

Mechanical Engineering

Chairperson: John Borg, Ph.D., FASME

Department of Mechanical Engineering website (<http://www.marquette.edu/engineering/mechanical/>)

Mission

We immerse individuals in an active environment to cultivate broadly educated mechanical engineers who balance theory with practice for advancing knowledge, solving problems and serving society.

Educational Objectives

Marquette University Mechanical Engineering graduates completing the Bachelor of Science degree in Mechanical Engineering will:

- Have successful careers.
- Continue their professional development.
- Serve their profession and society.
- Attain leadership roles in their professions and in society.
- Make strong contributions to their professions.

Synopsis

Mechanical engineering is that branch of engineering, which is concerned with mechanical and energy systems, along with the intelligent use of modern materials. Mechanical engineers conceive, plan, design and direct the manufacturing, distribution and operation of a wide variety of devices, machines and systems for energy conversion, environmental control, materials processing, transportation, materials handling and other purposes. The field of mechanical engineering is very broad, and the profession thus provides an ideal base for interdisciplinary activities.

Engineers are constantly challenged to advance and implement modern technologies. This challenge can be met if one obtains a sound knowledge of the fundamental principles of the engineering sciences. The mechanical engineering curriculum is designed to provide not only a thorough understanding of the engineering sciences but also of the principles of manufacturing and organization that are used to implement these fundamentals in practical engineering applications.

Integrated with the technical and scientific content of the program is a series of required and elective courses in the humanities, social sciences, theology, philosophy and communication arts. These courses provide the student with an understanding of society and an awareness of his or her social responsibilities.

To accommodate the students' professional interests, the department offers electives in a number of areas of study within mechanical engineering. In choosing electives, the student and faculty adviser confer to determine those courses which best meet the needs and interests of the individual student. By carefully selecting technical elective course work, the student can obtain in-depth knowledge in one or possibly two areas of study to compliment the broad, fundamental, required courses.

The mechanical engineering curriculum is outlined below and then followed by a description of the areas of study and the corresponding technical elective courses for each.

Five Year B.S./M.S. Program

This program allows students to receive a bachelor of science degree and a master of science degree in mechanical engineering in as few as five years. Only the thesis option is available with this program. Qualified students (3.500/4.000 GPA) who are enrolled in the Mechanical Engineering Department at Marquette University may apply for admission to this program during their undergraduate junior year. Students must submit an application to the Graduate School, indicate their interest in the five-year program, and meet all other admission criteria as stated in the Application Requirements section, including GRE test scores. See Mechanical Engineering section of Graduate School Bulletin for details.

Undergraduate College Programs

- Mechanical Engineering, BME (<https://bulletin.marquette.edu/engineering/mechanical-engineering/mechanical-engineering-bs/>)
- Mechanical Engineering, Minor (<https://bulletin.marquette.edu/engineering/mechanical-engineering/mechanical-engineering-minor/>)

Graduate Programs

- Mechanical Engineering, ME (<https://bulletin.marquette.edu/graduate/mechanical-engineering-me/>)
- Mechanical Engineering, MS (<https://bulletin.marquette.edu/graduate/mechanical-engineering-ms/>)
- Mechanical Engineering, PHD (<https://bulletin.marquette.edu/graduate/mechanical-engineering-phd/>)

MEEN 2460 Materials Science (3 credits)

Fundamental principles of materials science and engineering. Topics include atomic structure of matter, types of bonding, crystallography, role of imperfections, diffusion, phase diagrams, phase transformations, mechanical behaviors, fracture of materials, classification and property of materials. Laboratory experiments to develop understanding of processing-structure-property relationship in materials. 2 hrs. lec.; 2 hrs. lab. Enrolled in the Opus College of Engineering.

Prerequisite: CHEM 1001, which may be taken concurrently.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%202460>)

MEEN 2930 Special Topics in Mechanical Engineering (1-5 credits)

Offered as an experimental course to evaluate and determine if a course should be incorporated into the regular curriculum of a program, or courses in the approval process pipeline, but not yet officially approved. Once the same course has been offered twice as a Special Topic, it cannot be offered again until it moves through the curriculum approval process and is approved with a regular curriculum course number.

