

FastTrack: ABM in Mechanical Engineering

Accelerated B.S. to M.S. Program

Enhance your skills in mechanical systems, fluid and solid mechanics, and thermal sciences. This program provides a strong foundation in advanced engineering principles, preparing graduates for impactful careers in industry and research.

RESEARCH AREAS

- **Mechanical Systems/Design** - this area encompasses the broad field of computer-aided design including design methodology and computer graphics, as well as kinematics and dynamics of machines, vibrations, design of machine elements, controls, automation, and techniques for assessing reliability. Current areas of research include non-linear dynamics & vibrations, vibration-based structural health monitoring and failure prediction, expert systems, machine tool calibration, control of robot vehicles, kinematic design and optimization, computer-aided design of control systems, precision machining, surface roughness analysis, and robot-assisted waterjet machining.
- **Fluid Mechanics** - the fluid mechanics program includes advanced studies in laminar and turbulent flows, computational fluid dynamics, experimental methods, flows in micro-domains, flows with particulate matter, biological flow. Current areas of research include fluid flow and heat transfer in micro-domains, flow in human airways, computational fluid dynamics in irregular geometries, biological flows, and numerical direct simulation flow modeling.
- **Solid Mechanics** - studies in solid mechanics involve strength of materials, elasticity, plasticity, continuum mechanics, composite materials, fracture and fatigue, vibrations, wave propagation, computational methods, and micromechanics. Applications of these studies are applied to the mechanical and thermomechanical behavior of metals, composites, functionally graded materials, ceramics, and geological media under both static and dynamic loading conditions. A significant portion of our studies has been involved with micromechanical material behavior. Areas of current research include: behavior of materials under shock loading, dynamic fracture mechanics and material behavior, finite element modeling of biological materials, computational simulation of particulate composites, cellular and granular materials, fatigue crack growth, micromechanical behavior of composites.
- **Thermal Sciences** - The area of thermal science includes studies of thermodynamics, conduction, convection and radiation heat transfer, pollution, and energy processes. Recent research has been involved with experimental and numerical modeling of cooling of circuit boards, heat transfer and fluid flow in melting and solidification, micro heat transfer, aerosol transport in human respiratory flows, direct control heat transfer with phase change, computation of natural and forced convection in complex enclosures, energy system analysis including heating, ventilating, air conditioning, refrigeration, and electrical power systems.

APPLY BY FEB 1 JUNIOR YR



THESIS OPTION

Students are encouraged to begin undergraduate research by the junior year

Required Courses (9 credits)

- Fluid Mechanics/Thermal Sciences core course (3 cr)
- Solid Mechanics core course (3 cr)
- Mechanical Systems core course (3 cr)

Required but not for credit

- MCE 501 Graduate Seminar (fall)
- MCE 502 Graduate Seminar (spring)

Elective Courses (12-15 credits)

- up to 9 cr. of 400-level courses allowed for "graduate credit"
- remainder of credits must be at 500- or 600-level

Thesis Research (6-9 credits)

MCE 599 Master's Thesis Research

NON-THESIS OPTION

Required Courses (15 credits)

- at least one course from each core area: Fluid Mechanics/Thermal Sciences, Solid Mechanics, and Mechanical Systems (at least 9 cr)
- MCE 591 or 592 Special Problems (3-6 credits) culminating in a comprehensive report with oral examination

Required but not for credit

- MCE 501 Graduate Seminar (fall)
- MCE 502 Graduate Seminar (spring)

Elective Courses (15 credits)

- up to 9 cr. of 400-level courses allowed for "graduate credit"
- remainder of credits must be at 500- or 600-level

ADDITIONAL DETAILS

- M.S. degree requires a total of 30 credits
- Up to 9 elective credits can double count from the B.S. program toward the M.S. program: MCE 411, 426, 431, 433, 434, 437, 438, 440, 449, 454, 455, 456, 460, 464, 466, 471, 472, 473, 474, 476, 485
- Up to 6 credits of MCE 599 can double count toward M.S. program
- MCE 491/492 are not allowed to count toward M.S. program
- Students can transfer up to an additional 6 credits not counted toward the B.S. degree to the M.S. program (advanced standing credits)
- Students must complete the requirements of the M.S. degree by the end of their additional year
- GPA 3.0 or higher is required to apply
- Apply by February 1st of Junior Year

SAMPLE THESIS CURRICULUM

General Guidance: Years 1-4

- Incorporate 6 credits of ISE 491/492 to begin research.
- Choose 3 Professional Elective courses that count for graduate credit during Years 3-4.
- If schedule permits, take up to 6 credits of extra graduate-level courses during Year 4 that can transfer to the M.S. program as "advanced standing credits".

