Mechanical Engineering

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Program Codes:
20FS0133MS (MS)
20FS0133PHD (PhD)

The Department of Mechanical and Industrial Engineering offers graduate programs leading to degrees in Mechanical Engineering at both the master's and doctoral levels. In addition, the department offers a program leading to the Master of Science in Industrial Engineering and the Doctor of Philosophy in Industrial Engineering and Operations Research; consult the appropriate section of the catalog for more information.

The department offers a broad range of courses in the field of mechanical engineering. A rich array of research topics of contemporary interest are structured into four major interdisciplinary research areas of emphasis: Biomedical and Biotechnology, Microsystems and Nanotechnology, Transportation and Infrastructure, and Energy and Environment. Some examples of specific research focus areas within these emphasis areas include micro/nanoelectromechanical systems (MEMS/NEMS), micro/nanomanipulation, nanoparticles, nanofluidics, microtransducers and micromechanisms, electrospinning, acoustics, dynamics and vibration, medical imaging and diagnostics, biomechanics and computational mechanics, product design, mechatronics and automatic control, multi-body systems and vehicle dynamics, IC engines, combustors, plasma, combustion, heat transfer, turbulence, multi-phase flows, and molecular dynamics and air pollution control. Interdisciplinary and interdepartmental work is encouraged with other engineering departments such as, bioengineering, chemical engineering, electrical engineering, and computer science as well as various departments in the College of Medicine.

Admission and Degree Requirements

- MS in Mechanical Engineering
- PhD in Mechanical Engineering

ME 401. Applied Stress Analysis I. 3 or 4 hours.
Complex bending and torsion, curved flexural members, energy methods in design, theories of failure. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CME 203.

ME 408. Intermediate Vibration Theory. 3 or 4 hours.
Free and forced vibrations of multi-degree of freedom linear systems. Lagrangian dynamics, matrix, approximate and numerical methods. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 308.

ME 409. Advanced Kinematics I. 3 or 4 hours.
Kinematic synthesis of planar linkages. Higher-order, precision point and approximate synthesis. Unified treatment of position, function, and path-angle problems. Consideration of branching and rotatability. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 320.

ME 410. Automation and Robotics Applications. 3 or 4 hours.
Basic pneumatic and hydraulic systems. Design of sequential control circuits and ladder diagrams. Robot kinematics and dynamics. Robot design. Trajectory planning. Applications and demonstrations. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 210.

ME 411. Mechatronics I. 0-4 hours.
Elements of mechatronic systems, sensors, actuators, microcontrollers, modeling, hardware in the loop simulations, real time software, Electromechanical systems laboratory experiments. Course Information: Same as IE 411. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Senior standing or above; or approval of the department. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture.

ME 412. Dynamic Systems Analysis I. 3 or 4 hours.
Classical control theory, concept of feedback, laplace transform, transfer functions, control system characteristics, root locus, frequency response, compensator design. Course Information: Same as IE 412. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 308.

ME 413. Dynamics of Mechanical Systems. 3 or 4 hours.
Degrees of freedom, generalized coordinates, principle of virtual work. D'Alembert's Principle, Lagrange's Equation, Hamilton's Principle. Equations of motion and Newton-Euler equations for rigid bodies. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 320.

ME 414. Theory of Gearing and Applications. 3 or 4 hours.
Classification of gear drives. Geometry of plane and spatial gears. Analysis and synthesis of gears with approximate meshing. Applications to spur, helical, worm and bevel gear drives. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 320.

ME 415. Propulsion Theory. 3 or 4 hours.
Thermodynamics and fluid mechanics of air-breathing engines, performance of rockets; chemical and nuclear rockets. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 419 or the equivalent.

ME 416. Railroad Vehicle Dynamics. 3 or 4 hours.
Introduces analytical and computational methods used for the computer aided dynamic and stability analysis of railroad vehicle systems. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 413; or consent of the instructor.

