Biomedical Engineering Minor

Minimum number of credit hours: 15 hours, consisting of 1 required course, Cer Eng 3110: Introduction to Biomedical Engineering, plus at least 4 courses from an approved list. At least 2 of the elective courses will be at or above the 4000 level. Core courses used toward a student’s major degree requirements cannot be used for the minor degree program in BME. Elective courses used toward a student’s major degree requirements or another minor degree program cannot be used unless they are approved by the biomedical engineering program committee.

Elective courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO SCI 2213</td>
<td>Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 2219</td>
<td>Cell Biology Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>BIO SCI 2223</td>
<td>General Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 3313</td>
<td>Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 3319</td>
<td>Microbiology Lab</td>
<td>2</td>
</tr>
<tr>
<td>BIO SCI 3333</td>
<td>Human Anatomy and Physiology I</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 3339</td>
<td>Human Anatomy Physiology I Lab</td>
<td>1</td>
</tr>
<tr>
<td>BIO SCI 3343</td>
<td>Human Anatomy and Physiology II</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 3349</td>
<td>Human Anatomy and Physiology II Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>BIO SCI 3483</td>
<td>Biomedical Problems</td>
<td>3</td>
</tr>
<tr>
<td>CHEM ENG 4210</td>
<td>Biochemical Reactors</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 4323</td>
<td>Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 4353</td>
<td>Cancer Cell Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 4383</td>
<td>Toxicology</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 4610</td>
<td>General Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 4620</td>
<td>Metabolism</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 5001</td>
<td>Special Topics</td>
<td>0-6</td>
</tr>
<tr>
<td>BIO SCI 5240/ MS&amp;E 5210</td>
<td>Tissue Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>MS&amp;E 5310/ BIO SCI 5210/ CHEM ENG 5200</td>
<td>Biomaterials I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM ENG 5320</td>
<td>Introduction to Nanomaterials</td>
<td>3</td>
</tr>
<tr>
<td>BIO SCI 5323</td>
<td>Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>STAT 5425</td>
<td>Introduction to Biostatistics</td>
<td>4</td>
</tr>
<tr>
<td>ENG MGT 5511</td>
<td>Technical Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>MET ENG 4099</td>
<td>Undergraduate Research</td>
<td>0-6</td>
</tr>
</tbody>
</table>

1 Undergraduate Research may be taken in any science or engineering discipline.

Mohsen Asle Zaeem, Assistant Professor  
PHD Washington State University

Richard K Brow, Curators Professor  
PHD Pennsylvania State University

Fatih Dogan, Professor  
PHD Technical University of Berlin

William G Fahrenholtz, Curators Professor  
PHD University of New Mexico

Gregory E Hilmas, Curators Professor  
PHD University of Michigan-Ann Arbor

Wayne Huebner, Professor  
PHD University of Missouri-Rolla

F Scott Miller, Teaching Professor  
PHD University of Missouri-Rolla

Michael Scott Moats, Associate Professor  
PHD University of Arizona

Joseph W Newkirk, Associate Professor  
PHD University of Virginia

Matthew J O’Keefe, Professor  
PHD University of Illinois Urbana

Ronald J O’Malley, Professor  
PHD Massachusetts Institute of Technology

Mohamed N Rahaman, Professor  
PHD University of Sheffield (UK)

Von L Richards, Professor  
PHD University of Michigan-Ann Arbor

Mark E Schlesinger, Professor  
PHD University of Arizona

Jeffrey D Smith, Associate Professor  
PHD University of Missouri-Rolla

David C Van Aken, Curators Teaching Professor  
PHD University of Illinois Urbana

Jeremy Lee Watts, Research Assistant Professor  
PHD Missouri S&T

Caizhi Zhou, Assistant Professor  
PHD Iowa State University

MS&E 4001 Special Topics (LAB 0.0 and LEC 0.0)  
This course is designed to give the department an opportunity to test a new course. Variable title.

MS&E 5000 Special Problems (IND 0.0-6.0)  
Problems or readings on specific subjects or projects in the department. Consent of instructor required.

MS&E 5001 Special Topics (LEC 0.0-6.0)  
This course is designed to give the department an opportunity to test a new course. Variable title.

MS&E 5010 Seminar (RSD 0.0-6.0)  
(Variable) Discussion of current topics.

MS&E 5040 Oral Examination (IND 0.0)  
(Variable) After completion of all other program requirements, oral examinations for on-campus M.S./Ph.D students may be processed during intersession. Off-campus M.S. students must be enrolled in an oral examination and must have paid an oral examination fee at the time of the defense/comprehensive examination (oral/written). All other students must enroll for credit commensurate with uses made of facilities and/or faculties. In no case shall this be for less than three (3) semester hours for resident students.

MS&E 5099 Research (IND 0.0-15)  
(Variable) Investigations of an advanced nature leading to the preparation of a thesis or dissertation. Consent of instructor required.
**MS&E 5210 Tissue Engineering I** (LEC 3.0)
The course will introduce senior undergraduate students to the principles and clinical applications of tissue engineering including the use of biomaterials scaffolds, living cells and signaling factors to develop implantable parts for the restoration, maintenance, or replacement of biological tissues and organs. Prerequisite: Senior standing. (Co-listed with Bio Sci 5240).

**MS&E 5220 Advanced Phase Equilibria** (LEC 3.0)
Advanced aspects of unary, binary and ternary organic, phase equilibria. Includes practical examples of the applications of phase diagrams to solve engineering problems. Prerequisite: Graduate standing.

**MS&E 5230 Energy Materials** (LEC 3.0)
The objectives of the course are to understand how the rational design and improvement of chemical and physical properties of materials can lead to energy alternatives that can compete with existing technologies. Discussions on the present and future energy needs from a viewpoint of multidisciplinary scientific and technological approaches. Prerequisite: Senior standing.

**MS&E 5310 Biomaterials I** (LEC 3.0)
This course will introduce senior undergraduate students to a broad array of topics in biomaterials, including ceramic, metallic, and polymeric biomaterials for in vivo use, basic concepts related to cells and tissues, host reactions to biomaterials, biomaterials-tissue compatibility, and degradation of biomaterials. Prerequisites: Senior undergraduate standing. (Co-listed with BIO SCI 5210, CHEM ENG 5200).

**MS&E 5517 Materials Selection in Mechanical Design** (LEC 3.0)
This course will introduce the basics of materials selection in mechanical design. It will also introduce the benefits of computational materials and process selection. The students will also learn to use a commercially available materials selection software. This course will be offered as Distance Ed. Prerequisite: Met Eng 2110.