Prerequisite: Enrolled in the Opus College of Engineering.

Level of Study: Undergraduate

Last four terms offered: 2018 Spring Term, 2017 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%202930>)

MEEN 3210 Measurements and Controls (3 credits)

Fundamentals of measurement/instrumentation systems and control systems. Measurement topics include: sensors, signal conditioners, data acquisition, and transducers for measurement of strain, force, displacement, temperature, flow, pressure, and other engineering parameters. Control system topics include: mathematical modeling of dynamic systems, and analysis and design of systems using sensors, actuators, and controllers. Time-domain and frequency-domain methods for design of feedback control systems. Computer and laboratory exercises using MATLAB and LabVIEW. 2 hrs. lec., 2 hrs. lab.

Prerequisite: GEEN 2120 and ELEN 3001.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203210>)

MEEN 3220 Dynamics of Mechanical Systems (3 credits)

Analytical and computational analysis of the kinematics and kinetics of planar multi-body mechanical systems. Vibration analysis of single degree of freedom systems. Engineering applications including dynamic balancing, vibration absorption and vibration isolation.

Prerequisite: MATH 2451 or MATH 2455; and GEEN 2120.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203220>)

MEEN 3250 Design of Machine Elements 1 (4 credits)

Detailed design of structural elements, shafts, gears, bearings and other machine elements. Laboratory activities which cover the theoretical and experimental analysis of machine elements. 3 hrs. lec., 2 hrs. lab.

Prerequisite: GEEN 2110 and GEEN 2130.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203250>)

MEEN 3260 Numerical Methods of Mechanical Systems (3 credits)

Numerical algorithms (math analysis, optimization, function approximation) for analysis and preliminary design of engineering systems. Development and use of MATLAB functions. Finite difference and finite element analysis of thermal and elastic systems. 3 hrs. lec.

Prerequisite: MATH 2451 and GEEN 2130.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203260>)

MEEN 3310 Thermodynamics 1 (3 credits)

Elementary principles of equilibrium thermodynamics. Property relationships for pure substances, ideal gases and incompressible substances. Work and heat transfer, mass conservation and the first and second laws of thermodynamics applied to closed and open systems, operating at steady and unsteady conditions. Thermal efficiencies of thermodynamic cycles and isentropic efficiencies of single-stream devices.

Prerequisite: MATH 1451 or MATH 1455; PHYS 1030, PHYS 1003 or PHYS 1013; and PHYS 1020.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203310>)

MEEN 3320 Fluid Mechanics (3 credits)

Fundamental conservation laws of mass, momentum and energy as applied to fluid systems. Properties of fluids, hydrostatics, flow of real fluids in closed and open systems, dynamic similarity, dimensional analysis and viscous and inviscid fluid flow.

Prerequisite: MATH 2450 or MATH 1455; and GEEN 2120.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203320>)

MEEN 3330 Fundamentals of Heat Transfer (3 credits)

Overview of principal mechanisms of heat transfer: conduction, convection, and thermal radiation. Application of conduction and forced convection to heat exchangers. Discussion of theory and applications of conduction, forced and natural convection, boiling and condensation and thermal radiation.

Prerequisite: MATH 2451 or MATH 2455; MEEN 3310; and MEEN 3320 or BIEN 4400.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203330>)

MEEN 3340 Thermodynamics 2 (3 credits)

The culmination of thermodynamic, fluid and heat transfer concepts to the application of power and refrigeration cycles, psychrometrics systems, and combustion processes. Includes a laboratory section in which experiments are conducted to demonstrate, test and assess devices, processes and cycles. 2 hrs. lec.; 2 hrs. lab.

