Transfer Credits

The student's Advisory Committee may recommend transfer credits for graduate courses taken by the student at other institutions. Transfer credits may be recommended under both core and elective categories.

Written Qualifying Examination

All students pursuing the Ph.D. degree in Materials Science and Engineering must pass the comprehensive written qualifying examination in no, more than two attempts. The examination covers the contents of core courses and several basic courses including chemistry, mathematics, physics, strength of materials and thermodynamics.

Research Proposal

The student must also successfully present a formal proposal of his/her dissertation research to h i s / h e r A d v i s o r y C o m m i t t e e an n d the faculty in the Department of Materials Science and Engineering. The proposal presentation must include a thorough review of literature and a plan of research activities and progress to date. A research proposal document of about 15 pages should be submitted to the committee members at least two weeks before the scheduled date of proposal presentation. It should include at least but not limited to introduction, background, literature review, plan of research, preliminary data on the progress to date, timeline for completion of dissertation work and references.

Admission to Candidacy

Immediately after passing the written qualifying examination and successful presentation of his/her research proposal, the student must submit, to the Dean of Graduate Studies, a completed application for the Candidacy for the degree.

Seminars

A student pursuing the Ph.D. degree in Materials Science and Engineering is required to present several seminars during his/her course of study. The final seminar shall be his/her Final Oral Examination for the degree. The student is required to attend all seminars scheduled by the departm

MSEG 0628	**FINITE ELEMENT METHOD**. Cr. 3. Principles of finite element analysis, variation principles, displacement polynomials and shape functions, element family, application to 2D and 3D continuum problems, application to thermal and fluid flow problems, computer program development. ***Prerequisites: Graduate standing and instructor's approval.***
MSEG 0629	**MICROSTRUCTURAL ANALYSIS OF MATERIALS**. Cr. 3. To provide an integrated treatment of the science of microstructural analysis which emphasizes the interaction of the specimen with the electron beam used to probe the microstructure. The three main aspects of microstructural morphology, phase identification, crystallography, and microanalysis of the chemical composition will be covered. Following an introduction, the principal methods of characterization, e.g., diffraction analysis, scanning and transmission electron microscopy, and chemical microanalytical techniques will be taught. Some laboratory assignments will also be incorporated in this course. **(*Prerequisite: MSEC 0604)***
MSEG 0640	**NON-DESTRUCTIVE EVALUATION TECHNIQUES**. Cr. 3. Basics of NDE of metals and advanced materials, ultrasonics, modal analysis, acoustic emission, acousto-ultrasonics, acoustic impact testing, X-ray radiography. Eddy-current testing, and laser measurements.
MSEG 0641	**COMPOSITE MATERIALS**. CR. 3. Introduction to composite materials; fibers, matrix and interface; mechanical and chemical aspects; design, chemical synthesis, manufacturing and processing methods; mechanical testing methods; understanding of failure mechanisms based on static, fatigue, impact and other properties; microstructural consideration. ***Prerequisite: MENG 0318***
MSEG 0642	**MECHANICS OF COMPOSITES**. CR. 3. Classification and characterization of composite materials; mechanical behavior of composite materials; stress-strain relation for anisotropic materials; invariant properties of an orthotropic lamina; strength concepts and biaxial strength theories; classical lamination theory and theory of an anisotropic elastic continuum; equations of laminated anisotropic plates. ***Prerequisite: MSEG 0641***
MSEG 0643	**ELECTRONIC MATERIALS PROCESSING I**. CR. 3. Theory and current technology for Si integrated circuit fabrication processes, including crystal growth, wafer preparation, epitaxy, oxidation, photolithography, diffusion, ion implantation, thin film deposition by chemical vapor deposition (CVD), etching and metallization, process simulation.