ME 417. Intermediate Fluid Mechanics. 3 or 4 hours.
Development of conservation equations for Newtonian-fluids; continuity, Navier-Stokes and energy equations. Some exact and approximate solutions of highly viscous, viscous and inviscid flows. Boundary layer flows, jets and wakes. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 321.

ME 418. Transport Phenomena in Nanotechnology. 3 or 4 hours.
Free surface flows, rheologically complex liquids, colloidal suspensions, emulsions, Brownian motion, flows in micro- and nanochannels, and multiple applications. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 325 and ME 211.

ME 419. Compressible Flow Theory. 3 or 4 hours.
Conservation laws, one-dimensional flows. Normal and oblique shock waves, Prandtl-Meyer expansion, flow over airfoils. Applications to nozzles, shock-tubes, wind-tunnels. Flow with friction and heat addition or loss. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 321.

ME 421. Intermediate Heat Transfer. 3 or 4 hours.
Topics in conduction, convection and radiation with emphasis on exact solutions: extended surfaces, internal and external flows, surface radiation, combined modes of heat transfer and selected topics. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 321 or consent of the instructor.

ME 422. Heating, Ventilation and Air Conditioning. 3 or 4 hours.
Refrigeration systems and heat-pump, mass transfer in humidification, solar heat transfer in buildings, heating and cooling loads, air-conditioning computer project. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 321.

ME 423. Heat Exchangers. 3 or 4 hours.
Classification; heat transfer and pressure drop analysis, flow distribution, transient performance, surface selection and geometrical properties, codes and standards. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 211 and ME 321.

ME 424. Energy Management Solutions for Industry: Theory and Practice. 3 or 4 hours.
Emphasis on real world applications including: understanding utility billing and identifying costs; identifying and quantifying energy savings opportunities at industrial facilities; determining investment payback scenarios and considerations. Course Information: 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Field work required. Extensive use of Microsoft Excel. Prerequisite(s): Junior standing or above.

ME 425. Second Law Analysis in Energy Engineering. 3 or 4 hours.
Fundamentals: lost available work. Entropy generation minimization, optimal thermal design of: heat transfer augmentation devices, thermal energy storage, cryogenics, heat exchangers, thermal insulations, solar collectors. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 321.

ME 426. Applied Combustion. 3 or 4 hours.
Topics in combustion, providing both a theoretical and applied understanding of combustion processes as they relate to furnaces. Internal and external combustion engines; pollutant formation. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 325.

ME 427. Solar Engineering. 3 or 4 hours.
Applications; solar geometry and intensities; applied heat transfer topics; flat plate and concentrating collectors; energy storage; analysis of heating and cooling systems. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 321 or consent of the instructor.

ME 428. Numerical Methods in Mechanical Engineering. 3 or 4 hours.
Introduction to numerical solution methods for problems in mechanical engineering. Example problems include heat transfer, fluid mechanics, thermodynamics, mechanical vibrations, dynamics, stress analysis, and other related problems. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 109. Open only to juniors and seniors.

ME 429. Internal Combustion Engines. 3 or 4 hours.
Introduction to engine types, characteristics and performance. Combustion processes in spark and compression ignition engines; combustion abnormalities. Analysis of intake, exhaust and fuel system. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 325.

ME 433. Non-Equilibrium Thermal Processes. 3 or 4 hours.
Molecular engineering. Non-equilibrium statistical mechanics. Distribution functions. Molecular excitation and de-excitation. Ionization and dissociation. Laser engineering. Non-equilibrium chemical kinetics. Surface processes. Chemisorption and physosorption. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 325 or consent of the instructor.

ME 441. Optical Methods in Mechanical Engineering. 0-4 hours.
Optical measurement techniques in solid mechanics and thermal-fluid engineering. Fundamentals of optics. Use of holography, interferometry, LDV, lasers, light scattering, diffraction, and other relevant techniques. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Senior standing or consent of the instructor. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture-Discussion.

ME 444. Interdisciplinary Product Development I. 3 or 4 hours.
Cross-functional teams (w/students from AD 420/423 and MKTG 594) research and develop new product concepts. Focus on the identification of technologically appropriate product design problems. Course Information: Same as IE 444. 3 undergraduate hours. 4 graduate hours. Year-long (with IE/ME 445) project course. Prerequisite(s): Senior standing or above; and consent of the instructor.

