

Mechanical Engineering

College of Engineering

The Department of Mechanical Engineering at the University of Kentucky provides an intellectually challenging environment in which to pursue advanced studies and engage in research. The department offers programs of study leading to M.S. and Ph.D. Degrees in Mechanical Engineering. Financial assistance is available to qualified applicants in the form of graduate teaching assistantships, research assistantships and fellowships. Stipends vary depending on the student's program level and type of support.

Graduate students work closely with faculty, often recognized as renowned authorities in their discipline, in conducting research at the forefront of science and technology. Such graduate studies may be focused in any of the following areas:

- **Manufacturing:** analytical and numerical modeling, optimization of machining processes and systems, lean, sustainable, precision manufacturing, and robotics and machine vision.
- **Mechanics:** dynamic analysis of solids, contact mechanics, system identification of structures, thermal stress and boundary element methods.
- **Systems and Design:** application of nontraditional materials, finite element methods, vibration and noise prediction, rotating machinery dynamics, engineered surfaces, magnetic bearing technology, control of systems, micro-scale design and fabrication, MEMS, biologically-inspired design, and boundary element methods in acoustics.
- **Thermal-Fluid Sciences:** experimental and computational combustion and fire research, computational and experimental fluid dynamics, turbulence research and nonlinear dynamical systems, convection, phase change and radiation heat transfer, nano-technology, optics, and painting technology.

Admission Requirements

Applicants seeking admission to a graduate program in the Department of Mechanical Engineering (ME) as regular students must have been awarded a baccalaureate degree. Admission to the ME graduate programs normally requires a bachelor's degree in engineering (not necessarily in mechanical engineering), a minimum grade point average (GPA) of 3.0/4.0 or 70% on all graduate and undergraduate works, and Graduate Record Examination (GRE) scores of at least 1200 for the combined Quantitative and Verbal sections and 3.5 for the Analytical section. An undergraduate degree in mathematics, chemistry or physics combined with a strong interest in engineering topics may be suitable preparation when certain required undergraduate courses are taken. Exceptions to these requirements may be made if other persuasive evidence indicating the student's potential of success is available.

In addition, all international students (except those with a degree from a U.S. institution) must have a minimum score of 550 (paper) / 213 (computer) / 80 (Internet) on the Test of English as a Foreign Language (TOEFL).

The Master of Science Degree (M.S.)

There are two options, A and B, for fulfilling the requirements for the M.S. degree. Students are admitted into Option A by default. Transfers between options must be approved by the DGS.

Option A (Thesis Plan)

A minimum of 24 semester hours of course work and a research thesis are required. The thesis must be actively supervised by a full or associate member of the Graduate Faculty. In no case will independent work, taken as ME 699, ME 780-783 or ME 790, be counted as part of the 24 hours of coursework when

the course material is related to the student's thesis. No more than two special courses such as ME 599, ME 699, ME 780-783 or ME 790 or independent courses/projects may be counted towards fulfilling requirements for the Master's degree. At least half of all graduate course work must be at the 600 level or above.

Instructors of independent course projects must provide the DGS with a course syllabus in order to obtain approval for use of the course toward satisfaction of M.S. requirements.

Option B (Non-Thesis Plan)

A minimum of 30 semester hours of coursework is required for this program. This option is only allowed on a case-by-case basis with approval of the DGS, and is intended primarily for students with significant industrial experience and a desire to complete degree requirements on a part-time basis. At least half of all graduate course work must be at the 600 level or above. A final oral examination administered by the student's committee must be passed to complete degree requirements.

Doctor of Philosophy

The Ph.D. degree is a research degree granted on the basis of broad knowledge of mechanical engineering and specialized study in a specific area of interest. The student must conduct original and significant research and must submit and defend a dissertation based on that research. To obtain a Ph.D. degree from the Department of Mechanical Engineering, a student must Earn 36 graduate credit-hours taken at the University of Kentucky while in graduate standing after receiving a bachelor's degree. Residency and research courses may not be used to satisfy this requirement. Students who have a M.S. degree from an accredited institution must complete 18 hours of course work. In order to advance to candidacy, doctoral students must pass a qualifying examination consisting of both written and oral components. The written component tests the candidate's knowledge in three fundamental areas of Mechanical Engineering. The oral component consists of a presentation and defense of the student's proposed dissertation research; a prospectus prepared by the student must be submitted to the doctoral advisory committee prior to the examination.

