Materials Science and Engineering (MSE)

MSE 360M Experiments in Materials Science and Engineering 3 Hours
Hands-on lab-based course designed to teach practical techniques in the synthesis and characterization of materials and their properties, and to use experiments to explore fundamental and potentially abstract materials concepts.

MSE 386P Topics in Materials Science: Fundamentals 3 Hours

MSE 386P.1 Introduction to Phase Transformations 3 Hours
Basics of crystal structures and phase diagrams; diffusion; solidification; solid-state phase transformations.

MSE 386P.2 Mechanical Behavior of Materials 3 Hours
Elastic deformation; viscoelasticity; yielding, plastic flow, plastic instability; strengthening mechanisms; fracture, fatigue, creep; significance of mechanical properties tests. Microstructural mechanisms and macroscopic behavior of metals, polymers, ceramics, and composites.

MSE 386P.3 Introduction to Thermodynamics of Materials 3 Hours
Thermodynamic properties; reactions and chemical equilibrium in gases; solutions, phase equilibria, phase diagrams, reaction equilibria; surfaces and interfaces; point defects in crystals.

MSE 386P.4 Introduction to Solid-State Properties of Materials 3 Hours
Introduction to the electronic, magnetic, and optical properties of materials. Solid-state properties of metals, semiconductors, and ceramics; fundamental concepts needed for the description of these properties, using an introductory-level description of the electronic structure of solids.

MSE 386P.5 Structure of Materials 3 Hours
Essential crystallography of lattices and structures; symmetry; elements of diffraction and reciprocal lattices; point, line, and surface defects in crystals; crystalline interfaces; noncrystalline materials; polymers; glasses.

MSE 389 Topics in Materials Science and Engineering 3 Hours

MSE 397 Graduate Seminar 3 Hours
Presentation of research topics by invited speakers, faculty, and students.

MSE 197R, 297R, 397R Research 1-3 Hours

MSE 698 Thesis 6 Hours

MSE 398R Master's Report 3 Hours
Preparation of a report to fulfill the requirement for the master's degree under the report option.

MSE 399W, 699W, 999W Dissertation 3,6,9 Hours
Research leading to the Doctor of Philosophy in materials science and engineering.