ME 445. Interdisciplinary Product Development 2. 4 hours.
Cross-functional teams (w/students from AD 420 and MKTG 594) research and develop new product concepts. Focus on solutions to the opportunities identified in IE/ME 444 to functional prototypes. Serves as a replacement for IE/ME 396. Course Information: Same as IE 445. Year-long (with IE/ME 444) project course. Prerequisite(s): IE 444 or ME 444; and senior standing or above; and consent of the instructor.

ME 449. Microdevices and Micromachining Technology. 0-5 hours.
Microfabrication techniques for microsensors, microstructures, and microdevices. Selected examples of physical/chemical sensors and actuators. Simulation experiments. Course Information: Same as ECE 449. 4 undergraduate hours. 5 graduate hours. Laboratory. Prerequisite(s): ECE 347; or consent of the instructor. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture-Discussion.

ME 450. Air Pollution Engineering. 3 or 4 hours.
Environmental aspects of combustion processes, pollutant formation. Control of pollutants and particulates. Air quality control. Fundamentals of combustion. Course Information: Same as CHE 450. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 321 or consent of the instructor.

ME 464. Virtual Automation. 0-4 hours.
Fundamentals of manufacturing and automation modeling using CAD/CAM and computer-integrated manufacturing methods; concepts of virtual manufacturing; industrial robots and automated factory models within virtual environments. Course Information: Same as IE 464. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 107 or CS 108. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion, and one Laboratory.

ME 468. Virtual Manufacturing. 3 or 4 hours.
Virtual reality applications in manufacturing systems design, manufacturing applications of networked virtual reality, virtual reality modeling of occupational safety engineering. Course Information: Same as IE 468. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 107 or CS 108.

ME 481. Additive Manufacturing Process. 3 or 4 hours.
Covers aspects of additive manufacturing. The types that are covered are generic process, design, vat photopolymerization, extrusion based, jetting, direct writing, 3D bio-printing, powder bed fusion, slicing, and data representation. Course Information: Same as IE 481. 3 undergraduate hours. 4 graduate hours. Recommended background: Manufacturing Processes.

ME 494. Special Topics in Mechanical Engineering. 3 or 4 hours.
Particular topics vary from term to term depending on the interests of the students and the specialties of the instructor. Course Information: 3 undergraduate hours. 4 graduate hours. May be repeated. Prerequisite(s): Consent of the instructor.

ME 496. Undergraduate Senior Design Thesis I. 0-8 hours.
Introduction to the principles and practice of product design: specifications, evaluation of design alternatives, technical reports, and oral presentations, through independent design projects. Course Information: Same as IE 496. Credit only given to nondegree students. No graduation credit given to students enrolled in Engineering. Extensive computer use required. Field trips required at a nominal fee. Prerequisite(s): Consent of the instructor.

ME 497. Undergraduate Senior Design Thesis II. 0-8 hours.
ntroduction to engineering design and research methods: design tools, product conception and development, simulation, prototyping, technical reports and presentations, literature survey and undergraduate thesis. Course Information: Same as IE 497. Credit only given to nondegree students. No graduation credit given to students enrolled in Engineering. Extensive computer use required. Field trips required at a nominal fee. Prerequisite(s): Consent of the instructor.

ME 499. Professional Development Seminar. 0 hours.
Students are provided general information about their role as UIC MIE alumni in society and the role of the University in their future careers. Students provide evaluations of their educational experience in the MIE department. Course Information: Same as IE 499. Satisfactory/Unsatisfactory grading only. Prerequisite(s): Open only to seniors; and approval of the department. Must be taken in the student's last semester of study.

ME 501. Advanced Thermodynamics. 4 hours.
Thermodynamic laws of closed and open systems; exergy destruction; property relations, single phase systems, Gibbs-Duhem relations, multiphase systems, equilibrium; engineering applications. Course Information: Prerequisite(s): ME 325.

