Materials Research and Technology Institute Courses

Courses

MASE 6190. Contem Topics-Materials Sci/E.
Contemporary Topics in Materials Science and Engineering (1-3) Selected topics from materials science and engineering. Course may be repeated up to 5 times for credit as topic varies.
Department: Materials Science & Engr.
1 Credit Hour
3 Total Contact Hours
3 Lab Hours
0 Lecture Hours
0 Other Hours

MASE 6191. Individual Studies.
Individual Studies (0-0-1) Independent studies in materials science and engineering.
Department: Materials Science & Engr.
1 Credit Hour
1 Total Contact Hour
0 Lab Hours
1 Lecture Hour
0 Other Hours

MASE 6194. Graduate Research Projects.
Graduate Research Projects (0-0-1)
Department: Materials Science & Engr.
1 Credit Hour
1 Total Contact Hour
0 Lab Hours
0 Lecture Hours
1 Other Hour

MASE 6195. Doct. Rsrch Symposium I.
Doctoral Research Symposium I (0-0-1) MASE 6195 involves formal presentations and discussion by research students in the program (first year). MASE 6196 is taken in subsequent semesters or years where students make presentations and occasionally outside speakers make presentations on related topics to materials science and engineering. Prerequisites: MASE 6195 first and then MASE 6196 at least twice.
Department: Materials Science & Engr.
1 Credit Hour
1 Total Contact Hour
0 Lab Hours
0 Lecture Hours
1 Other Hour

MASE 6196. Doct. Rsrch Symposium II.
Doctoral Research Symposium II (0-0-1) MASE 6195 involves formal presentations and discussion by research students in the program (first year). MASE 6196 taken in subsequent semesters or years where students make presentations and occasionally outside speakers make presentations on related topices to materials science and engineering. Prerequisites: MASE 6195 first, then MASE 6196 at at least twice.
Department: Materials Science & Engr.
1 Credit Hour
1 Total Contact Hour
0 Lab Hours
0 Lecture Hours
1 Other Hour

MASE 6245. Electron Microscopy Appl.
Course will provide detailed instruction and hands on experience in the use of electron microscopy instrumentation (such as TEM, STEM, SEM/EDS). Aspects related to interpretation of contrast mechanisms, general instrument operation, benefits and disadvantages of different types of instruments as well as sample preparation will be covered. Keywords: materials characterization, microstructure, electronic.
Department: Materials Science & Engr.
2 Credit Hours
4 Total Contact Hours
3 Lab Hours
1 Lecture Hour
0 Other Hours

MASE 6290. Contem Topics-Materials Sci/E.
Contemporary Topics in Materials Science and Engineering (1-3) Selected topics from materials science and engineering. Course may be repeated up to 5 times for credit as topic varies.
Department: Materials Science & Engr.
2 Credit Hours
4 Total Contact Hours
3 Lab Hours
1 Lecture Hour
0 Other Hours

MASE 6291. Individual Studies.
Individual Studies (0-0-2) Independent studies in materials science and engineering.
Department: Materials Science & Engr.
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
0 Lecture Hours
2 Other Hours

MASE 6294. Graduate Research Projects.
Graduate Research Projects (0-0-2)
Department: Materials Science & Engr.
2 Credit Hours
4 Total Contact Hours
0 Lab Hours
2 Lecture Hours
2 Other Hours

MASE 6305. Adv Processing of Materials.
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: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (MASE 6304 w/C or better AND MASE 6400 w/C or better)

MASE 6306. Phase Transformations and Mic.
Phase Transformation and Microstructures: 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, a martensitic transformations are covered along with associated microstructural morphologies and property/ performance control by microstructure control in materials.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6311. Ceramics.
Understanding the development, utilization and control of ceramic materials properties based on microstructure.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6312. Polymer Engineering.
Polymer Engineering: The course provides a basic introduction to the field of polymer science. Basic concepts of organic chemistry address typical polymerization and copolymerization reactions. The characterization of polymer molecules include discussions of thermodynamic solutions, solubility parameters, colligative properties and scanning electron microscopy. Concepts on the structure and properties of bulk polymers emphasize its relationship to molecular characteristics and manufacturing processes.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6315. Metallography and Micro Inter..
Metallography and Microstructure Interpretation: Metallographic sample preparation and microstructural characterization for various metals, alloys and/or material systems. Use of tools necessary for analysis including sectioning, mounting, polishing and etching using standard metallographic procedures. Metallographic samples prepared in class will be evaluated using stereomicroscopy, optical and electron microcopy for microstructural interpretation. Introduction to chemical analysis using optical emission spectroscopy and X-ray fluorescence for positive material identification.
Department: Materials Science & Engr.
3 Credit Hours
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

