MANUFACTURING ENGINEERING (MFGE)

MFGE 2132. Manufacturing Processes Lab.
Hands-on experience in variety of material removal processes such as turning, milling, drilling, and CNC machining; joining processes such as gas/arc welding, and soldering; metal casting, polymer and composite processing, and microelectronics manufacturing. Prerequisite or corequisite: MFGE 2332.
1 Credit Hour. 0 Lecture Contact Hours. 2 Lab Contact Hours.
Grade Mode: Standard Letter
about Manufacturing Processes Lab

MFGE 2332. Material Selection and Manufacturing Processes.
Overview of material processing, material selection and process parameter determination. Processes covered include: material removal, forming, casting, polymer processing, semiconductor manufacturing and assembly processes. Laboratory activities provide opportunities for applying the design through manufacture activities of the product cycle. Prerequisite: ENGR 2300. Corequisite: ENGR 2300.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter
about Material Selection and Manufacturing Processes

Topics include design process, description of wireframe/surface/solid models, transformation and manipulation of objects, finite element analysis, data exchange, process planning, machine elements, fundamentals of numerical control programming for turning and milling processes, fundamentals of CAD/CAM systems, CNC code generation by CAD/CAM software, waterjet, and plasma cutting. Prerequisites: ENGR 1313 and MFGE2332.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter
about Computer Aided Design and Manufacturing

This course will cover the general procedures in designing various machine elements. These elements include shafts and flexible elements, springs, welded/riveted/brazed joints, screw fasteners, rolling/sliding contact bearings, gears, cams, and followers. Emphasis will be placed on using standard design practices. Prerequisite: ENGR 3311 or TECH 2351.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Design of Machine Elements

MFGE 4357. Dynamics of Machinery.
This course will cover kinematics and kinetics of particles; kinematics and kinetics of rigid bodies in two and three dimensions; application of dynamics to the analysis and design of machine and mechanical components; mechanical vibrations; linkages; gear trains; and balancing of machines. Prerequisites: MATH 3323 and MATH 3375.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Dynamics of Machinery

Integrated design and development of products and processes; impact of ethical issues on design; the discussion of real-world engineering problems and emerging engineering issues with practicing engineers; preparation of reports; plans or specifications; cost estimation; project management, communication and the fabrication of an engineered product/system. Prerequisites: ENGR 3311, MFGE 4365, and senior standing. Corequisite: IE 3330. (WI).
about Concurrent Process Engineering
3 Credit Hours. 2 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required|Writing Intensive
Grade Mode: Standard Letter
about Concurrent Process Engineering

MFGE 4365. Tool Design.
Design of single and multi-point cutting tools, jig and fixture design, gage design, and the design of tooling for polymer processing and sheet metal fabrication. Laboratory projects will involve the use of computer aided design and rapid prototyping. Prerequisite: MFGE 3316 or ENGR 3316 or TECH 2310.
about Tool Design
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Tool Design

MFGE 4367. Polymer Properties and Processing.
Structure, physical & mechanical properties, design considerations and processing methods for polymer-based materials are presented. Processing methods include: injection molding, blow molding, thermoforming, compression molding, extrusion, filament winding, lay-up methods, vacuum bag molding and poltrusion. Prerequisite: MFGE 2332 or TECH 4362.
about Polymer Properties and Processing
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter
about Polymer Properties and Processing

MFGE 4376. Control Systems and Instrumentation.
The theory of automated control systems and its applications to manufacturing systems are covered in this course. Topics covered include: modeling of systems, time and frequency domain feedback control systems, stability analysis, transducer and sensor technology and digital control. Prerequisites: PHYS 1430 and one of the following MFGE 2332, TECH 4362 or EE 3370. Co-requisite: MATH 3323.
about Control Systems and Instrumentation
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Control Systems and Instrumentation

MFGE 4392. Microelectronics Manufacturing I.
Provides an overview of integrated circuit fabrication including crystal growth, wafer preparation, epitaxial growth, oxidation, diffusion, ion-implantation, thin film deposition, lithography, etching, device and circuit formation, packaging and testing. The laboratory component involves production and testing of a functional semiconductor device. Prerequisites: CHEM 1141 and CHEM 1341.
about Microelectronics Manufacturing I
3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Microelectronics Manufacturing I
MFGE 4394. Microelectronics Manufacturing II.  
Topics include: atomic models for diffusion, oxidation and ion implantation; topics related to thin film processes i.e. CVD, PVD; planarization by chemical-mechanical polishing and rapid thermal processing; and process integration for bipolar and MOS device fabrication. Students will design processes and model them using a simulation. Prerequisite: MFGE 4392.

