

# MECH, IND, MFG ENGINEERING (MIME)

## MIME 1000 Orientation To Me & Ie

[0-3 credit hours (0, 2, 2)]

The mechanical engineering profession is discussed with emphasis on career opportunities. Orientation to the university campus, study skills and time management. Word processing, spreadsheets, e-mail, design projects, and MATLAB programming are studied.

**Term Offered:** Summer, Fall

## MIME 1010 Professional Development

[1 credit hour (0, 0, 1)]

Social protocol and ethics in industry are reviewed. Resume writing and interview skills are developed. Course assists in preparing the student for the co-op experience in industry.

**Prerequisites:** MIME 1000 with a minimum grade of D-

**Term Offered:** Spring, Summer

## MIME 1100 Introduction To Cad

[0-2 credit hours (1, 2, 0)]

Techniques for visualization and representation of machine components using solid modeling and projection. Section views, orthographic projection, dimensioning and tolerancing. CAD techniques for solving vector problems.

**Term Offered:** Summer, Fall

## MIME 1650 Materials Science & Engineering

[0-3 credit hours (2, 2, 0)]

Engineering properties of materials, the effect of atomic bonding and crystalline structure on the mechanical properties of metals, ceramics and polymers. Common measurement, testing and comparison techniques to aid in selection of materials. Laboratory experiences include compressive and tensile strength testing, the effects of heat upon strength, hardness and micro-structure, the effects of combining certain materials in a composite to improve overall mechanical properties.

**Prerequisites:** CHEM 1230 with a minimum grade of D-

**Term Offered:** Spring, Summer, Fall

## MIME 2000 Measurements Laboratory

[0-2 credit hours (1, 2, 0)]

How to write engineering laboratory reports. Statistical analysis of experimental data, uncertainty analysis, general characteristics of measurement systems, static and dynamic measurements, computer data acquisition, applications to thermal, mechanical and electrical systems.

**Prerequisites:** EECS 2340 with a minimum grade of D- and (ENGL 1930 with a minimum grade of D- or ENGL 2950 with a minimum grade of D-)

**Term Offered:** Spring, Summer, Fall

## MIME 2300 Engineering Dynamics

[3 credit hours (0, 0, 3)]

Kinematics of particles and rigid bodies. Thorough study of kinetics of particles and rigid bodies using Newton's laws of motion, work-energy methods, and impulse and momentum methods.

**Prerequisites:** CIVE 1150 with a minimum grade of D-

**Term Offered:** Spring, Summer, Fall

## MIME 2600 Engineering Economics

[3 credit hours (0, 0, 3)]

The study of micro-economic and macro-economic theories. Methods of economic analysis, including the time value of money, are described. Economic decision criteria are used to select best alternatives with emphasis in engineering. Impact of economic decisions on various sectors of society are discussed.

**Term Offered:** Spring, Fall

## MIME 2650 Manufacturing Processes

[0-3 credit hours (0-3, 0-3, 0)]

Manufacturing processes discussed include metal casting and forming such as forging, rolling, extrusion, stamping and drawing. Metal cutting processes such as turning, boring, drilling, milling, sawing and broaching are discussed. Polymer processes including injection molding and extrusion as well as ceramic part production are covered. Laboratory experiences include creating parts using many of these processes.

**Prerequisites:** MIME 1650 with a minimum grade of D-

**Term Offered:** Spring, Summer, Fall

## MIME 2920 Special Projects

[1-3 credit hours (0, 0, 0)]

A special project by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for students interested in mechanical, industrial or manufacturing engineering early in their undergraduate program. Instructor will specify scope of project to correspond to credit hours.

**Term Offered:** Spring, Summer, Fall

## MIME 2980 Special Topics

[1-3 credit hours (0, 0, 0)]

A special topic at the undergraduate level in Mechanical, Industrial or Manufacturing Engineering to be offered as a course during a term by a faculty member. Credits will correspond to regular class meetings of one lecture hour per week per credit hour.

