MECHANICAL INDUSTRIAL AND MANUFACTURING ENGINEERING (MIME)

MIME 5060 Manufacturing Engineering
[3 credit hours]
The course provides an overview of advanced manufacturing processes, manufacturing management, nano- and bio-manufacturing processes and their applications.
Term Offered: Spring, Fall

MIME 5070 Computer-Aided Manufacturing
[3 credit hours]
The study of machining processes using numerical control machine tools and controllers. Development of programs to machine parts on mills and lathes. Conversion of CAD models to programs through software interfaces.
Term Offered: Fall

MIME 5080 Operations Research I
[3 credit hours]
This course focuses on the mathematical methods of Operations Research and their applications in engineering. Topics include the optimal solution of deterministic and stochastic mathematical models, modeling process, linear programming, the simplex method, duality theory and sensitivity analysis.
Term Offered: Spring, Fall

MIME 5100 Manufacturing Systems Simulation
[3 credit hours]
Discrete and continuous simulation models are used to study queuing networks, manufacturing and related engineering systems. Simulation languages and animation are covered. Statistical inference is used to draw conclusions and to identify the best system.
Term Offered: Spring, Fall

MIME 5230 Dynamics Of Human Movement
[3 credit hours]
The goal of this course is for students to be able to describe motions of the human body. Three-dimensional analysis and measurements of human body movements including kinematics, kinetics and energetics of human gait, anthropometry and application to bioengineering and orthopedics will be presented. Euler angles and the screw axis method will be used to describe three-dimensional motions.
Term Offered: Spring, Fall

MIME 5240 Experimental Methods in Orthopaedic Biomechanics
[3 credit hours]
Experimental techniques used in orthopedics and in the study of the musculoskeletal system including mechanical testing, experimental and analytical methods for stress analysis, strain gages, methods used in human motion analysis to include motion capture, force plates and EMG's. Course prerequisites: For undergraduate students: (BIOE 2200 or MIME 1650) and (BIOE 3110 or CIVE 1160) For graduate students: None
Prerequisites: (BIOE 2200 with a minimum grade of D- or MIME 1650 with a minimum grade of D-) and (BIOE 3110 with a minimum grade of D- or CIVE 1160 with a minimum grade of D-)
Term Offered: Spring, Fall

MIME 5280 Cad - Finite Element Methods
[3 credit hours]
Numerical solutions of boundary value problems, variational calculus and the principle of minimum potential energy, finite element formulation of two dimensional field and elasticity problems, axisymmetric elements, finite element programming.
Term Offered: Summer, Fall

MIME 5300 Advanced Mechanics Of Materials
[3 credit hours]
Theory of elasticity, plane stress and plane strain problems, yield criteria and failure theories, bending of beams, energy methods, curved flexural members, unsymmetric bending, torsion, shear center and axisymmetrically loaded members.
Term Offered: Spring, Fall

MIME 5310 Mechanics Of Composite Materials
[3 credit hours]
Review of elasticity of anisotropic solids, determination of mechanical properties of fiber-reinforced lamina, analysis and performance of laminated composites.
Term Offered: Spring

MIME 5320 Fatigue Of Materials & Structures
[3 credit hours]
Fatigue design methods; fatigue mechanisms; cyclic deformation behavior and material cyclic properties; stress-based and fracture mechanics-based methodologies to fatigue life prediction of smooth and notched members subjected to constant or variable amplitude loadings.
Term Offered: Spring

MIME 5350 Advanced Ceramics
[3 credit hours]
This course provides greater knowledge on the atomic bonding, crystal structure, crystal imperfections, phases and interfaces, microstructures, phase diagrams, phase transformation, transport and diffusion, metal deformation, fracture of materials, deterioration of materials, electronic and physical properties of ceramics.
Prerequisites: MIME 1650 with a minimum grade of C- and PHYS 2130 with a minimum grade of C-
Term Offered: Spring, Fall

MIME 5370 Advanced Materials for Automotive Structures
[3 credit hours]
An in#depth study of the broad range of engineering materials used in the construction of motor vehicles. Inter#relations between materials microstructure, components manufacturing process and components service behavior.
Prerequisites: (MIME 1650 with a minimum grade of C- and PHYS 2130 with a minimum grade of C-)
Term Offered: Spring, Fall