For a more detailed description of these requirements, contact the Director of Graduate Studies.

Graduate Courses

ME 501	Mechanical Design With Finite Element Methods	(3)
ME 503	Lean Manufacturing Principles And Practices (Same As MFS 503)	(3)
ME 505	Modeling Of Manufacturing Processes And Machines (Same As MFS 505)	(3)
ME 506	Mechanics Of Composite Materials (Same As MSE 506)	(3)
ME 507	Design For Manufacturing (Same As MFS 507)	(3)
ME 510	Vibro-Acoustic Design In Mechanical Systems	(3)
ME 512	Manufacturing Systems (Same As MFS 512)	(3)
ME 513	Mechanical Vibrations	(3)
ME 527	Applied Mathematics In The Natural Sciences I (Same As MA 527)	(3)
ME 530	Gas Dynamics	(3)
ME 531	Fluid Dynamics I	(3)
ME 532	Advanced Strength Of Materials	(3)
ME 548	Aerodynamics Of Turbomachinery	(3)
ME 549	Power Generation	(3)
ME 554	Chemical And Physical Processing Of Polymer Systems	(3)
ME 556	Introduction To Composite Materials (Same As MSE 556)	(4)
ME 560	Engineering Optics	(3)
ME 563	Basic Combustion Phenomena	(3)

ME 565	Scale Modeling In Engineering	(3)
ME 580	Heating, Ventilation And Air Conditioning	(3)
ME 585	Fourier Series And Boundary Problems	(3)
ME 599	Topics In Mechanical Engineering (Subtitle Required)	(3)
ME 601	Advanced Cae Applications	(3)
ME 602	Dynamics Of Distributed Mechanical Systems	(3)
ME 603	Mechanics Of Plastic Solids I	(3)
ME 604	Dynamics Of Rotating Machinery	(3)
ME 606	Seminar And Project In Manufacturing Systems Engineering (Same As EE/MFS 606)	(3)
ME 607	Analysis Of Metal Cutting Processes (Same As MFS/MSE 607)	(3)
ME 610	Engineering Acoustics	(3)
ME 611	Boundary Element Methods In Engineering (Same As EGR 611)	(3)
ME 613	Nonlinear Oscillations	(3)
ME 620	Advanced Engineering Thermodynamics I	(3)
ME 626	Advanced Heat Convection	(3)
ME 627	Radiation Heat Transfer	(3)
ME 628	Boiling And Condensation	(3)
ME 631	Fluid Dynamics II	(3)
ME 634	Turbulent Flows	(3)
ME 640	Advanced Analysis And Simulation Of Dynamic Systems	(3)
ME 641	Foundations Of Solid Mechanics	(3)
ME 644	Advanced Dynamics I	(3)
ME 645	Advanced Control System Analysis	(3)
ME 647	System Optimization I (Same As AEN 647)	(3)
ME 651	Mechanics Of Elastic Solids I	(3)
ME 690	Advanced Algorithms For Computational Fluid Dynamics	(4)
ME 691	CFD I - Incompressible Flows	(3)
ME 692	CFD II - Incompressible Flows	(3)
ME 699	Topics In Mechanical Engineering (Subtitle Required)	(3)
ME 748	Master's Thesis Research	(0)
ME 767	Dissertation Residency Credit	(2)
ME 780	Special Problems In Mechanical Engineering	(3)
ME 790	Research In Mechanical Engineering	(1-9)
MFS 608	Nontraditional Manufacturing Processes	(3)
MFS 612	Design of Lean Manufacturing Systems	(3)
MFS 613	Sustainability, Ethics, and Leadership in Manufacturing Organizations	(3)
MFS 780	Independent Study	(3)