**Term Offered:** Fall

## MIME 2990 Independent Study

[1-3 credit hours (0, 0, 0)]

An independent study by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for engineering students early or midway through their program of study. Instructor will specify scope of project to correspond to credit hours.

## MIME 3200 Introduction to Project Engineering

[3 credit hours (3, 0, 0)]

Topics include: engineering economics; societal, legal and ethical concerns; project scheduling; and designing for quality as well as matching client desires with product attributes.

**Term Offered:** Spring, Fall

## MIME 3300 Design And Analysis Of Mechanical Systems

[3 credit hours (0, 0, 3)]

Design and analysis of mechanisms, gear trains, planetary gear trains, cam-and-follower devices with application to mechanical systems. Motion, force, torque and vibration analysis. Balancing of rotating and reciprocating components in machines.

**Prerequisites:** MIME 2300 (may be taken concurrently) with a minimum grade of D-

**Term Offered:** Spring, Summer, Fall

**MIME 3310 Mechanical Design I**

[3 credit hours (0, 0, 3)]

Applications of mechanics of materials to analysis and design of mechanical components; introduction to fracture mechanics; applications of failure theories to design of machine elements subjected to static and cyclic loadings.

**Prerequisites:** (CIVE 1160 with a minimum grade of D- and MIME 1650 with a minimum grade of D-)

**Corequisites:** MIME 3330

**Term Offered:** Spring, Summer, Fall

**MIME 3320 Mechanical Design II**

[3 credit hours (0, 0, 3)]

Application of failure theories in static and fatigue loading to the design and analysis of mechanical elements including fasteners, power screws, welded joints, springs, bearings, gears, clutches, brakes and shafts.

**Prerequisites:** MIME 3310 with a minimum grade of D-

**Term Offered:** Spring, Summer, Fall

**MIME 3330 Mechanics Laboratory**

[0-1 credit hours (0, 1, 0)]

This laboratory course consists of experiments in strength of materials and stress analysis. Experiments include stress analysis of straight and curved beams, analysis of torsion and combined stresses in shafts, stress concentrations, and determination of mechanical properties from tension tests and fatigue tests.

**Corequisites:** MIME 3310

**Term Offered:** Spring, Summer, Fall

**MIME 3360 Vibration Laboratory**

[0-1 credit hours (0, 0-1, 0)]

This laboratory course will be taken concurrently with Mechanical Vibration and consists of experiments to determine the natural frequency of one degree of freedom systems, free and forced vibrations of lumped parameter systems, mode shapes and natural frequencies of multidegree of freedom systems, and mode shapes and natural frequencies of torsional vibration systems.

**Corequisites:** MIME 3370

**Term Offered:** Spring, Summer, Fall

**MIME 3370 Mechanical Vibration**

[3 credit hours (0, 0, 3)]

Modeling mechanical systems, mechanical elements, equations of motion for single-DOF and multi-DOF systems, linearization of equations of motion, free and forced response, electrical systems, frequency response, feedback control systems.

**Prerequisites:** MIME 2300 with a minimum grade of D- and MATH 3860 with a minimum grade of D- or MATH 2860 with a minimum grade of D- or MATH 3820 with a minimum grade of D-

**Corequisites:** MIME 3360

**Term Offered:** Spring, Summer, Fall

**MIME 3380 Modeling and Control of Engineering Systems**

[3 credit hours (3, 0, 0)]

Physical modeling and feedback principles are applied for control of mechanical systems. Transient response, root locus and frequency response principles are applied to the control of basic mechanical and electrical systems.

**Prerequisites:** MIME 3370 with a minimum grade of D- and MIME 2000 with a minimum grade of D- and EECS 2340 with a minimum grade of D-

**Term Offered:** Spring, Summer, Fall

**MIME 3400 Thermodynamics I**

[3 credit hours (0, 0, 3)]

Introduction to thermal sciences with an emphasis on the first and second law of thermodynamics. Topics include conservation of energy for closed and open systems, thermodynamic properties and cycles and entropy production.