MIME 5380 Engineering Polymers and Rubbers
[3 credit hours]
Polymers and rubber are introduced through lecture and lab components at three levels- 1) synthesis and characterization, 2) thermal, molecular and mechanical properties, and 3) design considerations for engineering applications.
Prerequisites: (MIME 1650 with a minimum grade of C- and PHYS 2130 with a minimum grade of C-)
Term Offered: Spring, Fall

MIME 5390 Failure Analysis of Materials
[3 credit hours]
The failure analysis is a procedure to determine the physical cause of the failure of an element, component or industrial equipment. The course will be focused on material related and will present an introduction to the principles of failure analysis and the fundamental aspects to conduct a failure analysis investigation. A key component of the course is the discussion of real cases of failures (case studies), i.e. failures in mining machinery, chemical processing equipment, energy production, systems, aircraft and petrochemical industry components. This course provides the connection between mechanisms that are responsible for material failures and will address the characterization techniques used in failure analysis. Fundamental failure mechanisms in various materials applications including fracture of metals and alloys, failure in electronic devices, and environmental factor induced failures will be covered. Each categorized phenomenon will be approached by historical events to reveal the application and connection between the mechanism and the incidents.
Prerequisites: (MIME 1650 with a minimum grade of C- and PHYS 2130 with a minimum grade of C-)
Term Offered: Spring, Fall

MIME 5410 Alternative Energy
[3 credit hours]
This course focuses on the technical aspects of sustainable energy technologies, such as wind, solar, biomass, ocean, eaves/tides, geothermal, and hydropower; it also covers issues and applications related to storage, transportation, distribution, industrial usage, and buildings. The course investigates the progress, challenges, and opportunities of each technology to be both technically feasible and economically viable.
Term Offered: Spring, Fall

MIME 5420 Modeling and Control of Engineering Systems
[3 credit hours]
In this course students study physical modeling and feedback principles for control of mechanical and electrical systems. Transient response, root locus and frequency response principles are applied to the control of basic mechanical and electrical systems. PID control laws are emphasized.
Term Offered: Spring, Fall

MIME 5430 Advanced Automotive Control Systems
[3 credit hours]
This course covers the major aspects of automotive control, including engine, driveline, and complete vehicle control. This includes applications such as fuel and ignition control, ABS systems, gear-shifting, and vehicle velocity estimation.
Term Offered: Spring, Summer, Fall

MIME 5440 Advanced Mechatronics
[3 credit hours]
This course will give students hands-on experience with mechatronic systems and components. The mechatronics lab (NE-1063) will be used to demonstrate several mechatronics systems including inverted pendulums, suites of sensors and motors, and other more complex systems. A major part of the course will be a semester-long project where the students conceive, design, and build a mechatronic device. The components for this device, namely a Raspberry Pi and a variety of sensors and actuators, will be directly funded by the course fee.
Term Offered: Spring, Fall

MIME 5450 Advanced Automation Design
[3 credit hours]
This course will introduce the range of common components used in automation, including actuators, sensors, motors, linear guides, energy chain, industrial robots and light curtains. Students will practice (with feedback) walking through the design process in specifying, sizing, laying out and integrating these components. The course will use some elements of CAD, where CAD experience would be helpful, but this would also be a good opportunity to quickly build competence with CAD.
Term Offered: Spring, Fall

MIME 5460 Advanced MATLAB for Engineers
[3 credit hours]
MATLAB is a useful 'tool' for each engineer to have in their 'toolkit'. This course will review the basics of using MATLAB, identify best-practices (applicable to other programming languages as well), and then move on to examples of more-advanced functionality, e.g. image processing, Simulink control of mechatronic systems, numerically solving differential equations, GPU computation, and optimization. Programming experience would be helpful, but this would also be a good opportunity to rapidly grow programming skills with an easy-to-learn language. A major component of the course is a semester-long project where the student can choose a topic that is most relevant to their research or professional interests, or simply a new area that they're curious about, e.g. mechatronics and programming embedded systems.
Term Offered: Spring, Summer, Fall

MIME 5510 Turbomachinery
[3 credit hours]
Theory of energy transfer between fluid and rotor in turbomachines. Design of turbomachine components, axial flow compressors and fans, centrifugal compressors and pumps, axial flow turbines. Design theory and principles, performance analysis, and computational methods
Term Offered: Spring, Summer, Fall

