

Current Catalog Descriptions for MSE Core Classes

301: Materials Science Principles

Equilibrium and nonequilibrium development of microstructures. Mechanical behavior of metals, ceramics, and polymers. Corrosion and stability of engineering materials. Materials processing. Not to be taken for credit with or after 201. Prerequisite: CHEM 102.

314: Thermodynamics of Materials

Classical and statistical thermodynamics; entropy and energy functions in liquid and solid solutions, and their applications to phase equilibria. Lectures, problem solving. Materials science and engineering degree candidates may not take this course for credit with or after CHEM 342 1. (new stuff)

315: Phase Equilibria and Diffusion in Materials

Application of thermodynamics to ternary phase equilibria. Defects and diffusion in solids. Interdiffusion. Short circuit diffusion. Defects and transport in ionic solids. Lectures, problem solving. Prerequisite: 314 or equivalent.

316-1,2: Microstructural Dynamics

Principles underlying development of microstructures. Defects, diffusion, phase transformations, nucleation and growth, thermal and mechanical treatment of materials. Lectures, laboratory. Prerequisite: 315 or equivalent.

331: Soft Materials

Different kinds of polymeric materials. Relationships between structure and physical properties; rubber elasticity, the glassy state, crystallinity in polymers. Lectures, laboratory. Prerequisites: 301 or equivalent; 314 or CHEM 342 1.

332: Mechanical Behavior of Solids

Plastic deformation and fracture of metals, ceramics, and polymeric materials; structure/property relations. Role of imperfections, state of stress, temperatures, strain rate. Lectures, laboratory. Prerequisites: 316 1; 316 2 (may be taken concurrently).

351: Introductory Physics of Materials

Quantum mechanics; applications to materials and engineering. Band structures and cohesive energy; thermal behavior; electrical conduction; semiconductors; amorphous semiconductors; magnetic behavior of materials; liquid crystals. Lectures, laboratory, problem solving. Prerequisites: GEN ENG 205 4 or equivalent; PHYSICS 135 2,3.

361: Crystallography and Diffraction

Elementary crystallography. Basic diffraction theory; reciprocal space. Applications to structure analysis, preferred orientation. Film and counter techniques. Lectures, laboratory. Prerequisites: GEN ENG 205 4; PHYSICS 135 2,3.

390: Materials Design

Analysis and control of microstructures. Quantitative process/structure/property/ performance relations, with case studies. Computer lab for modeling multicomponent thermodynamics and transformation kinetics. Prerequisites: 315, 316 1,2, or consent of instructor.

391: Process Design

Processing of materials. Design and analysis of experiments to identify and optimize key parameters to control properties and performance. Resolving conflicting requirements. Statistical process control.

396: Senior Project in Materials Science and Engineering

To be taken in two consecutive quarters. Independent basic or applied research project, conceived and performed under the direction of a department faculty member. Prerequisite: senior standing in materials science program.