Prerequisite: MEEN 3310; MEEN 3330, which may be taken concurrently.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203340>)

MEEN 3426 Engineering Statistics (3 credits)

Introductory course in statistics, which is the field of study concerned with the collection, analysis and interpretation of uncertainty in data. Topics include summary statistics, basic probability, commonly used distributions, confidence intervals, and hypothesis testing. In addition, introductory concepts of engineering economy and cash flow diagrams will be covered in the first few weeks of the course to prepare students for the FE exam.

Prerequisite: MATH 1451 or MATH 1455.

Level of Study: Undergraduate

Marquette Core Curriculum: NSM Expanding Our Horizons

Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203426>)

MEEN 3443 Manufacturing Engineering (3 credits)

The types of processes available to manufacture various products. The characteristics of these processes and how they interact with design requirements, tolerances, safety and the environment. Integration of basic concepts into complete processes. Determination of the process to manufacture various assigned products. 2 hrs. lec., 2 hrs. lab.

Prerequisite: MEEN 2460.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2021 Spring Term, 2020 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203443>)

MEEN 3460 Materials Selection in Mechanical Design (3 credits)

Design methodology and the criteria for the selection of materials from the four classes of materials (metals, plastics, ceramics and composites) are discussed. Criteria include processing requirements, mechanical properties, and environmental resistance. A rationale for selecting materials based on materials selection charts is presented. The process-structure-property relationship for ferrous and non-ferrous alloys, plastics, ceramics and composites is presented from the point of view of understanding selection criteria. Considerations of cost and availability are also taken into consideration. 3 hrs. lec.

Prerequisite: MEEN 2460.

Level of Study: Undergraduate

Last four terms offered: 2021 Spring Term, 2020 Fall Term, 2020 Spring Term, 2019 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%203460>)

MEEN 4110 Mechanical Engineering Potpourri (3 credits)

Survey of practical engineering tools and processes utilizing in entry-level engineering positions. Comparison of engineering philosophical paradigms underlying the industrial state gate product design process from ideation, product, design, product manufacture and quality control to end of product life.

Prerequisite: Sr. stndg.

Level of Study: Undergraduate

Last four terms offered: 2022 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204110>)

MEEN 4220 Intermediate Dynamics (3 credits)

Develop an understanding of the principles of 3D rigid body kinematics (motion) and kinetics (forces and accelerations). Use these principles to analyze the dynamic behavior of mechanical systems. Learn to use analytical mechanics tools including virtual work and Lagrange's method. Develop a systematic approach for solving engineering problems.

Prerequisite: MEEN 2120.

Level of Study: Undergraduate

Last four terms offered: 2022 Spring Term, 2021 Spring Term, 2020 Spring Term, 2019 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204220>)

MEEN 4230 Intermediate Mechanics of Materials (3 credits)

Review of beam theory; asymmetric bending, shear center, thin-walled sections; torsion of non-circular sections, open and closed thin-walled sections; energy methods, Castigliano's second theorem, statically indeterminate structures, internal static indeterminacy; curved beams.

Prerequisite: GEEN 2130.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2018 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204230>)

MEEN 4240 Polymers and Polymer Composites (3 credits)

Introduction to physical/chemical structure of polymers, polymer characterization, polymer material properties and mechanical testing methods, elastic and viscoelastic polymer response, processing methods, composite materials and the selection of polymers in design applications.

Prerequisite: GEEN 2130.

Level of Study: Undergraduate

Last four terms offered: 2018 Fall Term, 2010 Fall Term, 2002 Fall Term, 2001 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204240>)

MEEN 4245 Fatigue and Fracture Mechanics (3 credits)

Application of fatigue and fracture models to engineering design. Stress-life (high-cycle), strain-life (low-cycle), and fatigue crack growth models for fatigue. Introduction to linear elastic fracture mechanics. Statistical considerations in failure. Fail-safe design practices. Includes illustrative case studies.

Prerequisite: GEEN 2130.

Level of Study: Undergraduate

Last four terms offered: 2014 Spring Term, 2013 Spring Term, 2012 Spring Term, 2011 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204245>)

MEEN 4260 Introduction to Continuum Mechanics (3 credits)

Introduction to tensor notation, tensor analysis and coordinate system invariance; analysis of stress, strain and rate of strain for infinitesimal and finite deformation; application of Newtonian mechanics to deformable media; mechanical constitutive equations; field equations for solid and fluid mechanics.

