

MATERIALS SCIENCE AND ENGINEERING

Biomedical Engineering Minor

Minimum number of credit hours: 15 hours, consisting of one required course, CER ENG 3110: Introduction to Biomedical Engineering, plus at least four courses from an approved list. At least two 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:

BIO SCI 2213	Cell Biology	3
BIO SCI 2219	Cell Biology Laboratory	1
BIO SCI 2223	General Genetics	3
BIO SCI 3313	Microbiology	3
BIO SCI 3319	Microbiology Lab	2
BIO SCI 3333	Human Anatomy and Physiology I	3
BIO SCI 3339	Human Anatomy Physiology I Lab	1
BIO SCI 3343	Human Anatomy and Physiology II	3
BIO SCI 3349	Human Anatomy and Physiology II Laboratory	1
BIO SCI 3483	Biomedical Problems	3
CHEM ENG 4210	Biochemical Reactors	3
BIO SCI 4323	Molecular Genetics	3
BIO SCI 4353	Cancer Cell Biology	3
BIO SCI 4383	Toxicology	3
CHEM 4610	General Biochemistry	3
CHEM 4620	Metabolism	3
BIO SCI 5001	Special Topics	0-6
BIO SCI 5240/ MS&E 5210	Tissue Engineering	3
BIO SCI 4666	Nanobiotechnology	3
BIO SCI 6666	Advanced Nanotechnology in Biomedicine	3
MS&E 5310/ BIO SCI 5210/ CHEM ENG 5200	Biomaterials I	3
CHEM ENG 5320	Introduction to Nanomaterials	3
BIO SCI 5323	Bioinformatics	3
STAT 5425		4
ENG MGT 5511	Technical Entrepreneurship	3
MET ENG 4099	Undergraduate Research ¹	0-6

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

Laura Bartlett, Associate Professor
PHD Missouri University of Science and Technology

Richard K Brow, Curators Distinguished Professor
PHD Pennsylvania State University

Anthony Convertine, Assistant Professor
PHD University of Southern Mississippi

Fatih Dogan, Professor
PHD Technical University of Berlin

Arezoo Emdadi, Assistant Professor
PHD Missouri University of Science and Technology

William G Fahrenholtz, Curators Distinguished Professor
PHD University of New Mexico

Yijia Gu, Assistant Professor
PHD Pennsylvania State University

Gregory E Hilmas, Curators Distinguished Professor and Department Chair
PHD University of Michigan-Ann Arbor

Wayne Huebner, Professor
PHD University of Missouri-Rolla

Aditya Kumar, Assistant Professor
PHD Ecole Polytechnique Federale de Lausanne (EPFL)

Simon Lekakh, Research Professor
PHD Belorussian Polytechnic Institute

David Lipke, Assistant Professor
PHD Georgia Institute of Technology

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

Michael Scott Moats, Professor
PHD University of Arizona

Joseph W Newkirk, Professor
PHD University of Virginia

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

Jeffrey D Smith, Professor
PHD University of Missouri-Rolla

David C Van Aken, Professor Emeritus¹
PHD University of Illinois Urbana

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

Haiming Wen, Assistant Professor
PHD University of California-Davis

Kelley Wilkerson, Assistant Teaching Professor
PHD Missouri University of Science and Technology

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 4810 Chemistry And Inherent Properties Of Polymers (LEC 3.0)
A basic study of the organic chemistry of natural and synthetic high polymers, their inherent properties and their uses in plastic, fiber, rubber, resin, food, paper and soap industries. Prerequisite: Chem 1320 or Met Eng 1210. (Co-listed with Chem 4810).

MS&E 4819 Polymer Science Laboratory (LAB 1.0)

Lectures and laboratory experiments dealing with polymerization reactions, solution properties and bulk or solid properties will be presented. Each student will prepare polymers and carry out characterization experiments on actual samples. Prerequisite: Chem 4810 or MS&E 4810 and preceded or accompanied by Chem 1100. (Co-listed with Chem 4819).

MS&E 4850 Fundamentals Of Protective Coating I (LEC 3.0)

Study of the basic principles of protective coatings with particular reference to the paint and varnish industry. Classifications, manufacture, properties and uses of protective coatings. Prerequisite: Chem 1320. (Co-listed with Chem 4850).

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 intercession. 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 5060 Chemistry of Construction Materials (LEC 3.0)

The objective of the course is to utilize fundamental concepts of materials science and chemistry to understand, analyze, and describe the chemistry of construction materials. Special focus is given to describe composition-reactivity-microstructure-property relations in various cementitious materials. Prerequisites: At least Senior standing.

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 (LEC 3.0)

The course will use problem-based case studies to introduce junior and senior undergraduate students to the principles and clinical applications of tissue engineering. Topics include the use of biomaterials, scaffolds, cells, and external factors to develop implantable parts for the restoration, maintenance, or replacement of tissues and organs. Prerequisite: Junior or 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 view point 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 5460 Molecular Engineering of Materials (LEC 3.0)

This course focuses on the fundamentals of molecular engineering with an emphasis on their applications including renewable/clean energy solutions, energy storage, air/water cleaning, and optoelectronics. Topics include principles of modern physics, carbon chemistry, macromolecules, metal(covalent)-organic frameworks sol-gel processing and crystal growth. Prerequisites: Senior Standing or consent of instructor. (Co-listed with Chem 5460).

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.

MS&E 5810 Introduction to Polymeric Materials (LEC 3.0)

A basic study of the organic chemistry of natural and synthetic high polymers, their inherent properties and their uses in plastic, fiber, rubber, resin, food, paper and soap industries. Credit may not be given for both Chem 5810 and Chem 4810. Prerequisite: Chem 1320. (Co-listed with Chem 5810 and Chem Eng 5810).

MS&E 5819 Polymer Synthesis and Characterization Lab (LAB 1.0)

Laboratory experiments dealing with polymerization syntheses and solution, bulk and solid properties will be presented. Each student will prepare polymers and carry out all characterization experiments on actual samples. Credit may not be given for both Chem 5819 and Chem 4819. Prerequisite: Chem 4810 or MS&E 4810 or Chem 5810 or MS&E 5810 or Chem Eng 5310, preceded or accompanied by Chem 1100 or Chem 5100 or an equivalent training program approved by S&T. (Co-listed with Chem 5819).

MS&E 5850 Introduction to Coating Chemistry (LEC 3.0)

Study of the basic principles of protective coatings with particular reference to the paint and varnish industry. Classifications, manufacture, properties and uses of protective coatings. Credit may not be given for both Chem 5850 and Chem 4850. Prerequisite: Chem 1320 or Met Eng 1210. (Co-listed with Chem 5850).