MIME 5520 Heating, Ventilating & Air Conditioning
[3 credit hours]
Control of the thermal environment within enclosed spaces including psychometric properties of air heating and cooling, loads and factors affecting human comfort. Analysis of basic heating and refrigeration systems, heat pumps, heaters, utilization of solar energy, humidifiers, energy conservation and controls for systems.
Term Offered: Fall

MIME 5530 Internal Combustion Engines
[3 credit hours]
Study of Otto, Diesel, and Miller Cycles, performance characteristics, and construction details of internal combustion engines. Analysis of problems associated with air flow, fuel injection, combustion, cooling, supercharging, friction, lubrication, emissions, testing, and control.
Term Offered: Spring

MIME 5540 Jet Propulsion
[3 credit hours]
Aerothermodynamic analysis of jet propulsion systems and components: diffuser, compressor, combuster, turbine and nozzle. Investigation of characteristics of ramjets, turbojets, turbofans and turboprops. Design theory and principles, performance analysis, and computational methods
Term Offered: Summer, Fall

MIME 5550 Aerodynamics
[3 credit hours]
Fundamentals of aerodynamics, potential flow theory, aerodynamic forces and moments, introduction to numerical analysis, application to external and internal flows, theory of lift for infinite and finite wings, induced drag.
Term Offered: Spring, Fall

MIME 5560 Gas Dynamics
[3 credit hours]
Analysis of compressible flow phenomena including shock and detonation waves. Topics include wave propagation, isentropic flow, normal shock waves, oblique shock waves, Prandtl-Meyer flow, and analysis and application to supersonic airfoil theory, inlet, and nozzle.
Term Offered: Spring

MIME 5690 Reliability
[3 credit hours]
Reliability of components and multicomponent systems. Static and dynamic reliability models for both independent and dependent failures. Effects of redundancy. Reliability testing consideration.
Term Offered: Spring, Summer, Fall

MIME 5800 Design For Manufacturability
[3 credit hours]
The course is an introduction to modern manufacturing methodologies used in the fabrication and analysis of new and existing product designs with three areas of emphasis: manufacturing processes, materials, and product development. The course exposes the students to the product development methods and the relationship of design to production processes, product material, material handling, quality costs, and CAD/CAM are presented. Emphasis is primarily on assembled products. Cost estimation software and other design analysis tools are employed. Lean manufacturing and Six Sigma concepts in the design context are also introduced.
Prerequisites: MIME 2650 with a minimum grade of D-
Term Offered: Spring, Fall

MIME 5820 Sustainability Analysis and Design
[3 credit hours]
The course is intended to introduce students to sustainability analysis and design in manufacturing and service settings as related to mechanical and industrial engineering. It will cover solid waste minimization for manufacturers, life cycle analysis, and environmentally conscious design.
Term Offered: Spring, Fall

MIME 5830 Additive Manufacturing
[3 credit hours]
Additive manufacturing (AM) is a method of manufacturing that has been growing rapidly. In this course the students will learn about various AM technologies. They will also work with the required design software packages to create 3D models and 3D-print objects from the designed models.
Prerequisites: MIME 2650 (may be taken concurrently) with a minimum grade of D-
Term Offered: Spring, Summer, Fall

MIME 5980 Special Topics
[1-6 credit hours]
A special topic at the graduate level in Mechanical, Industrial or Manufacturing Engineering to be offered as a course during a term by a faculty member.
Term Offered: Spring, Summer, Fall

MIME 6000 Advanced Engineering Mathematics I
[3 credit hours]
An advanced course in mathematical analysis for engineers. Topics include matrix methods, eigenvalues and eigenvectors, systems of equations, series representations including FFT, ordinary differential equations and Bessel functions. This course will make use of computer-aided-mathematics techniques and include engineering applications.
Term Offered: Fall

MIME 6100 Advanced Engineering Mathematics II
[3 credit hours]
Partial differential equations for engineering applications including elliptic, parabolic, hyperbolic differential and non-linear systems of equations. Solution procedures include separation of variables, Laplace transform methods, solutions using complex analysis including conformal mapping and numerical methods.
Prerequisites: MIME 6000 with a minimum grade of D-
Term Offered: Spring

MIME 6200 Advanced Dynamics
[3 credit hours]
Study of dynamics of a system of particles and rigid bodies using Newtonian and Lagrangian Mechanics including multi-body systems. Principles of nonlinear system dynamics and stability.
Term Offered: Spring