Prerequisite: MATH 2451, Co-req: MATH 3100 or MEEN 3260, or equivalent.

Level of Study: Undergraduate

Last four terms offered: 2017 Fall Term, 2016 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204260>)

MEEN 4265 Intermediate Finite Element Methods (3 credits)

Introduces the finite element solution method for linear, static problems. Includes calculation of element stiffness matrices, assembly of global stiffness matrices, exposure to various finite element solution methods, and numerical integration. Emphasizes structural mechanics, and also discusses heat transfer and fluid mechanics applications in finite element analysis. Computer assignments include development of finite element code (FORTRAN or C) and also use of commercial finite element software (ANSYS and/or MARC).

Prerequisite: MEEN 3260.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2021 Spring Term, 2018 Spring Term, 2006 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204265>)

MEEN 4270 Physical Systems Modeling (3 credits)

Principles of modeling of physical systems, including devices and processes. Development of models of physical systems: mechanical, electrical, fluid, thermal and coupled systems. Time-dependent behavior of interconnected devices and processes. Computer-based modeling and simulation of physical systems. Identification using models and measured data. Introduction to control systems analysis and design.

Prerequisite: MATH 2451.

Level of Study: Undergraduate

Last four terms offered: 2021 Fall Term, 2019 Fall Term, 2018 Fall Term, 2009 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204270>)

MEEN 4275 Mechatronics (3 credits)

Mechatronics, as an engineering discipline, is the synergistic combination of mechanical engineering, electronics, control engineering, and computer science, all integrated through the design process. This course covers mechatronic system design, modeling and analysis of dynamic systems, control sensors and actuators, analog and digital control electronics, interfacing sensors and actuators to a microcomputer/microcontroller, discrete and continuous controller design, and real-time programming for control.

Prerequisite: MEEN 3210 and MEEN 3220.

Level of Study: Undergraduate

Last four terms offered: 2018 Fall Term, 2017 Fall Term, 2015 Fall Term, 2014 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204275>)

MEEN 4310 Combustion: Thermochemistry, Kinetics and Applications (3 credits)

Fundamentals of combustion, including thermodynamics, chemical equilibrium and chemical kinetics. The application of the principles are emphasized for the development of mathematical models in MATLAB that can be used to simulate combustion in fundamental reactors and internal combustion engines. Prior experience with computer programming is recommended.

Prerequisite: MEEN 3340 and MEEN 3260.

Level of Study: Undergraduate

Last four terms offered: 2020 Fall Term, 2019 Fall Term, 2019 Spring Term, 2018 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204310>)

MEEN 4320 Internal Combustion Engines (3 credits)

Fundamental aspects of the design and operating characteristics of spark-ignition and diesel engines. Presents an overview of the thermodynamics, combustion, fluid flow and heat transfer that takes place within the engine cylinder. Discusses efficiency and emissions challenges that the engine must meet.

Prerequisite: MEEN 3330 and MEEN 3340.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2004 Fall Term, 1997 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204320>)

MEEN 4325 Intermediate Fluid Mechanics (3 credits)

Intermediate Fluid Mechanics continues to develop fluid mechanic concepts, building on a working knowledge of the Reynolds Transport Theorem. Topics include: differential analysis, irrotational flow theory, boundary layer theory and compressible flow theory. Both laminar and turbulent flows are discussed. Some working knowledge of computer programming is necessary.

Prerequisite: MATH 2450 or MATH 2455, and MEEN 3320 or equiv.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204325>)

MEEN 4350 Transport Phenomena (3 credits)

The subject of transport phenomena includes three closely related topics: fluid dynamics, mass transfer, and heat transfer. Fluid dynamics involves the transport of momentum, mass transfer is concerned with the transport of mass of various chemical species, and heat transfer deals with the transport of energy. In practice, rarely are these phenomena acting alone. Thus in this introductory course, these three topics are studied together so that a more cohesive understanding of these interrelated processes is developed.