ME 502. Applied Stress Analysis II. 4 hours.
Concepts from theory of elasticity, stress-raisers such as notches and holes, mechanical behavior of materials including yielding and fractures, thick-walled cylinders and rotating disks, thermal stresses, and plastic behavior. Course Information: Prerequisite(s): ME 401.

ME 503. Advanced Solid Mechanics. 4 hours.
Linear elastic Governing equations, weighted residual method, variational principle, probability theory and stochastic processes, and stochastic finite element. Course Information: Prerequisite(s): Consent of the instructor. Recommended background: Knowledge in applied stress analysis and finite element analysis.

ME 504. Computer Aided Analysis of Multibody Systems I. 4 hours.
Kinematics, dynamics, analysis of flexible mechanisms. Constrained mechanical systems with flexible components. Numerical methods. Computer-Aided Analysis. Applications. Course Information: Prerequisite(s): ME 413 or consent of the instructor.

ME 505. Computer Aided Analysis of Multibody Systems II. 4 hours.
Large scale deformable bodies. Finite element method. Constrained motion of interconnected rigid and deformable bodies. Coordinate reduction. Computational methods. Applications. Course Information: Prerequisite(s): ME 504.

ME 508. Engineering Acoustics. 4 hours.
Fundamentals of acoustic energy generation, radiation and transmission (both aerodynamically and structurally). Theoretical, experimental and numerical techniques. Applications spanning from 1-D plane waves to more complex 3-D problems. Course Information: Prerequisite(s): ME 408 or CME 435; or approval of the department.

ME 509. Advanced Kinematics II. 4 hours.
Spatial transformation and displacements. Design for bodyguidance; applications to function-generators. Analyses utilizing various operators for closure; dualization; branching, rotatability; differential kinematics; numerical solutions. Course Information: Prerequisite(s): ME 409.

ME 510. Robotic Manipulators. 4 hours.
Description of robotic manipulator; gripper trajectory execution; manipulator design, degree-of-freedom, mobility, workspace, special link positions; static and dynamic force transmission. Course Information: Prerequisite(s): ME 409 or ME 410 or ME 413; or consent of the instructor.

ME 511. Mechatronics II. 4 hours.
Microcontrollers used in electro-mechanical systems for measurement and control purposes, interface hardware, real time software and development tools, applications in robotic motion control and factory automation. Course Information: Same as IE 511. Prerequisite(s): ME 411 and consent of the instructor. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture.

ME 512. Automatic Control of Mechanical Systems. 4 hours.
Modeling and analysis of mechanical systems. Performance specification and evaluation. Modern control system design and analysis techniques. Real-time computer control of engines, manufacturing processes, biomechanical systems. Course Information: Prerequisite(s): ME 412 or consent of the instructor.

ME 514. Mechanics of Viscous Fluids. 4 hours.
Fundamentals of fluid mechanics. Streamline and vorticity. Boundary layer analysis. Similarity solutions, integral methods, and other techniques for treating laminar and turbulent flows. Course Information: Prerequisite(s): ME 417.

ME 515. Micro- and Nano-Transport Phenomena. 4 hours.
Covers free surface flows, rheological complex liquids, colloidal suspensions and emulsions. Course Information: Prerequisite(s): ME 205 and ME 211; or consent of the instructor.

ME 517. Microfluidics: Fundamentals and Applications. 4 hours.
Fundamentals of microfluidics. Microflow. Microfluidic components and microfabrication. Digital microfluidics. Acoustofluidics. Microfluidic sensors, including optical and electrochemical sensors. Prerequisite(s): Graduate standing; or consent of the instructor.

ME 518. Fundamentals of Turbulence. 4 hours.
Mathematical description of turbulence field; kinematics of homogeneous turbulence; correlation and spectrum tensor, dynamic behavior of isotropic turbulence, universal equilibrium theory; nonisotropic turbulence. Course Information: Prerequisite(s): ME 417.

