MATERIALS SCIENCE (MS)

Course numbers with the # symbol included (e.g. #400) have not been taught in the last 3 years.

MS #830 - Mechanical Behavior Materials
Credits: 4
Elastic and inelastic behavior of materials in terms of micro- and macro-mechanics. Stress, strain and constitutive relations related to recent developments in dislocation theory and other phenomena on the atomic scale and to the continuum mechanics on the macroscopic scale. Elasticity, plasticity, viscoelasticity, creep, fracture, and damping. Anisotropic and heterogeneous materials. Prior coursework in mechanics of materials and introductory materials science required.
Grade Mode: Letter Grading

MS #861 - Diffraction and Imaging Methods in Materials Science
Credits: 0 or 4
Introduction to x-ray diffraction and electron microscopy. Basic crystallography; reciprocal lattice; x-ray and electron diffraction, x-ray methods; transmission and scanning electron microscopy. Prior coursework in introductory chemistry and general physics II required. Lab.
Grade Mode: Letter Grading

MS 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.
Grade Mode: Letter Grading

MS 895 - Special Topics
Credits: 2-4
New or specialized courses and/or independent study. May be repeated barring duplication of subject.
Repeat Rule: May be repeated up to unlimited times.
Grade Mode: Letter Grading

MS 899 - Master's Thesis
Credits: 1-6
Master's Thesis.
Repeat Rule: May be repeated for a maximum of 6 credits.
Grade Mode: Graduate Credit/Fail grading

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.
Grade Mode: Letter Grading

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.
Grade Mode: Letter Grading

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-ray diffraction. Open to Biochemistry, Chemical Engineering, Engineering: Chemical, Chemistry, Chem: Chemistry Education, Mechanical Engineering, Materials Science, Engineering: Mat Science, and Physics majors only.
Grade Mode: Letter Grading

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, ceramics, and polymers.
Grade Mode: Letter Grading

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. Prior coursework in thermodynamics and kinetics of materials required.
Grade Mode: Letter Grading

MS 995 - Graduate Special Topics
Credits: 2-4
Investigation of graduate-level problems or topics in Materials Science.
Grade Mode: Letter Grading

MS 999 - Doctoral Research
Credits: 0
Doctoral Research.
Grade Mode: Graduate Credit/Fail grading
Special Fee: Yes