Prerequisite: MEEN 3340.

Level of Study: Undergraduate

Last four terms offered: 2017 Fall Term, 2016 Fall Term, 2015 Fall Term, 2014 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204350>)

MEEN 4360 Intermediate Thermodynamics (3 credits)

This intermediate course will cover fundamentals of thermodynamics, including classical and statistical approaches with application to equilibrium and non-equilibrium, non-reactive and reactive systems. Topics relevant to micro/nanoscale and biological systems may be covered.

Prerequisite: MEEN 3340.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204360>)

MEEN 4370 Heat Exchangers Design and Analysis (3 credits)

Addresses the fundamental thermal-hydraulic equations and correlations used to design and analyze various types of heat exchangers. A systematic approach/method to the thermal-hydraulic design and analysis, or rating, of various types of heat exchanger systems through selected virtual and real problems.

Level of Study: Undergraduate

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204370>)

MEEN 4380 Renewable Energy - Fundamentals and Applications (3 credits)

Emphasis on thermodynamics, heat transfer and fluid mechanics aspects of renewable energy systems and applications. Topics include solar, wind, hydropower, geothermal, biomass, and wave and tide. Both technical and economic analyses of renewable energy systems.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204380>)

MEEN 4410 Experimental Design (3 credits)

Application of statistical concepts to design engineering experiments to improve quality, production techniques, and reliability. Use and advantages of various models; factorial, fractional factorial, orthogonal arrays and fractional designs.

Prerequisite: MATH 4720 or MEEN 3426 or cons. of instr.

Level of Study: Undergraduate

Last four terms offered: 2022 Spring Term, 2021 Spring Term, 2020 Spring Term, 2018 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204410>)

MEEN 4420 Failure Analysis (3 credits)

Methodology of failure analysis. Studies of brittle fracture, ductile fracture, fatigue, stress corrosion and electro-chemical corrosion as applied to the failure of metals. Involves some laboratory work and analyses of a variety of metallurgical failures.

Prerequisite: MEEN 2460 and GEEN 2130.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204420>)

MEEN 4430 Powder Metallurgy (3 credits)

The course introduces a modern technology with growing importance. It covers the basics of powder metallurgy with main emphasis on sintered steel. The primary topics covered are powder production, die compacting, sintering theory and practice, full density processing, properties under static and dynamic loading conditions.

Prerequisite: MEEN 2460.

Level of Study: Undergraduate

Last four terms offered: 2017 Fall Term, 2015 Fall Term, 2013 Fall Term, 2012 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204430>)

MEEN 4440 Processing and Forming of Materials (3 credits)

Solidification and microstructural development in metal casting with an overview of selected melting processes. Overview of primary and secondary working principles involved in ferrous materials processing. Stress based and finite element analyses are applied to both sheet and bulk forming to develop a fundamental understanding of deformation processing principles and technology associated with processes such as drawing, open and closed die forging and rolling.

Prerequisite: MEEN 2460 and MEEN 3443, which can be taken concurrently.

Level of Study: Undergraduate

Last four terms offered: 2022 Spring Term, 2020 Fall Term, 2019 Fall Term, 2018 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204440>)

MEEN 4450 Mechanical Behavior of Materials (3 credits)

Stress and strain relationships for elastic behavior. Theory of plasticity. Plastic deformation of single crystals and polycrystalline aggregates. Dislocation theory, fracture, internal friction, creep and stress rupture and brittle failure.

Prerequisite: MEEN 2460 and GEEN 2130; or cons. of instr.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2020 Fall Term, 2019 Fall Term, 2019 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204450>)

MEEN 4470 Computer Integrated Production Systems (3 credits)

Overview of computer integrated production systems, which include computer numerical control, industrial robotics, material transport and storage systems, automated production lines, flexible manufacturing systems, quality control systems, CAD/CAM, production planning and control, just-in-time and lean manufacturing.

Prerequisite: MEEN 3443 or con. of instr.