**Prerequisites:** MATH 3860 with a minimum grade of D- or MATH 2860 with a minimum grade of D- or MATH 3820 with a minimum grade of D- and PHYS 2140 with a minimum grade of D-

**Term Offered:** Spring, Summer, Fall

**MIME 3410 Thermodynamics II**

[3 credit hours (0, 0, 3)]

Review of open and closed systems in thermodynamics, the Carnot principle and cycle efficiency concepts. Application to gas and vapor power cycles and refrigeration cycles. Thermodynamic property relations, gaseous mixtures and combustion.

**Prerequisites:** MIME 3400 with a minimum grade of D-

**Corequisites:** MIME 3420

**Term Offered:** Spring, Summer, Fall

**MIME 3420 Fluids Laboratory**

[0-1 credit hours (0, 0-1, 0)]

This laboratory course is to be taken with Fluid Mechanics and Thermodynamics II to illustrate the concepts in those courses.

Experiments include fluid statics, forces on a submerged surface, center of pressure, manometers, surface tension, flow visualization, Bernoulli's equation, control volume analysis, viscous flow in pipes, flow over bodies, turbomachinery, and thermodynamic cycles.

**Corequisites:** MIME 3410, MIME 3430

**Term Offered:** Spring, Summer, Fall

**MIME 3430 Fluid Mechanics**

[3 credit hours (0, 0, 3)]

Fluid mechanics for mechanical engineers. Topics include fluid statics and dynamics, equations of motion, dimensional analysis, boundary layer theory, flow in pipes, turbulence, fluid machinery, potential flow, CFD and aerodynamics.

**Prerequisites:** MIME 3400 with a minimum grade of D-

**Corequisites:** MIME 3420

**Term Offered:** Spring, Summer, Fall

**MIME 3440 Heat Transfer**

[3 credit hours (0, 0, 3)]

A comprehensive study of conduction, convection and radiation.

Derivation and solution of differential equations related to heat transfer.

Analysis of forced and free convection and heat exchangers. Dimensional analysis related to heat transfer.

**Prerequisites:** MIME 3430 with a minimum grade of D-

**Corequisites:** MIME 3450

**Term Offered:** Spring, Summer, Fall

**MIME 3450 Energy Laboratory**

[0-1 credit hours (0, 0-1, 0)]

This laboratory course is to be taken with Heat Transfer to illustrate the concepts in this course. Experiments include Fourier's Law, cooling of fins/rods, determination of free and forced convection heat transfer coefficients, heat exchangers, Stefan Boltzmann Law, surface emission, surface reflection.

**Corequisites:** MIME 3440

**Term Offered:** Spring, Summer, Fall

**MIME 3780 Engineering Management**

[3 credit hours (0, 0, 3)]

The development of the fundamentals required in an engineering and manufacturing environment where technical competency is considered standard and an appreciation of the human behavioral responses to managerial policies and rules is essential. This course covers the basics of planning organizing, leading and control from the subordinates' as well as the manager's perspective.

**Term Offered:** Fall**MIME 3940 Co-Op Experience**

[1 credit hour (0, 0, 1)]

Students in the Industrial and Mechanical Engineering programs are to enroll in this course during each of their approved Co-Op experiences.

**Prerequisites:** MIME 1010 with a minimum grade of D-**Term Offered:** Spring, Summer, Fall**MIME 3950 Co-op Experience**

[1 credit hour (0, 0, 1)]

Approved co-op work experience beyond third required co-op experience. Course may be repeated.

**Prerequisites:** MIME 3940 with a minimum grade of D-**Term Offered:** Spring, Summer, Fall**MIME 4000 Engineering Statistics I**

[3 credit hours (0, 0, 3)]

This course introduces the student to the areas of probability theory and statistical inferences. Topics include sample spaces, the concepts of random variables, probability distributions; functions of random variables, transformation of variables, moment generating functions, sampling and estimation theory; T, F and chi-square distribution.

