The Department offers the Master of Science degree in Mechanical or Aerospace Engineering without thesis. The quantitative requirement for the degree is 30-credit hours (normally 10 courses) completed with a grade-point average of 2.7 or better. Course programs may be composed from one area of specialization below (MSME) or in aerospace engineering (MSAE). They must conform to the following distribution:

- **Applied Mathematics**: 6 credits
- **Area of Specialization**: 15 credits
- **Electives**: 9 credits

Elective courses may be chosen in any area of engineering or mathematics at 400-level or higher. Of the 30 units, a minimum of 24 must be in 500-level courses. No more than 6 units may be in 400-level courses; core requirements for the ME undergraduate degree are not allowed. A maximum of 3 credits of Independent Study, MEMS 400/500, may be included as an elective course. A minimum of 15 units must be in MEMS. Non-engineering courses (such as T-courses or finance and entrepreneurship) cannot be counted as engineering electives. Full-time MS students in any area are required to take MEMS 501 Seminar every semester, which is a zero-unit pass-fail course.

Degree candidates will plan their course programs with the help of a departmental advisor. Given below are partial listings of courses recommended for satisfaction of distribution requirements in mathematics and each of the available areas of specialization.

### APPLIED MATHEMATICS

- 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
AREAS OF SPECIALIZATION for MS in Mechanical Engineering (choose one area only)

APPLIED MECHANICS

MEMS 5301       Nonlinear Vibrations
MEMS 5302       Theory of Vibrations
MEMS 5401       Thermodynamics
MEMS 5506       Experimental Methods in Solid Mechanics
MEMS 5410-5411  Fluid Dynamics I and II (Fluids I is not required for Fluids II)
MEMS 5414       Aeroelasticity and Flow-Induced Vibrations
MEMS 5416       Turbulence
MEMS 5500       Elasticity
MEMS 5501       Mechanics of Continua
MEMS 5507       Fatigue and Fracture Mechanics
MEMS 5560       Interfaces and Attachments in Natural and Engineered Structures
MEMS 5562       Cardiovascular Mechanics
MEMS 5564       Orthopaedic Biomechanics-Cartilage/Tendon
MEMS 5565       Mechanobiology of Cells and Matrices
MEMS 5566       Engineering Mechanobiology
MEMS 5601       Mechanical Behavior of Materials
MEMS 5613       Biomaterials Processing
MEMS 5515-5516  Numerical Simulation I, II
BME 4xxx, 5xxx  All Biomechanics courses in BME

DYNAMICS/MECHANICAL DESIGN

ESE 441 or MEMS 4301  Control Systems (both cannot be counted at the same time for MS degree)
ESE 446           Robotics
ESE 447           Robotics Laboratory
ESE 543           Control Systems Design by State-Space Methods
ESE 547           Robust and Adaptive Control
MEMS 424          Introduction to Finite Element Methods for Structural Analysis
MEMS 463          Nanotechnology Concepts and Applications
MEMS 4101         Manufacturing Processes
MEMS 5001         Optimization
MEMS 5102         Materials Selection
MEMS 5104         CAE-Driven Mechanical Design
MEMS 5301         Nonlinear Vibrations
MEMS 5302         Theory of Vibrations
MEMS 5414         Aeroelasticity and Flow-Induced Vibrations
MEMS 5500         Elasticity
MEMS 5501         Mechanics of Continua
MEMS 5507         Fatigue and Fracture Mechanics
MEMS 5515-5516    Numerical Simulation I, II
MEMS 5601         Mechanical Behavior of Materials
MEMS 5605         Mechanical Behavior of Composite Materials
MEMS 5608         Introduction to Polymer Science and Engineering
MEMS 5609         Electronic Material Processing
MEMS 5611         Principles and Methods of Micro and Nanofabrication
MEMS 5703         Analysis of Rotary-Wing Systems
MEMS 5704         Aerospace Structures
MEMS 5705         Wind Energy Systems
MEMS 5706 Aircraft Performance
MEMS 5801 Micro-Electrical Mechanical Systems

**SOLID MECHANICS/MATERIALS SCIENCE**

MEMS 424 Introduction to Finite Element Methods for Structural Analysis
MEMS 463 Nanotechnology Concepts and Applications
MEMS 5102 Materials Selections
MEMS 5500 Elasticity
MEMS 5501 Mechanics of Continua
MEMS 5502 Plates & Shells
MEMS 5506 Experimental Methods in Solid Mechanics
MEMS 5507 Fatigue and Fracture Mechanics
MEMS 5515-5516 Numerical Simulation in Solid Mechanics I, II
MEMS 5560 Interfaces and Attachments in Natural and Engineered Structures
MEMS 5601 Mechanical Behavior of Materials
MEMS 5602 Non-Metallics
MEMS 5603-5604 Materials Characterization I and II
MEMS 5605 Mechanical Behavior of Composite Materials
MEMS 5606 Soft Nanomaterials
MEMS 5607 Introduction to Polymer Blends and Composites
MEMS 5608 Introduction to Polymer Science and Engineering
MEMS 5609 Electronic Materials Processing
MEMS 5610 Quantitative Materials Science and Engineering
MEMS 5611 Principles and Methods of Micro and Nanofabrication
MEMS 5612 Atomistic Modeling of Materials
MEMS 5613 Biomaterials Processing
MEMS 5704 Aerospace Structures
MEMS 5801 Micro-Electrical Mechanical Systems
MEMS 5803 Topics in Nanotechnology

**FLUID/ THERMAL SCIENCES**

EECE 572 Advanced Transport
MEMS 5401 Thermodynamics
MEMS 5402 Radiation Heat Transfer
MEMS 5403 Conduction and Convection Heat Transfer
MEMS 5404 Combustion Phenomenon
MEMS 5410-5411 Fluid Dynamics I and II (Fluids I is not required for Fluids II)
MEMS 5412-5413 Computational Fluid Dynamics I, II
MEMS 5414 Aeroelasticity and Flow-Induced Vibrations
MEMS 5416 Turbulence
MEMS 5420-5421 HVAC Analysis and Design I & II
MEMS 5422 Solar Energy Thermal Processes
MEMS 5424 Thermo-Fluid Modeling of Sustainable Energy Systems
MEMS 5425 Thermal Management of Electronics
MEMS 5426 Fundamentals of Solar Energy Thermal Processes
MEMS 5501 Mechanics of Continua
MEMS 5700 Aerodynamics
MEMS 5701 Aerospace Propulsion
MEMS 5703 Analysis of Rotary-Wing Systems
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMS 5705</td>
<td>Wind Energy Systems</td>
</tr>
<tr>
<td>MEMS 5706</td>
<td>Aircraft Performance</td>
</tr>
<tr>
<td>MEMS 5801</td>
<td>Micro-Electrical Mechanical Systems</td>
</tr>
</tbody>
</table>