Metallurgical and Materials Engineering Courses

Courses

MME 5191. Individual Studies.
Individual Studies (0-0-1) Individual variable credit research, design, or analysis on advanced phases of metallurgical and materials engineering problems conducted under the direct supervision of a faculty member. A maximum of 3 credit hours may be applied towards the MS degree. Prerequisite: Department approval.
Department: Metallurgical & Materials Eng.
1 Credit Hour
1 Total Contact Hour
0 Lab Hour
0 Lecture Hour
1 Other Hour

MME 5194. Graduate Research.
Graduate Research (0-0-1) Individual variable credit research of contemporary topics in metallurgical and materials engineering.
Department: Metallurgical & Materials Eng.
1 Credit Hour
1 Total Contact Hour
0 Lab Hour
0 Lecture Hour
1 Other Hour

MME 5195. Graduate Seminar.
Graduate Seminar (1-0) Conferences and discussions of various, contemporary topics in metallurgical and materials engineering by faculty, graduate students, and speakers from industry, government, or other academic institutions or departments. The program is organized to encourage the development of communication skills at a professional level for graduate students. Required of all graduate students during each semester of full-time enrollment. Up to 3 credits can be applied to the degree.
Department: Metallurgical & Materials Eng.
1 Credit Hour
1 Total Contact Hour
0 Lab Hour
1 Lecture Hour
0 Other Hour

MME 5294. Graduate Research.
Graduate Research (0-0-2) Individual variable-credit research of contemporary topics in metallurgical and materials engineering.
Department: Metallurgical & Materials Eng.
2 Credit Hours
4 Total Contact Hours
0 Lab Hours
2 Lecture Hours
2 Other Hours

MME 5302. Materials Extraction & Synthesis.
Materials Extraction, Synthesis, and Processing (3-0) Thermodynamic, thermochemical, electrochemical kinetic, and phase equilibrium fundamentals and fundamental structures and properties of materials applied to examples of ferrous and non-ferrous extraction and processing. Examples include copper extraction, refinement, processing, alloying and performance; iron and steel making and iron alloy processing, metal and ceramic powder processing, and contemporary materials synthesis and processing. Offered in alternate years.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
MME 5304. Phase Transformations & Micros.
Phase Transforming and Microstructures (3-0) The theory of the nucleation and growth kinetics of solid materials, solid-solid transformations and mechanisms. Rate processes, decomposition and ordering reactions and microstructures. Diffusionless transformations, eutectoid, and martensitic transformations are covered along with associated microstructural morphologies and property/ performance control by microstructure control in materials. Prerequisite: MME 3406 and 3407, or equivalent, MME 5401, or department approval.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MME 5306. Advanced Materials Processing.
Advanced Materials Processing: The course provides an overview of important and novel processing methods used for the manufacture of advanced structural and functional semi-finished components, including the metals, polymers, ceramics, and their composites.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Major Restrictions:
Restricted to majors of MME
Classification Restrictions:
Restricted to class of GR
Prerequisite(s): (MME 5304 w/C or better AND MME 5403 w/C or better)

MME 5308. Mechanical Behavior of Matrls.
Mechanical Behavior of Materials (3-0) The underlying principles of elastic and plastic deformation of metals, ceramics, polymers, and composite materials will be developed. Topics include dislocation theory, slip, twinning, microstructures, high and low temperature deformation behavior (tensile properties, creep and fatigue) of crystal line and amorphous materials. Offered in alternate years. Prerequisite: MME 2303 or MET 3203, or equivalent, or department approval.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MME 5310. Advanced Failure Analysis.
Advanced Failure Analysis (3-0) An advanced study of structural failure processes to include topics in fracture mechanics, fatigue, and environmental assisted cracking. Analysis of failures using metallographic, electron microscopy, and microanalytic techniques will be covered. Fracture of specific materials; steels, nonferrous alloys, composites, and nonmetallics will be included. Offered in alternate years.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MME 5313. Advanced Matrls & Composites.
Advanced Materials and Composites (3-0) Properties and structures of composite materials and design of composite systems to yield desired combinations of properties. Metal, ceramic, and polymer composite systems as well as high-performance alloy system or microcomposites. Applications of materials and composite fundamentals to manufacturing and processing. Offered in alternate years. Prerequisites: MME 5401 and 5403 or department approval.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
MME 5331. Biomaterials.
This course discusses various aspects pertaining to the selection, processing, testing (in vitro and in vivo) and performance of hard and soft biomaterials, orthopedic devices, and cardiovascular, ophthalmologic and dental applications. The biocompatibility and surgical applicability of metallic, polymeric and ceramic implants and prosthetic devices are discussed. The physicochemical interactions between the implant material and the physiological environment will be described. Biomaterials in maxillofacial, orthopedic dental, ophthalmic and neuromuscular applications will be emphasized. Prerequisite: Department approval required. Restricted to level of DR, GR.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MME 5333. Biofabrication.
This course focuses on using cells, proteins, biomaterials and/or other bioactive elements as building blocks to fabricate advanced biological models, medical therapeutic products and non-medical biological systems. Prerequisite: Department approval. Restricted to level of DR, GR.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MME 5390. Special Topics.
Special Topics: Advanced topics of contemporary interest in metallurgical and materials engineering. May be repeated for credit when topic varies.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MME 5391. Individual Studies.
Individual Studies (0-0-3) Individual variable credit research, design, or analysis on advanced phases of metallurgical and materials engineering problems conducted under the direct supervision of a faculty member. A maximum of 3 credit hours may be applied towards the M.S. degree.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