Year 4, Fall

- Choose 1 professional elective that counts for graduate credit (3 cr)

Year 4, Spring

- Choose 2 professional electives that count for graduate credit (6 cr)

Year 4, Summer

- MCE 599 (3 cr)

Year 5, Fall (10 cr + Seminar)

- 3 core courses (9 cr)
- MCE 599 (1 cr)
- MCE 501 (1 cr)

Year 5, Spring (8 cr + Seminar)

- 2 elective courses (6 cr)
- MCE 599 (2 cr)
- MCE 502 (1 cr)
- M.S. defense

Year 5, Summer

SAMPLE NON-THESIS CURRICULUM

General Guidance: Years 1-4

- Choose 3 Professional Elective courses that count for graduate credit during Years 3-4.
- If schedule permits, take up to 6 credits of extra graduate-level courses during Year 4 that can transfer to the M.S. program as "advanced standing credits".

Year 4, Fall

- Choose 1 professional elective that counts for graduate credit (3 cr)

Year 4, Spring

- Choose 2 professional electives that count for graduate credit (6 cr)

Year 4, Summer

Year 5, Fall (11 cr + Seminar)

- 2 core courses (6 cr)
- 1 elective course (3 cr)
- MCE 591 (2 cr)
- MCE 501 (1 cr)

Year 5, Spring (10 cr + Seminar)

- 1 core course (3 cr)
- 1 elective course (3 cr)
- MCE 592 (4 cr)
- MCE 502 (1 cr)
- Comprehensive report based on MCE 591/592 work with oral examination.

Year 5, Summer

DEPARTMENTAL CORE AREAS

Fluid Mechanics/Thermal Sciences

- EGR 515: Hydrodynamics
- MCE 541: Advanced Thermodynamics I
- MCE 545: Heat Transfer
- MCE 546: Convection Heat Transfer
- MCE 550: Continuum Mechanics I
- MCE 551: Fluid Mechanics I
- MCE 552: Adv. Experimental Methods I
- MCE 553: Microfluidics
- MCE 562: Comp. Methods in Fluid Flow and Heat Transfer
- MCE 569: Extreme Mechanics
- MCE 580: Micro/Nanoscale Energy Tran.
- MCE 585: Solar Thermal Engineering
- MCE 653: Fluid Mechanics II

Solid Mechanics

- MCE 550: Continuum Mechanics I
- MCE 552: Advanced Experimental Methods I
- MCE 561: Computational Methods in Solid Mechanics
- MCE 565: Wave Motion and Vibrations of Continuous Media
- MCE 568: Theory of Plates
- MCE 569: Extreme Mechanics
- MCE 571: Theory of Elasticity I
- MCE 576: Fracture Mechanics
- MCE 671: Theory of Elasticity II
- MCE 678: Micromechanics
- MCE 679: Theory of Plasticity
- MCE 680: Adv. Topics in Solid Mech.

Mechanical Systems

- MCE 503: Linear Control Systems
- MCE 504: Optimal Control Theory
- MCE 523: Advanced Kinematics I
- MCE 530: Real-Time Monitoring and Control
- MCE 538: Mechanical Engineering Systems
- MCE 549: Adv. Product Design for Manufacture
- MCE 563: Advanced Dynamics
- MCE 564: Advanced Vibrations
- MCE 566: The Mechanics of Robot Manipulators
- MCE 567: Experimental Nonlinear Dynamics
- MCE 586: Adaptive Control for Robotic Systems
- MCE 663: Nonlinear Dynamics



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