MIME 6210 Advanced Mechanical Vibrations
[3 credit hours]
Advanced concepts in normal mode theory for discrete systems and vibration of continuous systems such as bars, beams and plates.
Term Offered: Spring

MIME 6300 Continuum Mechanics
[3 credit hours]
A unified approach to the study of the mechanics of continuous media; analysis of tensors; kinematics of material media; analysis of deformation and stress; the mathematical statement of the laws of conservation of mass, momentum and energy; formulation of the mechanical constitutive equations for various classes of solids and fluids.
Term Offered: Spring, Fall

MIME 6350 Elasticity
[3 credit hours]
Review of tensor analysis, analysis of stress and strain, three dimensional equations of elasticity, plane problems in rectangular Cartesian and polar coordinates.
Term Offered: Fall

MIME 6360 Plasticity
[3 credit hours]
Review of elastic stress-strain relations, analysis of strain rate and concept of stress rate, criteria of yielding and rules of plastic flow, elastoplastic bending and torsion, theory of slipline fields, mechanics of metal forming processes.
Term Offered: Spring

MIME 6380 Fracture Mechanics
[3 credit hours]
Principles of fracture mechanics and its applications to the prevention of fractures in components and structures, linear elastic and elastic-plastic fracture mechanics, fracture mechanisms, fracture toughness, applications to fatigue crack propagation.
Term Offered: Fall

MIME 6440 Computational Fluid Dynamics I
[3 credit hours]
Properties of various partial differential equations. Basics of finite difference methods. Governing equations of fluid mechanics and heat transfer. Numerical solution of inviscid flow equations. Methods for solving Euler equations. Treatment of shock waves. Applications to simple compressible flows. Numerical methods for boundary-layer type equations.
Term Offered: Fall

MIME 6450 Experimental Fluid Mechanics
[3 credit hours]
Digital data acquisition and analysis; limitations and interpretation of physical measurements; sources of errors and difficulties in experimental technique; advanced experimental methods for static and dynamic measurements in thermal systems and fluid flow.
Term Offered: Spring

MIME 6460 Intermediate Fluid Mechanics and Heat Transfer
[3 credit hours]
Development of the Navier-Stokes and the convective equations. Analysis of boundary-layer flows including similarity solutions, potential flows as well as convective heat transfer topics. This course is intended to provide a solid theoretical foundation in fluid mechanics and convective heat transfer for graduate students, preparing them for more specialized courses in Heath Transfer and Fluid Mechanics.
Term Offered: Fall

MIME 6470 Advanced Computational Fluid Dynamics
[3 credit hours]
This course presents numerical methods to solve hyperbolic equations for compressible fluids. The eigensystem and characteristics of the system of equations representing one-dimensional Euler flows are detailed in terms of conservative and primitive variables. The focus of this course is to introduce concepts of finite-volume upwinding schemes and numerical flux formulations. Numerical solution methods using both explicit and implicit schemes will be introduced in the class and be selectively exercised in the CFD coding project.
Prerequisites: MIME 3430 with a minimum grade of D- and MIME 3400 with a minimum grade of D-
Term Offered: Spring, Fall

MIME 6540 Computational Fluid Dynamics II
[3 credit hours]
Finite difference procedures applied to the solution of reduced forms of the Navier-Stokes equations. Numerical solution of compressible and incompressible forms of the Navier-Stokes equations for laminar and turbulent flows. Fundamental turbulence models. Solution enhancement methods including multi-grid schemes and the use of preconditioning. Grid generation procedures using algebraic and differential equation methods. Structured versus unstructured grid methods. Grid adaptation procedures. Computer program applications.
Prerequisites: MIME 6440 with a minimum grade of D-
Term Offered: Spring

MIME 6570 Advanced Fluid Mechanics
[3 credit hours]
Review of general governing equations, stability of laminar flows, transition to turbulence, incompressible turbulent flows, compressible boundary layer flow, and a selected topic chosen with the class.
Prerequisites: MIME 6460 with a minimum grade of D-
Term Offered: Spring

MIME 6580 Advanced Heat Transfer
[3 credit hours]
Analytical and numerical methods for steady and transient heat conduction, convective heat transfer in boundary layers, models for external and internal forced flows, free flows, influence of turbulence, and phase change.
Prerequisites: MIME 6460 with a minimum grade of D-
Term Offered: Spring

