

MATERIALS SCIENCE (MS)

Repeat Rule:
Cr/F.

Credits:
MS 899 - Master's Thesis
and seminar are presented. IA (continuous grading) Cr/F.
a well-defined research and/or original design problem. A written report
The student works with a faculty member during one or two semesters on
Credits:
MS 898 - Master's Project
for credit.
New or specialized courses and/or independent study. May be repeated
Credits:
MS 895 - Special Topics
ME 862
Electronic Materials Science
Credits: 4
This course provides engineering and science students with a foundation
in the materials science of modern electronic devices. Topics include
bonding and structure of solids, electrical and thermal conduction,
elements of quantum mechanics, band theory of electrons in solids,
semiconductors, magnetism, dielectrics and superconductors. Examples
of applications are taken primarily from the fields of semiconductor
electronics and nanotechnology, and illustrate how the electrical and
optical properties of devices are obtained from their compositions,
crystal structures and microstructures. Permission of instructor required.
Equivalent(s): ME 862

MS 895 - Special Topics
Credits: 2-4
New or specialized courses and/or independent study. May be repeated
for credit.

MS 898 - Master's Project
Credits: 3-4
The student works with a faculty member during one or two semesters on
a well-defined research and/or original design problem. A written report
and seminar are presented. IA (continuous grading) Cr/F.

MS 899 - Master's Thesis
Credits: 1-6
Cr/F.
Repeat Rule: May be repeated for a maximum of 6 credits.

MS 900 - Seminar
Credits: 1
Topics of interest to graduate students and faculty; reports of research
ideas, progress, and results; lectures by outside speakers. Continuing
course: instructor may assign IA (continuous grading) grade at the end of
one semester.
Repeat Rule: May be repeated for a maximum of 2 credits.

MS 905 - Macromolecular Synthesis
Credits: 3
Fundamentals of polymerization reaction mechanisms, kinetics, and
chain structures as they are developed from the different chemistries
available. Detailed discussions of the chemical mechanisms of step,
free radical, ionic, and ring opening polymerizations. Treatment of the
reaction parameters that control the rate of polymerization, molecular
weight and chemical composition of the polymer chains. Introduction to
stereo-chemical and catalytic polymerizations. Considerations of bulk,
solution, and dispersion polymerization systems. Permission of instructor
required. Open to Biochemistry, Chemical Engineering, Engineering:
Chemical, Chemistry, Mechanical Engineering, Engineering: Mechanical,
Materials Science, Engineering: Mat Science, and Physics majors only.

MS 910 - Macromolecular Characterization
Credits: 3
Molecular characterization of synthetic and natural macromolecules
in solution and in the solid state. Emphasis on the principles of various
analytical techniques designed to provide information on the chemical
composition, polymer chain size and structure in solution and in the
dry state. Extension to methods that measure the interaction and
association between polymer molecules. Interpretations of data from
important characterization techniques including liquid chromatography
(GPC), spectroscopy (FTIR, NMR, MS), microscopy (TEM, AFM, Confocal
Raman), thermal analysis (DSC), light scattering, sedimentation, and x-
diffraction. Permission of instructor required. (Also listed as BCHM
950). Open to Biochemistry, Chemical Engineering, Engineering:
Chemical, Chemistry, Chem: Chemistry Education, Mechanical Engineering,
Materials Science, Engineering: Mat Science, and Physics majors only.
Equivalent(s): BCHM 950

MS 960 - Thermodynamics and Kinetics of Materials I
Credits: 3
Classical and statistical thermodynamics are used to establish the
conditions of equilibrium for simple and multi-component, heterogeneous
materials. Additionally, the thermodynamics of phase diagrams,
miscibility, interfaces, and defects are explored. Examples and problems
apply these concepts to various types of materials, including metals,
cermics, and polymers.

MS 961 - Thermodynamics and Kinetics of Materials II
Credits: 3
Introduction to diffusion and phase transformations in materials, and
detailed descriptions of interfacial regions. Mechanisms of phase
separation by spinodal decomposition and homogeneous nucleation.
Kinetic processes leading to changes in phase structure driven by
chemical reaction, temperature and diffusive processes (e.g. Ostwald
ripening) are treated quantitatively. Applications to metals, ceramics and
polymers. Prereq: Thermodynamics and Kinetics of Materials I.
Equivalent(s): ME 961

MS 965 - Advanced Surface and Thin Film Characterization
Credits: 4
Fundamentals of modern analytical techniques used to analyze the
surface region of materials. Prereq: Introduction to Materials, or
permission.
Equivalent(s): ME 965
MS 995 - Graduate Special Topics  
**Credits:** 2-4  
Investigation of graduate-level problems or topics in Materials Science.

MS 999 - Doctoral Research  
**Credits:** 0  
Cr/F.