3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.  
Grade Mode: Standard Letter  
about Microelectronics Manufacturing II

This course is an overview of computer integrated manufacturing is presented. Topics include control strategies for manufacturing systems, automated material handling systems, production planning, shop floor control, manufacturing execution systems, manufacturing databases and their integration, data communication and protocols and man/machine interfaces. Prerequisite: MFGE 3316. (WI).  
about Computer Integrated Manufacturing

3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hours.  
Grade Mode: Standard Letter  
about Computer Integrated Manufacturing

MFGE 4396. Manufacturing Systems Design.  
Applications of simulation modeling to the design and analysis of manufacturing systems are presented in this course. Topics covered include queuing theory and discrete event simulation methods. Design projects will involve the use of current simulation language for modeling and analysis of manufacturing systems. Prerequisites: IE 3320. (WI).  
about Manufacturing Systems Design

3 Credit Hours. 3 Lecture Contact Hours. 2 Lab Contact Hours.  
Grade Mode: Standard Letter  
about Manufacturing Systems Design

MFGE 4399A. Reverse Engineering and Rapid Prototyping.  
In the course 3D scanning technology for design, analysis, and inspection, is covered. Also, applications of the 3D scanning in reverse engineering and different rapid prototyping processes in a hands-on approach will be explained in this course.  
about Reverse Engineering and Rapid Prototyping

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.  
Grade Mode: Standard Letter  
about Reverse Engineering and Rapid Prototyping

MFGE 4399B. Introduction to Reinforced Polymer Nanocomposites in Industrial Applications.  
Introductory course in reinforced polymer nanocomposites focusing on materials, manufacturing, characterization, and applications. Include, primarily nanoclay polymer matrix composites. Thrust will be the challenges in low-cost manufacturing for industrial applications, commercial successes, its impact on current material market, and future.  
about Introduction to Reinforced Polymer Nanocomposites in Industrial Applications

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.  
Grade Mode: Standard Letter  
about Introduction to Reinforced Polymer Nanocomposites in Industrial Applications

MFGE 4399C. Introduction to Industrial Robotics.  
This course will cover the basic principles and techniques involved in industrial robotics. Emphasis will be placed on industrial robot applications, analysis of robot manipulators, components of industrial robots, robot programming and control. Prerequisite: MFGE 4376.  
about Introduction to Industrial Robotics

3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.  
Course Attribute(s): Exclude from 3-peat Processing|Topics  
Grade Mode: Standard Letter  
about Introduction to Industrial Robotics

Topics include design process, mathematical presentation of wireframe/surface/solid modes, transformation and manipulation of objects, finite element analysis, data exchange, process planning, fundamentals of multi-axis NC programming for turning and milling processes, fundamentals of CAD/CAM systems, CNC code generation by CAD/CAM software for the CNC, and waterjet machines. Registration required instructor's approval. Restricted to students enrolled in the MS Engineering program.  
about Advanced Computer Aided Design and Manufacturing

3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.  
Grade Mode: Standard Letter  
about Advanced Computer Aided Design and Manufacturing

MFGE 5318. Reverse Engineering and Freeform Fabrication.  
The course covers theory, techniques, and applications of Advanced Reverse Engineering & Freedom Fabrication. Topics include reverse engineering generic process, reverse modeling, contact and noncontact scanning, point cloud, geometric modeling, data extraction, rapid prototyping processes, uniform and adaptive slicing, industrial and medical applications, hardware, and software. Co-requisite: MFGE 5316. Registration requires instructor’s approval. Restricted to students enrolled in MS Engineering program.  
about Reverse Engineering and Freeform Fabrication

3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.  
Grade Mode: Standard Letter  
about Reverse Engineering and Freeform Fabrication

MFGE 5320. Polymer Nanocomposites.  
This course covers polymer nanocomposites focusing on materials, manufacturing, characterization, and applications. The primary focus is on fiber reinforced polymer nanocomposites. Morphological, Thermal, Mechanical, and Electrical Characterization will be discussed in detail. Applications include fire-resistant, ablative, fatigue-resistant, impact-resistant, and bio-based composites. Registration requires instructor's approval. Restricted to students enrolled in the MS Engineering program.  
about Polymer Nanocomposites

3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.  
Grade Mode: Standard Letter  
about Polymer Nanocomposites
MFGE 5326. Advanced Robotics in Manufacturing Automation.
This course covers principles and techniques involved in advanced robotics. Topics include introduction to robotics, industrial robotics, robot kinematics, path planning, robot dynamics, advanced control, force control, sensors and actuators, mobile robotics, and introduction to nanorobotics. Registration requires instructor’s approval. Restricted to student’s enrolled in the MS Engineering program.
about Advanced Robotics in Manufacturing Automation
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Advanced Robotics in Manufacturing Automation

MFGE 5328. Advanced Control Techniques.
This course covers advanced control techniques in manufacturing processes. Topics include modeling of dynamic systems, feedback control systems analysis, stability analysis, PID control, optimal control, programmable logic control, design of control systems, transducer and sensor technology, and digital control. Registration requires instructor’s approval. Restricted to students enrolled in the MS Engineering program.
about Advanced Control Techniques
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Advanced Control Techniques