ME 519. Computational Compressible Flow. 4 hours.
Equations of fluid dynamics; nonlinear hyberbolic partial differential equations; some properties of the Euler Equations; the Riemann problem for the Euler Equations; notions on numerical methods; the method of Godunov for nonlinear systems. Course Information: Extensive computer use required. Prerequisite(s): ME 419; or consent of the instructor. Recommended Background: Compressible Flow Theory and knowledge of programming C++, Fortran, or Python.

ME 520. Elastography. 4 hours.
Theoretical foundations of elastography, viscoelasticity, propagation of mechanical waves, elastographic imaging techniques. Magnetic resonance imaging to magnetic resonance elastography data transformation, viscoelastic parameter reconstruction. Course Information: Same as BME 520. Extensive computer use required. Recommended background: BME 421 and BME 422 and BME 423. Class Schedule Information: To be properly registered, students must enroll in one Lecture and one Discussion.

ME 521. Heat Conduction. 4 hours.
Analysis of heat transfer in solids including separation of variables, superpositions, Du Hamel's theorem, integral transforms, similarity transformations, and approximate methods. Course Information: Prerequisite(s): ME 321 or consent of the instructor.

ME 522. Convective Heat Transfer. 4 hours.
Conservation equations. Momentum heat and mass transfer in laminar and turbulent boundary layers. Internal and external flows and heat transfer. Heat transfer with phase change. Special topics in convective heat transfer. Course Information: Prerequisite(s): ME 321 or consent of the instructor.

ME 524. Thermal Radiation. 4 hours.
Fundamentals of radiative transfer; energy exchange between surfaces and in enclosures; radiative transfer in the presence of an attenuating medium; combined radiation, conduction, convection problems. Course Information: Prerequisite(s): ME 421 or consent of the instructor.

ME 525. Multi-phase Heat Transfer. 4 hours.
Nucleate boiling, nucleation and bubble dynamics. Leidenfrost effect. Condensation and engineering application problems. Ice/Frost formation. Surface engineering for enhancing heat transfer. Course Information: Prerequisite(s): ME 421; and graduate standing; or consent of the instructor.

ME 528. Numerical Heat Transfer. 4 hours.
Numerical methods for solving conduction, convection and radiation problems in heat transfer. Iterative methods with shooting; local nonsimilarity methods perturbation methods; finite difference methods; grid generation. Course Information: Prerequisite(s): CS 108 and ME 421 or consent of instructor.

ME 529. Advanced Internal Combustion Engines. 4 hours.
Fundamentals of internal combustion engines. Combustion in homogeneous charged and compression ignition engines. Emission formation. Effect of design and operating variables, control, and instrumentation. Course Information: Prerequisite(s): ME 426 or ME 429.

ME 531. Thermophysics of Gas Flows. 4 hours.
Kinetic theory of gases. Transport properties, quantum mechanical analysis of atomic and molecular structures, atomic scale collision phenomena, propogation, emission, and absorption of radiation.

ME 533. Plasma Engineering. 4 hours.
Plasma-assisted applications. Kinetic theory of non-equilibrium processes. Plasma dynamics. Elementary processes-collisions. Diffusion and transport. Chemical reactions and surface treatment. Particle and energy balance in plasmas. Course Information: Prerequisite(s): ME 433 or consent of the instructor.

ME 534. Finite Element Analysis II. 4 hours.
Application of the finite element method to the analysis of complex continuum and structural linear systems. Introduction to error analysis and convergence of the finite element solutions. Course Information: Same as CME 534. Prerequisite(s): CME 434.

ME 535. Theory of Vibrations II. 4 hours.
Harmonic vibrations; vibrations of a string; vibrations of a beam; vibrations of a membrane; periodic systems; floquet waves; nonlinear vibrations. Course Information: Same as CME 535. Prerequisite(s): CME 435 or ME 408 or the equivalent.

ME 536. Chemically Reacting Flows. 4 hours.
Nonequilibrium states; chemical thermodynamics and kinetics. Multicomponent contiuum equations for flow of nonequilibrium fluids. Inversed nonequilibrium flows. Boundary layer flows with surface and gas-phase reactions. Frozen and equilibrium criteria. Waves in relaxing media. Course Information: Prerequisite(s): ME 516; and ME 514 or ME 522.

