2010-11 Catalog Description:
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.

Credits: 3 Credit-Hours (2 Lecture and 1 Laboratory)

Designation: Elective

Prerequisites: METE 2320 or Consent of instructor

Lab: Students must register for METE 5110 Lab (Co-requisite). This 'hands-on' experience with spreadsheets is provided without which the lecture material cannot be completely understood.

Textbooks: Handouts are on-line using Blackboard from notes and references.

References:

Relationship of Course to Metallurgical & Materials Engineering Program Outcomes: This course focuses on the use of spreadsheets for designing belt conveyors and pipelines and consequently helps to conclude the design experience of Metallurgical and Materials Engineering students particularly those interested in process engineering.

Objectives:
This course gives engineering students a design experience using spreadsheet calculations to size pipelines and slurry pumps for handling wet solids and to size conveyor belts and drives for handling dry solids. The course covers some aspects of fluid dynamics. Resulting spreadsheets overcome problems with circular references.

Outcomes: Graduates of this course will or will be able to:
1. Use spreadsheets for design calculations and other purposes as will be demanded on future jobs.
2. Overcome problems of circular references which make calculations of this nature tedious.
3. Understand how parameters affect various calculations and thus how they may be manipulated to modify answers (pipeline diameter, belt size, horsepower, etc.) and minimize costs (operating, capital, etc.).
4. Gain knowledge in fluid dynamics, hopefully enough to pass said portion of the FE examination.
5. Have an appreciation for other materials handling techniques (feeders, bins, pneumatic conveying, etc.).
6. Gain experience at gathering plant data for analytical and design purposes.
7. Be prepared for employment and success in industry, particularly those with materials handling needs.
8. Meet ABET Outcomes a, c and k (consult the Course Catalog and Department Guidelines)

Topics:
1. Materials Handling – Definition and Scope (1 class)
2. Dynamic and Static Heads (3 classes)
3. Pump Characteristics and Types (1 class)
4. Worster Equation (3 classes)
5. Calculation of Pipeline Parameters (5 classes)
6. Slurry Rheology and Particle Settling (3 classes)
7. Conveyor Belt Characteristics and Types (3 classes)
8. Tension Equations (3 classes)
9. Calculation of Conveyor Belt Parameters (3 classes)
10. Belt Brakes and Stops (1 class)
11. Feeders (1 class)
12. Pneumatic Conveying and Storage in Bins (as possible)
13. Final Oral Examinations (2 classes)
14. Field Trip to MR (1 class: Tailings Line and Conveyor Belt #7)

Homeworks: Homeworks are required periodically and are due one week after they are given.

Computer Usage: Major spreadsheet problems including mass balances are required:
1. Pipeline Design (7 weeks)
2. Conveyor Belt Design (8 weeks)

Laboratory Projects: Industrial Fieldtrips are used to collect samples and gather data for both Spreadsheets.
1. Industrial Field Trip (1 class)
2. Sample Analyses (2 classes)

Examinations: One-on-one oral examinations will be given over each spreadsheet.

Attendance: Attendance is critical and can lower grade by as much as two letters. There will be no class the week of Feb 28-March 4. The course lectures will conclude approximately April 14.

Grading: The final grade will be weighted from course elements approximately as follows:
- Homework Assignments 10%
- Oral Examinations 60%
- Laboratory Reports 10%
- Attendance 20%

Professional Component:
- Engineering Topics – 100%
- Engineering Design – Yes
- Computer Usage – Spreadsheets
- Ethics – No
- Statistics – Yes (limited)
- Safety – Yes (some industry and laboratory)

ABET Outcomes Covered: a, c and k

Prepared by: C.A. Young Date: January 8, 2011