

Approved Courses for MS in Materials Science & Engineering

The MS in MSE requires a total of 30 credit hours. These courses are to be Engineering courses at 500-level or above, or Chemistry, Earth and Planetary Science, or Physics courses at 400-level or above. At least 15 units must be MEMS courses. For students pursuing the Thesis Option, at least 6 units must be Masters Research (MEMS 599), and at least 24 units must be coursework. All MS students must also complete 3 units (1 course) of mathematics at the graduate level. The following courses may be used to fulfill the math requirement:

ESE 405 Reliability and Quality Control
ESE 415 Optimization
ESE 501-502 Mathematics of Modern Engineering I, II
ESE 517 Partial Differential Equations
ESE 520 Probability and Stochastic Processes
Math 416 Complex Variables
Math 429-430 Linear Algebra, Modern Algebra
Math 449 Numerical Applied Mathematics
Math 4111 Intro to Analysis
Physics 501-502 Theoretical Physics (must know quantum mechanics)
Physics 503-504 Advanced Math Methods for Physicists and Engineers
MEMS 5001 Optimization Methods in Engineering
MEMS 5301 Nonlinear Vibrations
MEMS 5403 Conduction and Convection Heat Transfer
MEMS 5501 Mechanics of Continua
MEMS 5610 Quantitative Materials Science and Engineering

For students pursuing the **Course Option**, the remaining coursework must include at least 18 units (6 courses) from the following list. For students pursuing the **Thesis Option**, the remaining coursework must include at least 12 units (4 courses) from the following list. It is recommended that the student take at least one course from each from the following areas:

- (A) Structure
- (B) Characterization
- (C) Properties
- (D) Synthesis and Processing

STRUCTURE

MEMS 5602 Non-Metallics
MEMS 5608 Introduction to Polymer Science & Engineering
MEMS 5612 Atomistic Modeling of Materials
EECE 502 Advanced Thermodynamics in EECE
BME 523 Biomaterials Science
BME 5231 Biomaterials Science: Polymer Physics
CHEM 465 Solid State & Materials Chemistry
PHYS 472 Solid State Physics
PHYS 537 Kinetics of Materials
PHYS 539 Structure and Diffraction in Materials
PHYS 549 Solid State Physics I
PHYS 550 Solid State Physics II

CHARACTERIZATION

MEMS 5506 Experimental Methods in Solid Mechanics
MEMS 5603 Materials Characterization Techniques I
MEMS 5604 Materials Characterization Techniques II

PROPERTIES

MEMS 5102 Materials Selection in Design
MEMS 5504 Fracture Mechanics
MEMS 5507 Fatigue and Fracture Analysis
MEMS 5560 Interfaces and Attachments in Natural and Engineered Structures
MEMS 5601 Mechanical Behavior of Materials
MEMS 5605 Mechanical Behavior of Composites
MEMS 5610 Quantitative Materials Science & Engineering
CHEM 543 Physical Properties of Quantum Nanostructures

SYNTHESIS & PROCESSING

MEMS 5607 Introduction to Polymer Blends & Composites
MEMS 5609 Electronic Materials Processing
MEMS 5611 Principles and Methods in Micro and Nanofabrication
MEMS 5801 Micro-Electro-Mechanical Systems I
EECE 505 Aquatic Chemistry
EECE 574 Electrochemical Engineering
CHEM 426 Inorganic Electrochemistry and Photochemistry
CHEM 452 Synthetic Polymer Chemistry

SPECIAL TOPICS

MEMS 5606 Soft Nanomaterials
ESE 531 Nano & Micro Photonics
ESE 532 Introduction to Nano-Photonic Devices
ESE 536 Introduction to Quantum Optics
EECE 504 Aerosol Science & Technology
EECE 571 Industrial and Environmental Catalysis
CHEM 542 Special Topics in Inorganic Chemistry: The Chemistry of Energy Storage
EPS 567 Planetary Materials