MASTER OF SCIENCE, MECHANICAL ENGINEERING

http://mechse.illinois.edu

For more details of the degree requirements for both M.S. programs, visit the department’s Graduate Program Web site (p. 1).

Thesis Option

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 599</td>
<td>Thesis Research (min-max applied toward the degree)</td>
<td>4-8</td>
</tr>
<tr>
<td>MSE 492</td>
<td>Lab Safety Fundamentals (credit does not apply toward the degree)</td>
<td>0</td>
</tr>
<tr>
<td>ME 590</td>
<td>Seminar (registration for 1 hour every term while in residence; credit does not apply toward the degree)</td>
<td>0</td>
</tr>
</tbody>
</table>

Elective courses (formal graded coursework) – chosen in consultation with advisor (subject to Other Requirements and Conditions below)

Total Hours 32

Other Requirements and Conditions

Other Requirements and Conditions may overlap

A minimum of 8 ME or TAM credit hours with 4 at the 500 level.

A minimum of 12 500-level credit hours applied toward the degree.

Departmental approval is required to pursue the non-thesis option.

Minimum GPA: 3.0

For additional details and requirements refer to the department’s graduate program requirements (http://mechanical.illinois.edu/graduate/mechse-graduate-degrees) and the Graduate College Handbook (http://grad.illinois.edu/gradhandbook).

Non-Thesis Option

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
</tr>
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<tr>
<td>MSE 492</td>
<td>Lab Safety Fundamentals (credit does not apply toward the degree)</td>
<td>0</td>
</tr>
<tr>
<td>ME 590</td>
<td>Seminar (registration for 1 hour every term while in residence; credit does not apply toward the degree)</td>
<td>0</td>
</tr>
<tr>
<td>ME 597</td>
<td>Independent Study</td>
<td>4</td>
</tr>
</tbody>
</table>

or TAM 597 Advanced Independent Study

Total Hours 36

Elective courses – chosen in consultation with advisor (subject to Other Requirements and Conditions below)

Total Hours 32

Courses

ME 501 Combustion Fundamentals credit: 4 Hours.
Fundamentals of kinetic theory, transport phenomena, chemical equilibria, and reaction kinetics; flames, their gross properties, structure, and gas dynamics including oscillatory and turbulent burning; solid and liquid propellant combustion; one-dimensional detonation theory including structure and initiation; three-dimensional and other complex detonation waves; supersonic burning. Same as AE 538. Prerequisite: AE 311 or ME 410.

ME 502 Thermal Systems credit: 4 Hours.
Steady-state simulation and optimization of thermal systems, dynamic performance, and probabilities in system design. Prerequisite: ME 402.

ME 503 Design of IC Engines credit: 4 Hours.
Design of internal combustion engines, including gas forces, inertia loads, bearing analysis, torsional vibration, balance, lubrication, valve and cam design, and stress analysis of major engine components. Prerequisite: ME 403.

ME 504 Multiphase Systems & Processes credit: 4 Hours.
Dynamics and thermodynamics of multiphase and multicomponent systems with special relevance to air-pollution control and energy conversion; relaxation phenomena; general motion of systems of disparate elemental masses; diffusion in gravitational and electric fields, and boundary-layer motion with mass transport; dispersion and collection of particulate matter; transport with surface reactions. Prerequisite: ME 404.

ME 510 Advanced Gas Dynamics credit: 4 Hours.
Theoretical gas dynamics; fundamental laws and basic equations for subsonic, transonic, and supersonic steady and unsteady flow processes. Same as AE 510. Prerequisite: ME 410.

Information listed in this catalog is current as of 04/2018
ME 520  Heat Conduction  credit: 4 Hours.  
Fundamentals of heat conduction in isotropic and anisotropic materials;  
methods of solution to steady and transient heat conduction problems  
in one, two, and three dimensions; internal heat sources; periodic flow  
of heat; problems involving phase change; approximate analytical  
techniques; numerical methods; study of current articles on the subject.  
Prerequisite: ME 420.

ME 521  Convective Heat Transfer  credit: 4 Hours.  
Fundamentals of convective heat transfer; calculation of heat transfer  
within ducts and over submerged objects for laminar and turbulent  
flow; natural convection; film condensation and boiling; liquid metals.  
Prerequisite: ME 411.

ME 522  Thermal Radiation  credit: 4 Hours.  
Fundamentals of radiant-energy transport in absorbing and nonabsorbing  
media; pyrometry; applications to selected problems involving combined  
energy-transport mechanisms. Prerequisite: ME 420.

ME 523  Nanoscale Energy Transport  credit: 4 Hours.  
An advanced treatment of diverse transport phenomena at the nanometer  
scale involving solids, liquids and gases emphasizing common features  
in transport by molecules, electrons, phonons, photons, and other quasi-  
particles of interest, oriented toward applied research in the areas of  
nanoscale heat transfer and nanoscale energy conversion. Topics include  
intermolecular forces at surfaces and in the bulk, momentum and species  
transport in microfluidics, linear response theory, free molecular flow in  
gases, electron and phonon transport in crystals, Boltzmann equation  
and its moments, ballistic and diffusive transport, thermoelectric energy  
conversion, interfacial transport, energy transport in nanostructures and  

ME 530  Fatigue Analysis  credit: 4 Hours.  
Fatigue analysis methods for the design of structures and components:  
stress-life, strain-life, and crack-propagation approaches; multiaxial and  
high-temperature fatigue; interrelationship among material properties,  
geometry, and design methodology appropriate for a wide range of  
mechanical engineering components. Prerequisite: ME 430.

ME 531  Inelastic Design Methods  credit: 4 Hours.  
Material deformation under combined mechanical and thermal loading;  
constitutive equations and their application in engineering design and  
in inelastic finite element methods; material and structural degradation  
derunder fatigue and creep conditions. Prerequisite: ME 471 and ME 430.

ME 532  Fracture Resistant Design  credit: 4 Hours.  
Application of fracture mechanics and microstructural behavior to  
materials selection for design; practical approximation of linear and  
inelastic fracture parameters for evaluation of complex components;  
destructive and nondestructive tests for control of toughness in  
manufacture; residual life assessment involving time-dependent  
fracture (creep, fatigue, stress, corrosion); case studies; design project.  
Prerequisite: ME 430.

ME 533  Physical Basis for Plasticity  credit: 4 Hours.  
Physical and mathematical foundation for plasticity in crystalline  
materials, with application to deformation processes. Metal forming;  
deformation processes in other materials, such as slip in geological  
materials and polymers; rate dependence of plastic flow, with underlying  
physical mechanisms; kinetics of dislocation motion, mechanisms of  
work hardening, and crystallographic texture; theoretical framework  
for modeling the constitutive response of rate-dependent materials  
undergoing crystallographic slip, and allied computational procedures.  
Prerequisite: TAM 445.
ME 591  Interest Group Seminar  credit: 1 Hour.
Seminars on current topics in mechanical science and engineering. May be repeated in the same term if topics vary. May be repeated in separate terms.

ME 597  Independent Study  credit: 1 to 4 Hours.
Independent study of advanced problems related to mechanical engineering. May be repeated in the same term or in separate terms if topics vary to a maximum of 12 hours. Prerequisite: Consent of instructor.

ME 598  Special Topics  credit: 1 to 4 Hours.
Subject offerings of new and developing areas of knowledge in mechanical engineering intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

ME 599  Thesis Research  credit: 0 to 16 Hours.
Approved for S/U grading only. May be repeated.