ME 540. Design, Modeling, and Fabrication of Microsystems. 4 hours.
MEMS design approach, materials and mechanical properties, scaling laws, transduction methods, microfabrication techniques, modeling and simulation strategies, dynamics, domain-specific details-structures, fluids, dissipation, and system issues. Course Information: Prerequisite(s): Consent of the instructor.

ME 541. Microelectronic Fabrication Techniques. 4 hours.
Current fabrication techniques of microelectronic technology; plasma and CVD processes; etching techniques; ion implantation; surface analytical methods. Course Information: Same as ECE 541. Prerequisite(s): ECE 347 or ECE 449.

ME 542. Advanced Computational Methods for Product and Process Design. 4 hours.
Deterministic and statistical methods for modeling and optimizing engineering systems, in the broad context of product design, manufacturing process development, and designing for life cycle issues. Course Information: Same as IE 542. Prerequisite(s): Programming language experience.

ME 547. Advanced Concepts in Computer-Aided Engineering. 4 hours.
Useful concepts in motion simulation of complex rigid multibody systems. Interactive computer solutions. Recursive formulation of kinematical and dynamical equations of open and constrained multibody systems. Course Information: Prerequisite(s): ME 413 and ME 447.

ME 548. Advanced Computer Aided Manufacturing. 4 hours.
Analysis and design of computer-integrated systems for process planning, production planning and control of discrete part manufacturing activities. Course Information: Prerequisite(s): ME 447.

ME 550. Dynamics of Floating Offshore Structures. 4 hours.
Covers environmental loads and dynamics of floating structures in fluid. Course Information: Same as CME 550. Prerequisite(s): ME 210 and CME 211 and ME 211 and MATH 220; or consent of the instructor.

ME 562. Biomedical Implants in Orthopedics and Dentistry. 4 hours.
Advanced aspects of implant design, including biomaterials, surface coatings, biomechanics, corrosion, tribocorrosion, failure mechanisms, implant monitoring, clinical and regulatory concerns, critical review of current research. Course Information: Same as BME 562 and CME 562. Credit is not given for ME 562 is the student has credit in BIOE 562 or BME 562 or CME 562. Prerequisite(s): BIOE 460 or BME 460. 2007347.

ME 569. Advanced Virtual Manufacturing. 4 hours.
Manufacturing systems design optimization using virtual environments, optimization of manufacturing decision support using virtual reality interfaces, analysis and evaluation of virtual environments. Course Information: Same as IE 569. Prerequisite(s): Consent of the instructor.

ME 591. Mechanical Engineering Internship. 1 hour.
Provides students with the opportunity to apply the skills and knowledge gained in previous engineering courses within a professional, working environment. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. A maximum of 4 hours awarded toward degree requirements. Prerequisite(s): Approval of the Department.

ME 594. Current Topics in Mechanical Engineering. 4 hours.
Particular topics vary from term to term depending on the interests of the students and the specialties of the instructor. Course Information: May be repeated. Prerequisite(s): Consent of the instructor.

ME 595. Mechanical Engineering Seminar. 0-1 hours.
Advances in mechanical engineering research will be discussed in a seminar setting. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Must be taken every semester by all registered MS and PhD students in Mechnical Engineering. Students taking the course for one credit hour submit reflective summaries of the presentations. Prerequisite(s): Graduate standing in mechanical engineering.

ME 596. Independent Study. 1-4 hours.
Individual study under close supervision of a faculty member. Course Information: May be repeated to a maximum of 4 hours. Students may register in more than one section per term. Prerequisite(s): Consent of the instructor.

ME 598. M.S. Thesis Research. 0-16 hours.
Individual research in specialized problems under close faculty supervision. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Consent of the instructor.

ME 599. Ph.D. Thesis Research. 0-16 hours.
Individual research on specialized problems under close faculty supervision. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Consent of the instructor.