EMAT 595 Special Topics  
Instructor: Dr. Sudhakar K.V.  
Biomaterials  
Office: ELC 218, x 4267  
Lecture: Tu, Th: 11:00–11:50 am, ELC 106  
Office Hours: M through F, 1:00-1:50 p.m. or by appointment  

2011-2012 Catalogue Description:  
Various classes of biomaterials are introduced and their processing, structure and bulk/surface properties are discussed to evaluate their similarities and differences. Specific processing methods, surface and bulk property characterization of biomaterials are explored. The basic principles of tissue engineering are discussed and their influence on the performance and useful life in terms of degradation of synthetic implants are discussed.

Credits:  
2.0 Credit Hours (Lectures)  

Designation:  
Special Topics

Prerequisites:  
CHEM 1066, MATH 1530, EMAT 251,351,353,354, 471 or consent of the instructor.

Lab:  
There is no lab allotted to this course.

Textbook:  

Additional References:  

Relationship of Course to Metallurgical and Materials Engineering Program Outcomes:  
This course introduces various advanced materials in biomedical applications/engineering and addresses various processing and testing methods, structure and property relationship in them.

Objectives: The objective of this course is to provide the student with:
♦ Classification of biomaterials and their varieties of applications inside human body  
♦ Properties/characteristics of each type of biomaterial and method/s of evaluating them  
♦ Basic principles of tissue engineering  
♦ Interactions between synthetic implants and biological environments

Outcomes: Graduates of the course will be able to:
♦ Describe the similarities and differences between various classes of biomaterials in terms of their atomic/chemical structure and function  
♦ Describe the similarities and differences between various mechanical and/or analytical methods used for characterizing bulk and surface properties of biomaterials  
♦ Evaluate processing methods and structure-property correlations in biomaterials  
♦ Understand various aspects of biodegradable biomaterials in tissue engineering  
♦ Fulfill ABET outcomes a, e and l (consult the Course Catalog and Department Guidelines)
**Tentative Course Plan**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Forecast lectures</th>
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<tbody>
<tr>
<td>1. Introduction to biomaterials</td>
<td>1</td>
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<tr>
<td>2. Materials for Biomedical applications</td>
<td>2</td>
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<td>3. Chemical structure of Biomaterials</td>
<td>2</td>
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<td>4. Metallic implant materials</td>
<td>2</td>
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<td>5. Ceramic implant materials</td>
<td>2</td>
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<td>6. Polymeric implant materials</td>
<td>2</td>
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<td>7. Composites as biomaterials</td>
<td>3</td>
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<td>8. Processing of biomaterials</td>
<td>3</td>
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<td>9. Bulk and surface properties of biomaterials</td>
<td>3</td>
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<tr>
<td>10. Structure-property relationships in biological materials</td>
<td>3</td>
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<tr>
<td>11. Biodegradable materials for tissue engineering</td>
<td>2</td>
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<tr>
<td><strong>Tests</strong></td>
<td><strong>3</strong></td>
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<td><strong>Total</strong></td>
<td><strong>28</strong></td>
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**Assessment:**

- HW / Quiz: 20%
- Tests (3): 60%
- Project/Term Paper: 20%
- Total: 100%

*Excessive absence will result in lowering of the final grade.*

**Academic Integrity:**

Academic dishonesty or cheating will not be tolerated. Acts of academic dishonesty include (but are not limited to):

- Plagiarism
- Copying from another student’s paper while taking a quiz or examination
- Using unlawful aids (books, notes, cell phones or other electronic devices, etc.) to pass an examination (*unless the instructor has clearly stated that it is an open notes or open book exam*)
- Assisting another student in an act of academic dishonesty

If it is determined that a student has deliberately cheated on a quiz, examination, or assignment, he or she will be dropped from the course with an “F” grade. In compliance with Montana Tech policy, cases of academic dishonesty will be reported to the Office of the Vice Chancellor for Academic Affairs.

With one exception, the Department policy is that electronic devices are not to be activated or evident during lectures and examinations. This restriction includes but is not limited to programmable calculators, cell phones, Ipods, or entertainment devices. The exception is that students are permitted to use a calculator from the following list during lectures, quizzes, and exams:

- Casio – any model fx-115 calculator
- Hewlett-Packard – the HP33s and 35s models
- Texas Instruments – all TI-30X or TI-36X models
Students that possess unapproved calculators or other electronic devices during a quiz or exam are subject to dismissal from the classroom. Penalties for disregarding the policy during lecture will be enforced at the instructor’s discretion.

**Contribution to Professional Component:**

- Engineering Topics- Yes
- Engineering Design- Yes (Introductory)
- Computer Usage- Yes
- Ethics- No
- Statistics- No
- Safety- No

**ABET outcomes covered:** a, e and l

**Prepared by:** Dr. Sudhakar K.V.  
**Date:** January 9, 2012