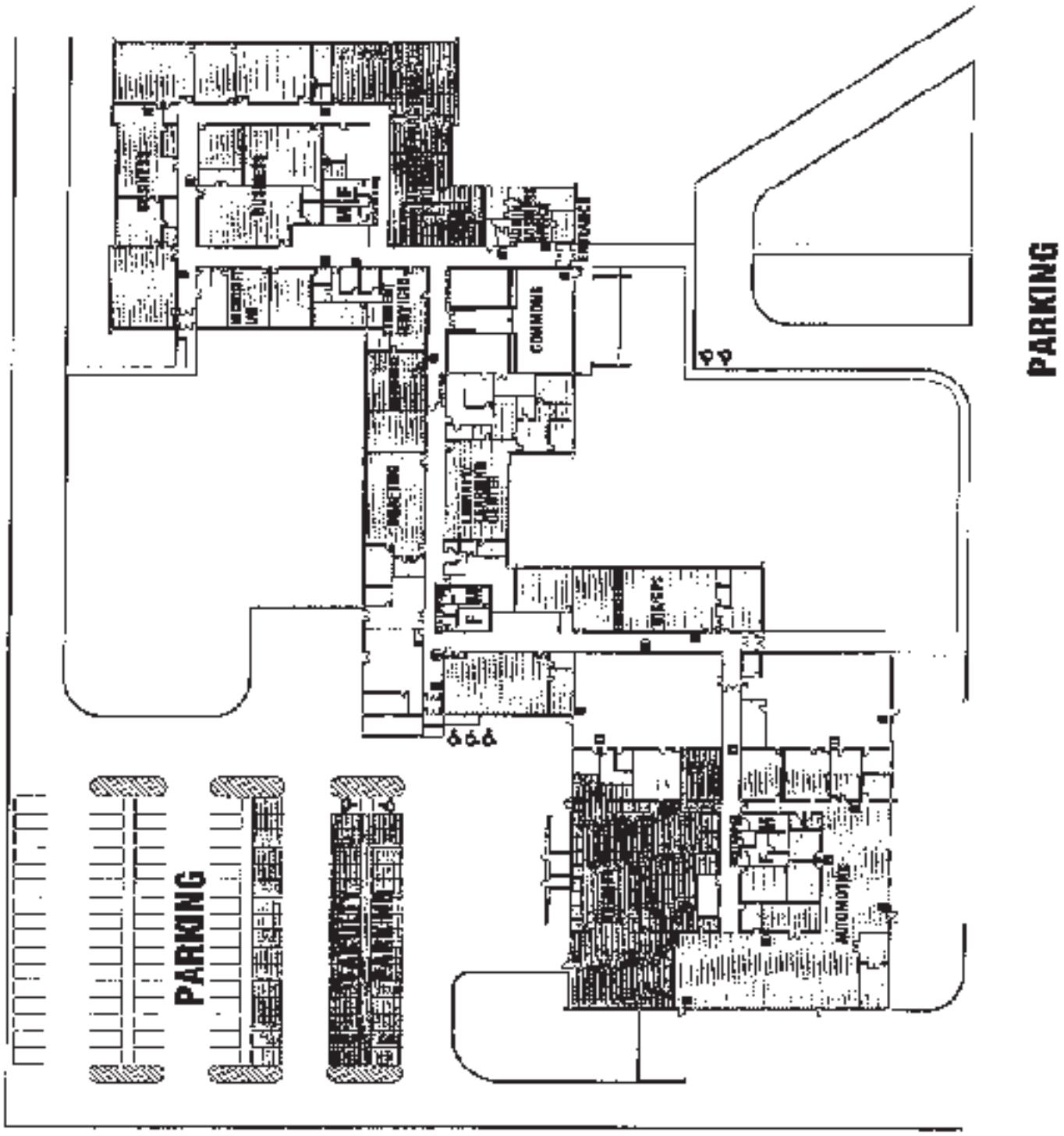

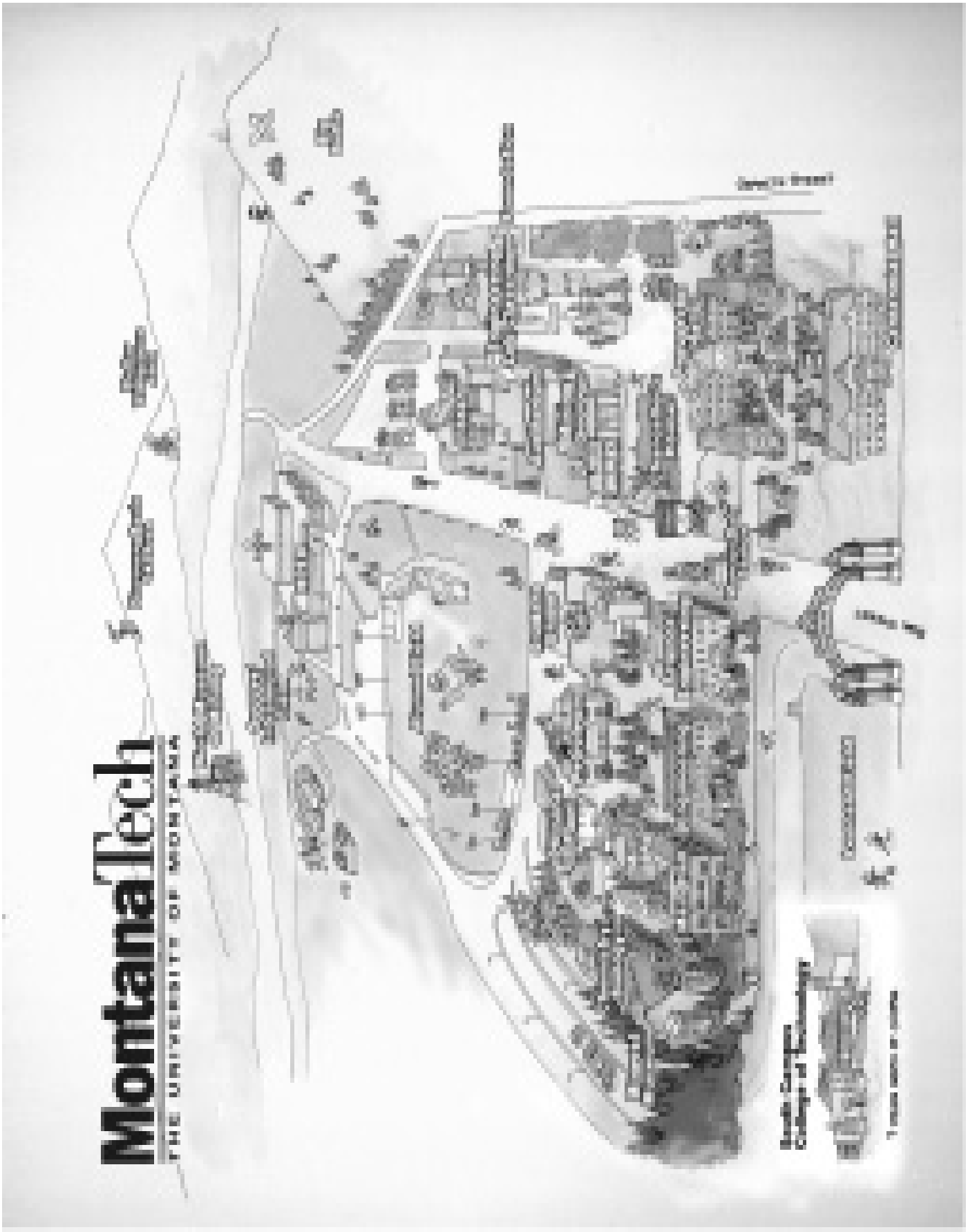
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