Level of Study: Undergraduate

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204470>)

MEEN 4475 Ergonomics (3 credits)

Ergonomics maximizes the health and safety of workers, while maintaining productivity and quality. Covers biomechanical and physiologic aspects of workplace design, such as engineering anthropometry, cumulative trauma disorders, (including carpal tunnel syndrome), low back injuries, hand tool design and evaluation, methods of surveillance in industrial environments, modeling, and ergonomics guidelines. Laboratory experiences are offered to demonstrate ergonomic principles and also provide students with hands-on experience in collecting data and conducting experiments.

Prerequisite: MEEN 3426 or MATH 4720 or equiv.

Level of Study: Undergraduate

Last four terms offered: 2020 Fall Term, 2018 Fall Term, 2017 Spring Term, 2016 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204475>)

MEEN 4485 Welding Engineering (3 credits)

Arc welding physics, fundamentals of power supplies and welding circuits, fusion and solid-state welding processes, weld testing, analysis of welded joints, demonstrations using various processes.

Prerequisite: GEEN 2130 and MEEN 3443.

Level of Study: Undergraduate

Last four terms offered: 2013 Spring Term, 2009 Spring Term, 2007 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204485>)

MEEN 4570 Biomaterials Science and Engineering (3 credits)

Designed to introduce the uses of materials in the human body for the purposes of healing, correcting deformities and restoring lost function. The science aspect of the course encompasses topics including: characterization of material properties, biocompatibility and past and current uses of materials for novel devices that are both biocompatible and functional for the life of the implanted device. Projects allow students to focus and gain knowledge in an area of biomaterials engineering in which they are interested. Same as BIEN 4420.

Prerequisite: MEEN 2460 or consent of instructor.

Level of Study: Undergraduate

Last four terms offered: 2020 Spring Term, 2019 Spring Term, 2018 Spring Term, 2016 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204570>)

MEEN 4590 Engineering Fundamentals Review (1 credits)

Review of basic science, mathematics, engineering science, and economics. S/U grade assessment.

Prerequisite: Sr. stndg.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204590>)

MEEN 4920 Principles of Design (3 credits)

Course content focuses on a structured product design and development process that includes project definition, customer needs identification, product specification, concept generation and concept selection. Also focuses on issues related to teamwork, project management and effective communication. Student team design projects culminate in the development of a technically and economically viable concept and a proposal for future development of this concept (done in the second semester of this two-course sequence). 2 hrs. lec., 1 hr. disc. Cross-listed with BIEN 4920, COEN 4920, EECE 4920.

Prerequisite: Sr. stndg; Co-op students, Jr. stndg.

Level of Study: Undergraduate

Last four terms offered: 2022 Fall Term, 2021 Fall Term, 2020 Fall Term, 2019 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204920>)

MEEN 4931 Topics in Mechanical Engineering (3 credits)

Covers a unique perspective or in-depth topic in: energy conversion, mechanical analysis and design and manufacturing systems.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204931>)

MEEN 4995 Independent Study in Mechanical Engineering (1-3 credits)

Undergraduate independent study project of either theoretical or experimental nature., 3.000 GPA, cons. of instr., and cons. of dept. ch.

Prerequisite: Jr. stndg.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Fall Term, 2022 Spring Term, 2021 Fall Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204995>)

MEEN 4998 Senior Design Project (3 credits)

Course focuses on detailed design, prototyping, and testing design concepts. Course includes topics directly relevant to student design projects and careers in the engineering profession. Student team design projects culminate in a final report that documents the performance and details (engineering drawings and/or documentation) of their final design. 2 hrs. lec., 1 hr. disc. Cross-listed with BIEN 4998, COEN 4998, and EECE 4998.

Prerequisite: MEEN 4920.

Level of Study: Undergraduate

Last four terms offered: 2023 Spring Term, 2022 Spring Term, 2021 Spring Term, 2020 Spring Term

Schedule of Classes (<https://bulletin.marquette.edu/class-search/?details&code=MEEN%204998>)