**Prerequisites:** MATH 2850 with a minimum grade of D- or MATH 2950 with a minimum grade of D-**Term Offered:** Spring, Summer, Fall**MIME 4040 Modern Manufacturing Methods**

[3 credit hours (3, 0, 0)]

This course provides an overview of the philosophy, design and management of production factories throughout the world. This course explores the evolution and revolution of manufacturing since the 1960's and the numerous philosophical changes that have shaped the factory of today. The course examines the fundamental design of the factory in an effort to meet the demands of customers, culture of the organization, competitive situation, and pressures of marketing and management.

**Term Offered:** Fall**MIME 4060 Manufacturing Engineering**

[3 credit hours (0, 0, 3)]

Students apply machine tools and fabrication processes to optimize the manufacture of a product. Emphasis is on engineering design integrated with economic principles and fabricating methods.

**Prerequisites:** MIME 2650 with a minimum grade of D- and MATH 2860 with a minimum grade of D- or MATH 3860 with a minimum grade of D- or MATH 3820 with a minimum grade of D-**Term Offered:** Summer, Fall**MIME 4070 Computer-Aided Manufacturing**

[3 credit hours (0, 2, 2)]

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.

**Prerequisites:** MIME 2650 with a minimum grade of D-**Term Offered:** Fall**MIME 4100 Manufacture Systems Simulation**

[3 credit hours (0, 0, 3)]

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.

**Prerequisites:** MIME 2650 with a minimum grade of D- and MATH 2860 with a minimum grade of D- or MATH 3860 with a minimum grade of D- or MATH 3820 with a minimum grade of D-**Term Offered:** Spring**MIME 4180 Legal Aspects of Engineering**

[3 credit hours (3, 0, 0)]

This course offers an introduction to legal topics for engineers. Topics include: contracts, negligence, products liability, patents and copyright, employment law, criminal law, environmental law, and business law.

**Term Offered:** Spring**MIME 4200 Senior Design Projects**

[3 credit hours (0, 0, 3)]

Students work in teams using knowledge gained in earlier courses to solve real design, manufacturing and operational problems relevant to industry. Oral and written communications with participating companies as well as teamwork are stressed. Other topics include patents, product liability, safety, ethics and design for manufacturing.

**Prerequisites:** (MIME 3320 with a minimum grade of D- or MIME 3710 with a minimum grade of D-) and (MIME 4020 (may be taken concurrently) with a minimum grade of D- or MIME 3440 (may be taken concurrently) with a minimum grade of D-)**Term Offered:** Spring, Summer, Fall**MIME 4230 Dynamics Of Human Movement**

[3 credit hours (0, 0, 3)]

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.

**Prerequisites:** MIME 2300 with a minimum grade of D-**Term Offered:** Fall**MIME 4280 Cad-Finite Element Methods**

[3 credit hours (0, 0, 3)]

An introduction to the basic concepts of the finite element method. Topics include engineering analysis of continuous systems, numerical solutions of boundary value problems, method of weighted residuals and the principle of minimum potential energy, applications of commercially available finite element programs.

**Prerequisites:** MIME 3320 with a minimum grade of D-**Term Offered:** Summer, Fall

**MIME 4300 Advanced Mechanics Of Materials**

[3 credit hours (0, 0, 3)]

Theory of elasticity, plane stress and plane problems, yield criteria and failure theories, bending of beams, energy methods, curved flexural members, unsymmetric bending, torsion, shear center and axisymmetrically loaded members.

**Prerequisites:** CIVE 1160 with a minimum grade of D- and MATH 2860 with a minimum grade of D- or MATH 3860 with a minimum grade of D- or MATH 3820 with a minimum grade of D-

**Term Offered:** Fall**MIME 4310 Mechanics Of Composite Materials**

[3 credit hours (0, 0, 3)]

Review of elasticity of anisotropic solids, determination of mechanical properties of fiber-reinforced lamina, analysis and performance of laminated composites.

**Prerequisites:** (CIVE 1160 with a minimum grade of D- and MIME 1650 with a minimum grade of D-)

**Term Offered:** Spring**MIME 4320 Fatigue Of Materials & Structures**

[3 credit hours (0, 0, 3)]

Fatigue design methods; fatigue fracture 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.