MIME 6590 Advanced Gas Dynamics
[3 credit hours]
One-dimensional steady flows of prefect gases: fundamental laws and basic equations for subsonic, transonic, and supersonic processes. Multidimensional flows: exact solutions; linearized flows; characteristics; supersonic nozzle design. Unsteady one-dimensional flows with discontinuities. Measurements in compressible flows. A selected topics in viscous, heat conducting compressible flows and boundary layers.
Prerequisites: MIME 4560 with a minimum grade of D-
Term Offered: Spring

MIME 6650 Advanced Material Science and Engineering
[3 credit hours]
The course provides an overview of structure, properties, design considerations, processing and engineering application of engineering materials. Hard and Soft materials are introduced through lecture and demonstrations at three levels- 1) synthesis and characterization, 2) thermal, molecular and mechanical properties, and 3) design considerations for engineering applications.
Term Offered: Spring, Fall

MIME 6720 Design of Experiments
[3 credit hours]
Design and analysis of experiments including analysis of variance and regression analysis. Factorial, blocked and nested models are considered together with appropriate estimation and post ANOVA tests.
Term Offered: Fall

MIME 6800 Advanced Manufacturing Systems Engineering
[3 credit hours]
The course is an advanced-level course focusing on advanced studies of traditional manufacturing processes and advanced manufacturing systems with emphasis on manufacturing engineering processes and equipment, machine tools, process planning, design and operation of manufacturing systems.
Term Offered: Spring, Fall

MIME 6810 Assembly And Joining Processes
[3 credit hours]
This course is comprised of two parts: joining processes and assembly systems. Commonly used joining methods, such as welding, mechanical fastening and adhesion are discussed. General principles of assembly are presented with extensive use of automobile assembly as an example.
Term Offered: Spring

MIME 6900 Independent Research
[1-16 credit hours]
Research credit hours toward the Master of Science degree in Mechanical, Industrial and Manufacturing Engineering Department. Students are to use the section number of their thesis/dissertation adviser.
Term Offered: Spring, Summer, Fall

MIME 6910 Engineering Analysis of Smart Material Systems
[3 credit hours]
In this course the students will study the fundamental concepts behind different types of active materials. The course emphasizes current research topics and engineering applications of active materials.

MIME 6920 Special Projects
[1-6 credit hours]
A special project by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for graduate students interested in mechanical, industrial or manufacturing engineering.
Term Offered: Spring, Summer, Fall

MIME 6930 Graduate Seminar
[0 credit hours]
This is a seminar for graduate students in Mechanical, Industrial and Manufacturing Engineering. Topics include orientation to the graduate program and special topics by speakers from industry and other universities. Credit does not apply toward a graduate degree.
Term Offered: Spring, Fall

MIME 6960 Graduate Research and Thesis
[1-9 credit hours]
Masters thesis research.
Term Offered: Spring, Summer, Fall

MIME 6970 Graduate Engineering Internship
[1 credit hour]
Faculty advisor approved industry, government, or agency internship to provide an experiential learning component to the Master's/Doctoral degree program.
Prerequisites: GNEN 5000 with a minimum grade of S
Term Offered: Spring, Summer, Fall

MIME 6980 Special Topics
[1-6 credit hours]
A special topic at the graduate level in Mechanical, Industrial or Manufacturing Engineering to be offered as a course during a term by a faculty member.
Term Offered: Spring, Summer, Fall

MIME 6990 Independent Study
[1-6 credit hours]
An independent study by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for graduate students in mechanical, industrial or manufacturing engineering.
Term Offered: Fall

MIME 7550 Aerodynamics
[3 credit hours]

MIME 7690 Reliability
[3 credit hours]

MIME 8000 Advanced Engineering Mathematics I
[3 credit hours]
An advanced course in mathematical analysis for engineers. Topics include matrix methods, eigenvalues and eigenvectors, systems of equations, series representations including FFT, ordinary differential equations and Bessel functions. This course will make use of computer-aided-mathematics techniques and include engineering applications.
Term Offered: Fall

MIME 8100 Advanced Engineering Mathematics II
[3 credit hours]
Partial differential equations for engineering applications including elliptic, parabolic, hyperbolic differential and non-linear systems of equations. Solution procedures include separation of variables, Laplace transform methods, solutions using complex analysis including conformal mapping and numerical methods.
Prerequisites: MIME 8000 with a minimum grade of D-
Term Offered: Spring