MASE 6321. BME for Global Health.
Graduate level course that provides an overview of the role of engineering technological advances to improve human health. The following points will be emphasized throughout the semester: What are the challenges in healthcare delivery in remote locations; How are we paying for healthcare delivery; What is the role of engineering to solve healthcare problems; and how do new healthcare technologies move from the lab to the beside. Prerequisite: Department approval. Restricted to level of DR, GR.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6322. Engineering Alloys.
Engineering Alloys: The study of the selection and specification of engineering alloys for use in industrial applications. Topics related to ferrous and nonferrous metals in the cast, wrought, powder and particulate state will be covered. Mill test reports (MTR) and how to interpret them as well as interpreting compliance with various specification entities to include ASTM, API, ABS, etc. are inherent to the course.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6340. Advanced Failure Analysis.
Advanced Failure Analysis: 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.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6342. Hydrometallurgy.
Hydrometallurgy: The study of metal extraction process in aqueous solutions from ore or concentrates.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6343. Advanced Materials/Composites.
Advanced Materials/Composites: 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 systems or microcomposites. Applications of materials and composite fundamentals to manufacturing and processing.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6344. Interfacial Phenomena.
Interfacial Phenomena: Thermodynamics of solid interfaces and interfacial equilibria. Interfacial free energy concepts and measurements. Structure of interfaces: solid surfaces, grain boundaries, phase boundaries, and system interfaces. Properties of interfaces and their role in materials performance.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6350. Material Joining Technologies.
Material Joining Technologies: Fundamentals of materials joining theory and application. A variety of technologies will be covered, to include: welding, brazing, soldering, adhesives, etc. for metals, ceramics, polymers, composites, and electronic materials. Emphasis will be on both the theoretical principles of each process and practical aspects of the technique and/or equipment.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6351. Non-Destructive Examination.
Non-Destructive Examination: Introduction and theory of ultrasonic testing, such as phased array and shear wave techniques, dye penetration inspection, interpretation of radiographs, wet/dry magnetic particle inspection, chemical analysis using X-ray fluorescence and in-situ metallography techniques (replication).
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6352. Root Cause Analysis.
Root Cause Analysis: Using analytical techniques to determine underlying causes and causal factors related to materials, component and systematic problems. Analytical tools and techniques will be used to identify problems and track data used to determine the root and proximate cause and to implement corrective actions.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6353. Fracture Mechanics.
Fracture Mechanics: Mechanisms of fracture for brittle and ductile materials using linear elastic and elastic-plastic fracture materials. ASTM standard fracture testing, numerical methods, and creep, fatigue, and dynamic fractures of metallic and non-metallic materials.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6390. Contem Topics-Materials Sci/En.
Contemporary Topics in Materials Science and Engineering (3-0) Selected topics from materials science and engineering. Course may be repeated twice for credit as topic varies.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6391. Individual Studies.
Individual Studies (0-0-3) Independent studies in material science and engineering.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

MASE 6394. Graduate Research Projects.
Graduate Research Projects (0-0-3)
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

MASE 6398. Dissertation.
Dissertation (0-0-3)
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

MASE 6399. Dissertation.
Dissertation (0-0-3) Prerequisite: MASE 6398.
Department: Materials Science & Engr.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours
Prerequisite(s): (MASE 6398 w/P or better)

MASE 6400. Advanced Concepts Mat Sci/Engr.
Advanced Concepts in Materials Science and Engineering (4-0) A blend of topics on contemporary solid state physics and chemistry emphasizing structure and properties including processing (synthesis) and performance, and illustrated by various classes of materials: structural, electronic, magnetic, photonic and superconducting. Fundamental issues and applications will include: crystal structure and phase equilibria, phase diagrams, phase tansformation; reaction rate, kinetics, thermodynamics; microstructures in processing and performance; materials design/materials by design.
Department: Materials Science & Engr.
4 Credit Hours
4 Total Contact Hours
0 Lab Hours
4 Lecture Hours
0 Other Hours

MASE 6401. Applied Matls Sci & Eng.
Topics associated with scientific and engineering principles based on the materials paradigm, the interplay between structure, properties, processing and performance.
Department: Materials Science & Engr.
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6402. Microchem/Microstruc Char Matl.
Microchemical and Microstructural Characterization of Materials (3-3) The structure and composition of materials can be investigated at a variety of levels utilizing a variety of analytical techniques. It is imperative that the principles and applications of a range of these techniques be presented to students examining classes of materials. Techniques which can allow microscopic and macroscopic characterization should be presented as well as techniques for bulk, surface, and related interfacial characterization. This course will focus on a variety of microscopy and spectrometry techniques-optical, electron, acoustic, and ion. As many microanalysis areas as possible will be deonstrated by having students visit facilities on the campus which constitute a materials characterization and analysis network. Principal microanalysis areas will include: x-ray diffraction, electron microscopy (scanning and transmission), electron probes, surface and near surface microanalysis, and optical and acoustic microscopy.
Department: Materials Science & Engr.
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours

MASE 6490. Contem Topics-Materials Sci/E.
Contemporary Topics in Materials Science and Engineering (4-0) Selected topics from materials science and engineering. Course may be repeated twice for credit as topic varies.
Department: Materials Science & Engr.
4 Credit Hours
4 Total Contact Hours
0 Lab Hours
4 Lecture Hours
0 Other Hours