

Materials Science & Engineering Prerequisite Information

All entering graduate students are expected to develop backgrounds closely related to a BS degree in Materials Science and Engineering. Since MSE is an interdisciplinary field, this experience is generally met via coursework, but practical experience can also satisfy the following background knowledge:

Fundamentals of Materials Science and Engineering equivalent to MSE 170

Crystallography equivalent to MSE 331

Materials properties equivalent to MSE 351 and MSE 362

Kinetics equivalent to MSE 322

If you don't have this background knowledge, you are welcome to enroll in the following courses, or make arrangements to sit in on courses. These courses are OPTIONAL, if you find them to be beneficial.

Please note: courses completed below the 400 credit level will not count toward graduate credits.

Autumn Quarter

MSE 170 Fundamentals of Materials Science (offered quarterly)

Fundamental principles of structure and properties of materials utilized in practice of engineering. Properties of materials are related to atomic, molecular, crystalline structure. Metals, ceramics, multiphase systems, and polymeric materials. Relationships between structure and electrical, mechanical, thermal, chemical properties

MSE 321 Thermodynamics and Phase Equilibrium

Prerequisite for thermodynamics course 421 in winter - 421 is required for those who didn't previously complete 2 thermodynamic courses as an undergrad or if haven't either had a course or experience as described.

Course description: Phase equilibria in materials systems of one, two, and three components. Determination of phase diagrams. Quantitative applications of thermodynamics to systems of interest to materials scientists; detailed review of thermodynamic laws and principles.

MSE 331 Crystallography & Structure

Prerequisite for 541 defects in materials required course in winter

Course Description: Theory and practice of x-ray diffraction with applications to materials sitemaps. Principles of crystal symmetry, lattice systems, and stereographic projections. Bragg's law of diffraction, Laue conditions, diffraction by X-rays, single crystal and powder diffraction techniques and their applications to lattice, phase, strain, and texture analyses.

Doctoral students are also able to enroll in MSE 570 Graduate Tutorial in MSE (required for master's students) if coming from a non-MSE background.

Winter Quarter

MSE 322 Kinetics/Microstructure Evolution (pre-req for 525 kinetics course in spring)

Course Description: Applications of thermodynamic and kinetic principles to the study of transport processes, transformations and reactions in engineering materials. Thermal activation and rates of processes, nucleation and growth, phase transformations, grain growth, sintering, among other processes.

MSE 351 Electronic Properties of Materials

Course Description: Introduction to elementary solid-state concepts in materials, free electrons, and band theories. Principles to conduction in metals, insulators, semiconductors, and applications of semiconductors and devices

Spring Quarter

MSE 362 Mechanical Behavior of Materials

Course Description: Influence of structure on the mechanical properties materials. Definition of different mechanical properties and experimental techniques to measure them. Elastic, viscoelastic, and plastic deformation. Introduction to fracture.

For additional information [see MSE course descriptions.](#)