MME 5394. Graduate Research.
Graduate Research (0-0-3) Individual variable-credit research of contemporary topics in metallurgical and materials engineering.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

MME 5396. Graduate Projects.
Graduate Projects (0-0-3) Individual research design, or analysis on advanced phases of engineering problems conducted under the direct supervision of a faculty member. The courses, including a written report, are requested of all students in the non-thesis option.
Department: Metallurgical & Materials Eng.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours
MME 5397. Graduate Projects.
Graduate Projects (0-0-3) Individual research, design, or analysis on advanced phases of engineering problems conducted under the direct supervision of a faculty member. The courses, including a written report, are required of all students in the non-thesis option. Prerequisite: MME 5396.

**Department:** Metallurgical & Materials Eng.

**3 Credit Hours**
**3 Total Contact Hours**
0 Lab Hours
0 Lecture Hours
3 Other Hours

**Prerequisite(s):** (MME 5396 w/P or better)

MME 5398. Thesis.
Thesis (0-0-3)

**Department:** Metallurgical & Materials Eng.

**3 Credit Hours**
**3 Total Contact Hours**
0 Lab Hours
0 Lecture Hours
3 Other Hours

MME 5399. Thesis.
Thesis (0-0-3) Prerequisite: MME 5398.

**Department:** Metallurgical & Materials Eng.

**3 Credit Hours**
**3 Total Contact Hours**
0 Lab Hours
0 Lecture Hours
3 Other Hours

**Prerequisite(s):** (MME 5398 w/P or better)

MME 5401. Microstruc & Microchem Charac.
Microstructural and Microchemical Characterization of Materials (3-3) An interdisciplinary approach to the theory and applications of techniques for characterizing chemical (microchemical) and microstructural features of solid materials. Techniques that will be stressed include X-ray diffraction, optical metallography, scanning and transmission electron microscopy (emphasizing analytical transmission electron microscopy), electron probe microanalysis, and surface and near surface surface microanalysis (Auger electron spectroscopy, ESCA, SIMS, etc.). Sample preparation techniques will be covered and students will be encouraged to examine materials which may have some application to their research problems. Offered in alternate years.
Prerequisite: MME 4413 or MET 4413.

**Department:** Metallurgical & Materials Eng.

**4 Credit Hours**
**6 Total Contact Hours**
3 Lab Hours
3 Lecture Hours
0 Other Hours

Advanced Concepts in Materials Science and Engineering (4-0) A blend of contemporary solid state physics and chemistry emphasizing structure and properties and including processing (synthesis) and performance, illustrated by various classes of materials: structural, electronic, magnetic, photonic, and superconducting. Fundamental issues and applications will include: crystal structure and crystal chemistry; disorder/order imperfections; phase equilibria, phase diagrams, phase transformation; reaction rates, kinetics, thermodynamics; microstructures in processing and performance; materials design/materials by design. Prerequisites: MME 2306, MME 2308, and MME 3406.

**Department:** Metallurgical & Materials Eng.

**4 Credit Hours**
**4 Total Contact Hours**
0 Lab Hours
4 Lecture Hours
0 Other Hours
MME 5494. Graduate Research.
Graduate Research (0-0-4) Individual variable-credit research of contemporary topics in metallurgical and materials engineering. Prerequisite: Department approval.
Department: Metallurgical & Materials Eng.
4 Credit Hours
4 Total Contact Hours
0 Lab Hours
0 Lecture Hours
4 Other Hours

MME 5594. Graduate Research.
Graduate Research (0-0-5) Individual variable-credit research of contemporary topics in metallurgical and materials engineering. Prerequisite: Department approval.
Department: Metallurgical & Materials Eng.
5 Credit Hours
5 Total Contact Hours
0 Lab Hours
0 Lecture Hours
5 Other Hours

MME 5694. Graduate Research.
Graduate Research (0-0-6) Individual variable-credit research of contemporary topics in metallurgical and materials engineering. Prerequisite: Department approval.
Department: Metallurgical & Materials Eng.
6 Credit Hours
6 Total Contact Hours
0 Lab Hours
0 Lecture Hours
6 Other Hours