MATERIALS SCIENCE ENGINEERING (MSE)

MSE 530 Materials Science (3 Credits)
This course presents basic knowledge of the internal structure, properties, processing, and characterization of materials, including metals, ceramics, inorganic composites, and "smart" materials.

MSE 533 Polymers/Composites (3 Credits)
This course deals with general concepts about polymers and polymeric materials/composites, their compositions, chemical structure, synthesis and fabrication, characterization, and properties.

MSE 535 Electronic and Optic Material (3 Credits)
This course deals with the internal structure, chemistry and physics of semiconductors, magnetic and photonic materials as related to their electronic and optical properties, as well as their applications. The course also focuses on how electronic materials are produced, and how to control processing to achieve desired materials performance.

MSE 575 Basic Instrumentation for Material Sci (3 Credits)
This course presents basic materials science related instrumentations, principles, measurements, and data manipulation and visualization with IDL; data collection and data analysis with the LabView Interface; powder x-ray diffraction technique, etc.

MSE 580 Advanced Organic Synthesis (3 Credits)
This course will cover essential synthetic and characterization methodologies of complex organic molecules and polymers, particularly the conjugated semiconducting and conducting molecules and polymers relevant to supramolecular 'plastic' electronic and optoelectronic applications. The course will first provide a brief overview of important and relevant organic reactions and mechanisms; it will then present advanced lab techniques and instrumentations, product purification and characterizations, including air sensitive chemicals handling, vacuum distillation, sublimation, rotary evaporation, thin-layer chromatography, column chromatography, nuclear magnetic resonance spectroscopy (NMR), elemental analysis and mass spectrometry, thermal analysis (DSC/TGA), gel permeation chromatography (GPC) and HPLC, cyclic voltammetry (CV), UV-VIS spectrometry, luminescence spectrometry, FT-IRRaman, etc.
Prerequisites: Take CHM-100. Take PHY-100. Take CHM-321. Take CHM-322.

MSE 600 Materials Science/Engineering Seminar I (1 Credits)
This course exposes students to the most recent research developments in the areas of materials science and engineering. Students attend weekly seminars, delivered by local and invited scientists and engineers, who present results of projects carried in their research groups.

MSE 601 Materials Science & Engineer Seminar II (1 Credits)
This course exposes students to the most recent research developments in the areas of materials science and engineering. Students attend weekly seminars, delivered by local and invited scientists and engineers, who present results of projects carried in their research groups.

MSE 605 Ethics of Research (1 Credits)
This is a core professional development course designed for science and engineering graduate students. Students will learn about ethics in the workplace, receive guidance in the selection of and application to job positions in materials science and engineering, as well as improve their skills such as in written and oral communication.

MSE 607 Materials for Nanotechnology (3 Credits)
This course provides a broad overview of the entire arena of nanotechnology including phenomena specific for nanoparticle or nanostructured systems, as well as their modern and future applications. The topics include characterization and fabrication methods in nanoscale, properties of materials as a function of size, review of nanocrystals, quantum dots, nanophotonic structures, nanomagnets, and brief introduction to the principles of quantum computing.
Prerequisites: Take PHY-580. MSE-530. MSE-535.

MSE 609 Intro to Computational Materials Science (3 Credits)
Presents basics of computational materials science.
Prerequisites: Take PHY-580. Take CHM-545.

MSE 635 Optical Materials (3 Credits)
The course relates optical behavior and its underlying processes to the chemical, physical, and microstructural properties of the materials so that students gain insight into the kinds of materials, engineering and processing conditions that are required to produce materials exhibiting a desired optical property.