MIME 8120 Advanced Measurement Systems
[3 credit hours]
Sensor selection, data acquisition system selection, evaluation of system response, digital sampling theory, statistical data analysis, space-time correlations, spectral analysis, analog and digital signal conditioning, and static and dynamic measurements.
Term Offered: Fall

MIME 8200 Advanced Dynamics
[3 credit hours]
Study of dynamics of a system of particles and rigid bodies using Newtonian and Lagrangian Mechanics including multi-body systems. Principles of nonlinear system dynamics and stability.
Term Offered: Spring

MIME 8210 Advanced Mechanical Vibrations
[3 credit hours]
Advanced concepts in normal mode theory for discrete systems and vibration of continuous systems such as bars, beams and plates.
Term Offered: Spring

MIME 8300 Continuum Mechanics
[3 credit hours]
A unified approach to the study of the mechanics of continuous media; analysis of tensors; kinematics of material media; analysis of deformation and stress; the mathematical statement of the laws of conservation of mass, momentum and energy; formulation of the mechanical constitutive equations for various classes of solids and fluids.
Term Offered: Spring, Fall

MIME 8350 Elasticity
[3 credit hours]
Review of tensor analysis, analysis of stress and strain, three dimensional equations of elasticity, plane problems in rectangular Cartesian and polar coordinates.
Term Offered: Fall

MIME 8360 Plasticity
[3 credit hours]
Review of elastic stress-strain relations, analysis of strain rate and concept of stress rate, criteria of yielding and rules of plastic flow, elastoplastic bending and torsion, theory of slipline fields, mechanics of metal forming processes.
Term Offered: Spring

MIME 8380 Fracture Mechanics
[3 credit hours]
Principles of fracture mechanics and its applications to the prevention of fractures in components and structures, linear elastic and elastic-plastic fracture mechanics, fracture mechanisms, fracture toughness, applications to fatigue crack propagation.
Term Offered: Fall

MIME 8440 Computational Fluid Dynamics I
[3 credit hours]
Properties of various partial differential equations. Basics of finite difference methods. Governing equations of fluid mechanics and heat transfer. Numerical solution of inviscid flow equations. Methods for solving Euler equations. Treatment of shock waves. Applications to simple compressible flows. Numerical methods for boundary-layer type equations.
Term Offered: Fall

MIME 8450 Experimental Fluid Mechanics
[3 credit hours]
Digital data acquisition and analysis; limitations and interpretation of physical measurements; sources of errors and difficulties in experimental technique; advanced experimental methods for static and dynamic measurements in thermal systems and fluid flow.
Term Offered: Spring

MIME 8460 Intermediate Fluid Mechanics and Heat Transfer
[3 credit hours]
Development of the Navier-Stokes and the convective equations. Analysis of boundary-layer flows including similarity solutions, potential flows as well as convective heat transfer topics. This course is intended to provide a solid theoretical foundation in fluid mechanics and convective heat transfer for graduate students, preparing them for more specialized courses in Heath Transfer and Fluid Mechanics.
Term Offered: Fall

MIME 8470 Advanced Computational Fluid Dynamics
[3 credit hours]
This course presents numerical methods to solve hyperbolic equations for compressible fluids. The eigensystem and characteristics of the system of equations representing one-dimensional Euler flows are detailed in terms of conservative and primitive variables. The focus of this course is to introduce concepts of finite-volume upwinding schemes and numerical flux formulations. Numerical solution methods using both explicit and implicit schemes will be introduced in the class and be selectively exercised in the CFD coding project.
Prerequisites: MIME 3430 with a minimum grade of D- and MIME 3400 with a minimum grade of D-
Term Offered: Spring, Fall

MIME 8540 Computational Fluid Dynamics II
[3 credit hours]
Finite difference procedures applied to the solution of reduced forms of the Navier-Stokes equations. Numerical solution of compressible and incompressible forms of the Navier-Stokes equations for laminar and turbulent flows. Fundamental turbulence models. Solution enhancement methods including multi-grid schemes and the use of preconditioning. Grid generation procedures using algebraic and differential equation methods. Structured versus unstructured grid methods. Grid adaptation procedures. Computer program applications.
Prerequisites: MIME 8440 with a minimum grade of D-
Term Offered: Spring