**Prerequisites:** CIVE 1160 with a minimum grade of D-

**Term Offered:** Spring**MIME 4410 Alternative Energy**

[3 credit hours (3, 0, 0)]

This course focuses on the technical aspects of sustainable energy technologies, such as wind, solar, biomass, ocean waves/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.

**MIME 4510 Turbomachinery**

[3 credit hours (0, 0, 3)]

Theory of energy transfer between fluid and rotor in turbomachines. Design of turbomachine components. Applications to pumps, compressors and turbines.

**Prerequisites:** (MIME 3410 with a minimum grade of D- and MIME 3430 with a minimum grade of D-)

**Term Offered:** Fall**MIME 4520 Heating, Ventilating And Air Conditioning**

[3 credit hours (0, 0, 3)]

Control of the thermal environment within enclosed spaces including psychrometric 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.

**Prerequisites:** MIME 3410 with a minimum grade of D-

**Term Offered:** Fall**MIME 4530 Internal Combustion Engines**

[3 credit hours (0, 0, 3)]

Study of Carnot, Otto, Diesel and Brayton Cycles, performance characteristics, combustion engines and construction details of internal combustion engines. Analysis of problems associated with carburetion, fuel injection, combustion, cooling, supercharging, emissions and emission control.

**Prerequisites:** MIME 3410 with a minimum grade of D-

**Term Offered:** Spring, Fall**MIME 4540 Jet Propulsion**

[3 credit hours (0, 0, 3)]

Mechanics and thermodynamics of jet propulsion. Fundamentals of high-speed flow. Analysis of gas turbine engine components: diffuser, compressor, turbine and nozzle. Investigation of characteristics of ramjets, turbojets, turbofans and turboprops. Introduction to solid and liquid rockets.

**Prerequisites:** MIME 3410 with a minimum grade of D-

**Term Offered:** Fall**MIME 4550 Aerodynamics**

[3 credit hours (0, 0, 3)]

Fundamentals of aerodynamics, potential flow theory, aerodynamic forces and moments, introduction to numerical analysis, application to internal flows, theory of lift for infinite and finite wings, induced drag.

**Prerequisites:** MIME 3430 with a minimum grade of D-

**Term Offered:** Spring**MIME 4560 Gas Dynamics**

[3 credit hours (0, 0, 3)]

Analysis of compressible flow phenomena including shock and detonation waves. Internal flow with friction and heat addition. Analysis and application to supersonic airfoil theory, inlet nacelles, nozzles to generate supersonic thrust and jet engine combustors.

**Prerequisites:** MIME 3430 with a minimum grade of D-

**Term Offered:** Spring**MIME 4690 Reliability**

[3 credit hours (0, 0, 3)]

Reliability of components and multicomponent systems. Static and dynamic reliability models for both independent and dependent failures. Effects of hot and cold redundancy. Reliability testing consideration and renewal theory.

**Prerequisites:** MIME 4010 with a minimum grade of D-

**Term Offered:** Spring**MIME 4820 Sustainability Analysis and Design**

[3 credit hours (3, 0, 0)]

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.

**MIME 4920 Special Projects**

[1-3 credit hours (0, 0, 0)]

A special project by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for students interested in mechanical, industrial or manufacturing engineering nearing completion of their undergraduate degree. Instructor will specify scope of project to correspond to credit hours.

**Term Offered:** Spring, Summer, Fall

**MIME 4980 Special Topics**

[1-3 credit hours (0, 0, 0-3)]

A special topic at the undergraduate level in Mechanical, Industrial or Manufacturing Engineering to be offered as a course during a term by a faculty member. This is intended for students nearing graduation. Credits will correspond to regular class meeting of one lecture hour per week per credit hour.

**Term Offered:** Spring, Summer, Fall

**MIME 4990 Independent Study**

[1-3 credit hours (0, 0, 0)]

An independent study by the student to investigate or solve an acceptable problem in industrial or mechanical engineering. This course is primarily intended for engineering students nearing graduation. Instructor will specify scope of study to correspond to credit hours.

**Term Offered:** Fall