MSE 660 Organic Optoelectronic Materials/Devices (3 Credits)
This course covers the basic knowledge, concepts, and current status of organic/polymer electronic optoelectronic (OE) materials and devices. From fundamentals of electron conjugated organic and polymetic materials, structures, synthesis, to basic principles, architectures, and functions of organic/polymetric electronic and OE devices including, but not limited to, field effect transistors (FETs), light emitting diodes (LEDs), solar cells, electro-optic modulators, optical-switching materials and devices, photorefractive materials and devices, single molecule OE devices, artificial Muscles, spintronic and supramolecular OE materials and devices, etc.
Prerequisites: Take MSE-533. Take MSE-530.

MSE 697 Research I (1-9 Credits)
The Research I course is the first of a three-semester, research course sequence. Students attend seminars and workshops on how to conduct, present and report research activities. Students are also expected to spend considerable time in their research laboratories or in research related activities (between 10 and 15 hours a week). Students must work closely with their research advisor to ensure progress in the course.

MSE 698 Research II (1-9 Credits)
The Research II course is the second of a three-semester research course sequence. Students attend seminars and workshops on how to conduct, present, and report research activities. Students are also expected to spend considerable time in their research laboratories or in research related activities (between 10 and 15 hours a week). Students must work closely with their research advisor to ensure progress in the course.

MSE 699 Research III (1-9 Credits)
The Research III course is the third of a three-semester research course sequence. Students attend seminars and workshops on how to conduct, present, and report research activities. Students are also expected to spend considerable time in their research laboratories or in research related activities (between 10 and 15 hours a week). Students must work closely with their research advisor to ensure progress in the course.
Prerequisites: Take MSE-698.

MSE 703 Materials Devices for Energy Conversion (3 Credits)
Presents Materials and Devices for Energy Conversions.
Prerequisites: Take MSE-533. Take MSE-660.

MSE 704 Thin Film Phenomena (3 Credits)
This is a core elective course taken by materials science and engineering doctoral students during their first or second year. Students will learn about critical issues on thin film processing, characterizations, and possible device applications.
Prerequisites: Take MSE-530. Take MSE-533. Take MSE-535.

MSE 770 Materials Science Doctoral Qualifiers (0 Credits)
To determine the preparation for doctoral research each student will write a proposal outlining the scientific question that their project will address and the methods that they will use to address that question, after performing some preliminary research with their advisor. The proposal will also contain an examination of the validity of the chosen methods and any preliminary results as well as a timeline for the completion of the research. This proposal will be presented to a committee of faculty.

MSE 897 Research I (1-9 Credits)
This course provides the Ph.D. student in the Materials Science and Engineering program academic credit for working solely in the development of their Ph.D. thesis research project. Students are expected to spend considerable time in their research laboratories or in research related activities (between 35 and 40 hours a week) and consult with their research advisor often to ensure progress in the course towards completion of their doctoral research project.

MSE 898 Research II (1-9 Credits)
This course provides the Ph.D. student in the Materials Science and Engineering program academic credit for working solely in the development of their Ph.D. thesis research project. Students are expected to spend considerable time in their research laboratories or in research related activities (between 35 and 40 hours a week) and consult with their research advisor often to ensure progress in the course towards completion of their doctoral research project.

MSE 899 Research III (1-9 Credits)
This course provides the Ph.D. student in the Materials Science and Engineering program academic credit for working solely in the development of their Ph.D. thesis research project. Students are expected to spend considerable time in their research laboratories or in research related activities (between 35 and 40 hours a week) and consult with their research advisor often to ensure progress in the course towards completion of their doctoral research project.

MSE 900 Dissertation (9 Credits)
This course provides guidance for students who are in the final phase of their doctoral studies. Students are expected to spend considerable time preparing their dissertation manuscript and oral defense. Students must work closely with their research advisors to ensure progress in the dissertation writing and thesis oral defense preparation.
Prerequisites: Take MSE-897. Take MSE-898. Take MSE-899.

MSE 999 Continuing Registration (0 Credits)
Students in the Ph.D. in Materials Science and Engineering program register for MSE 999 while finalizing preparation of their thesis manuscript and oral defense, after fulfilling all requirements for the degree, except MSE 900, Ph.D. Dissertation.