MIME 8570 Advanced Fluid Mechanics
[3 credit hours]
Review of general governing equations, stability of laminar flows, transition to turbulence, incompressible turbulent flows, compressible boundary layer flow, and a selected topic chosen with the class.
Prerequisites: MIME 8460 with a minimum grade of D-
Term Offered: Spring

MIME 8580 Advanced Heat Transfer
[3 credit hours]
Analytical and numerical methods for steady and transient heat conduction, convective heat transfer in boundary layers, models for external and internal forced flows, free flows, influence of turbulence, and phase change.
Prerequisites: MIME 8460 with a minimum grade of D-
Term Offered: Spring

MIME 8590 Advanced Gas Dynamics
[3 credit hours]
One-dimensional steady flows of prefect gases: fundamental laws and basic equations for subsonic, transonic, and supersonic processes. Multidimensional flows: exact solutions; linearized flows; characteristics; supersonic nozzle design. Unsteady one-dimensional flows with discontinuities. Measurements in compressible flows. A selected topics in viscous, heat conducting compressible flows and boundary layers.
Prerequisites: MIME 4560 with a minimum grade of D-
Term Offered: Spring

MIME 8650 Advanced Material Science and Engineering
[3 credit hours]
The course provides an overview of structure, properties, design considerations, processing and engineering application of engineering materials. Hard and Soft materials are introduced through lecture and demonstrations at three levels- 1) synthesis and characterization, 2) thermal, molecular and mechanical properties, and 3) design considerations for engineering applications.
Term Offered: Spring, Fall

MIME 8720 Design of Experiments
[3 credit hours]
Design and analysis of experiments including analysis of variance and regression analysis. Factorial, blocked and nested models are considered together with appropriate estimation and post ANOVA tests.
Term Offered: Fall

MIME 8800 Advanced Manufacturing Systems Engineering
[3 credit hours]
Advanced studies of traditional manufacturing processes and advanced manufacturing systems with emphasis on manufacturing engineering processes and equipment, machine tools, process planning, design an operation of manufacturing systems.

MIME 8810 Assembly And Joining Processes
[3 credit hours]
This course is comprised of two parts: joining processes and assembly systems. Commonly used joining methods, such as welding, mechanical fastening and adhesion are discussed. General principles of assembly are presented with extensive use of automobile assembly as an example.
Term Offered: Spring

MIME 8900 Independent Research
[1-16 credit hours]
Research credit hours toward the doctoral degree for students in the Mechanical, Industrial and Manufacturing Engineering Department. Students are to use the section number of their dissertation adviser.
Term Offered: Spring, Summer, Fall

MIME 8910 Engineering Analysis of Smart Material Systems
[3 credit hours]
In this course the students will study the fundamental concepts behind different types of active materials. The course emphasizes current research topics and engineering applications of active materials.

MIME 8920 Special Projects
[1-6 credit hours]
A special project by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for graduate students interested in mechanical, industrial or manufacturing engineering.
Term Offered: Spring, Summer, Fall

MIME 8930 Graduate Seminar
[0 credit hours]
This is a seminar for graduate students in Mechanical, Industrial and Manufacturing Engineering. Topics include orientation to the graduate program and special topics by speakers from industry and other universities. Credit does not apply toward a graduate degree.
Term Offered: Spring, Fall

MIME 8960 Dissertation
[1-9 credit hours]
Doctoral dissertation research credit hours for students in the Mechanical, Industrial and Manufacturing Engineering Department. Students are to use the section number of their dissertation adviser.
Term Offered: Spring, Summer, Fall

MIME 8970 Graduate Engineering Internship
[1 credit hour]
Faculty advisor approved industry, government, or agency internship to provide an experiential learning component to the Master's/Doctoral degree program.
Prerequisites: GNEN 5000 with a minimum grade of S
Term Offered: Spring, Summer, Fall

MIME 8980 Special Topics
[1-6 credit hours]
A special topic at the graduate level in Mechanical, Industrial or Manufacturing Engineering to be offered as a course during a term by a faculty member.
Term Offered: Spring, Summer, Fall

MIME 8990 Independent Study
[1-6 credit hours]
An independent study by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for graduate students in mechanical, industrial or manufacturing engineering.
Term Offered: Summer, Fall