MFGE Manufacturing Engineering

MFGE 2142 Fundamentals of Engineering Mechanics
4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course provides an introductory survey of engineering statics, mechanics of materials, and dynamics as they apply to manufacturing engineering.
Prerequisite(s): A minimum grade of "C" in MATH 2242 and PHYS 2211K.

MFGE 2239 Engineering Modeling and Mathematical Analysis
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
An introduction to probability and distribution functions as they relate to component/system reliability and degradation, an applied overview of ordinary differential equations, and graphical/mathematical analysis, with an emphasis on manufacturing engineering applications such as design, process, reliability, uncertainty and risk assessment.
Prerequisite(s): A minimum grade of "C" in STAT 2231.
Corequisite(s): MENG 2139.

MFGE 2421 Introduction to Additive Manufacturing Studio
2 Credit Hours. 0 Lecture Hours. 4 Lab Hours.
Students will develop a working ability to use parametric solid modeling software. In addition to creating solid models, students will develop a basic proficiency in structures and thermal analysis software. They will also gain insight into rapid prototyping principles three dimensional design and printing in an applied project based setting. Students will gain exposure to additive manufacturing Digital Design to Manufacturing concepts. Students will learn to perform basic finite element analysis of solid models.
Prerequisite(s): A minimum grade of "C" in ENGR 1133 and MFGE 2142.

MFGE 2531 Materials Science Studio for Manufacturing Engineering
3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
This course covers a broad range of engineering materials with an emphasis on application, use, and manufacturing processes. Students will develop an understanding of relationships between material properties, microstructure and manufacturing processing. Topics include atomic structure and arrangement; control of the microstructure and mechanical properties; solidification, phase diagrams, mechanical testing, strengthening mechanisms, thermosets and thermoplastics, introduction to composites, and selection of materials based upon manufacturing applications. Laboratory activities include studies of mechanical and/or metallurgical tests related to strengths, hardness, toughness, solidification, and metallography of materials with an emphasis on manufacturing processes and techniques.
Prerequisite(s): A minimum grade of "C" in CHEM 1212K or CHEM 1310.

MFGE 2533 Manufacturing Processing 2 Studio
3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
This course covers theory and hands-on experiences with various forming processes such as casting, forging, extrusion, rolling and drawing. Students will gain insight into the theory of manufacturing processes and will develop competency through lab based hands-on practice and the processing constraints related to the design of products and systems.
Prerequisite(s): A minimum grade of "C" in MENG 1310 and MFGE 2531.

MFGE 2534 Applied Computing in Manufacturing Engineering
3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
This course provides a survey introduction to programming logic and flowcharting, applications of the principles and techniques of computer numerically controlled machine tools (CNC). G and M code programming of Industrial machines, tooling systems, and an introduction to Computer Aided Manufacturing (CAM) systems will be covered. Manual hands on programming as well as interfacing with professional machining software such as MasterCAM or HSM Works will be incorporated. IT interfacing of components and systems will be introduced, as well as basic control devices such as PLCs.
Prerequisite(s): A minimum grade of "C" in ENGR 1133 and MENG 1310.

MFGE 3131 Design for Manufacturability, Assembly, Sustainability
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
A study and application of the principles that result in the integration of machine design, product design and process planning into one common activity with considerations given to assembly tolerances, fit, and clearance as well as whole–lifecycle usability, recyclability and sustainability. The goal is to design a product that is easily and economically manufactured. Also included is a study of coordinate measurement machines (CMM), machine design, metrology and design principles that contribute to enhanced sustainability.
Prerequisite(s): A minimum grade of "C" in MFGE 2142 and MFGE 2421 and MFGE 2533.

MFGE 3132 Quality and Statistical Process Control for Engineers
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Course focuses on the definition of Quality. Introduces students to proactive concepts of quality such as Six Sigma, QFD, FMEA, POKAYOKE, Ishikawa analysis and reactive methods used to ensure quality production through the measurement and maintenance of desired product characteristics in manufacturing processes such as control charts and sampling.
Prerequisite(s): A minimum grade of "C" in MFGE 2239.

MFGE 3337 Hydraulics and Electro-mechanical Systems
3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
Exploration of the basic principles of fluidic (hydraulic and pneumatic) systems and electrical movers as they relate to manufacturing assembly processes and lines, and industrial robotics.
Prerequisite(s): A minimum grade of "C" in ENGR 2131 and MFGE 3421 and MFGE 3541.

MFGE 3421 Industrial Controls and Networking Studio
2 Credit Hours. 0 Lecture Hours. 4 Lab Hours.
This studio laboratory will cover the theory and practice of engineering measurements, measuring devices, and their application to controlled activities in an applied environment. The experimental activities will include the application of traditional measuring devices, development of data acquisition packages, and inner-connectivity and networking of sensors and programmable logic control (PLC) devices with an emphasis on robotics, automation, and manufacturing applications. Prerequisite(s): A minimum grade of "C" MFGE 2534 and prior or concurrent enrollment in ENGR 2131.

MFGE 3423 Facilities Design
2 Credit Hours. 2 Lecture Hours. 0 Lab Hours.
The goal of this course is to impart an understanding of the basic principles of facilities location, layout, and material handling systems so as to design an efficient manufacturing/service facility. This will be enhanced through hands on practice in designing facilities. Facilities design issues that will be stressed upon will include modeling, design, and analysis techniques. It will try to provide a balance of exposure to available methodologies in facilities location, layout, and material handling with a practical emphasis, not just quantitative evaluation.
Prerequisite(s): A minimum grade of "C" in MFGE 2533.

MFGE 3531 Advanced Materials Processing
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
Students will develop both a theoretical and hands-on appreciation for techniques working with plastics, ceramics, composites, nanomaterials, etc.
Prerequisite(s): A minimum grade of "C" in ENGR 1133 and MFGE 2142.

MFGE 3541 Energy Science Studio
4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
A survey of fluid mechanics, thermodynamics, and heat transfer with an emphasis placed upon manufacturing engineering. Fundamentals of fluid statics and fluid dynamics for incompressible fluids, fluid properties, static and dynamic forces, Bernoulli's equation, pipe flow and losses, open channel flow and flow measurement. Thermodynamic properties, state postulate, work interactions, steady-state and transient energy and mass conservation, entropy and the second law. First and Second Law analysis of thermodynamic systems. Gas cycles and vapor cycles. An introduction to basic energy transport by conduction, convection, and radiation with applications to heat exchanger, extended surfaces etc. The laboratory will provide both problem solving and hands on experimentation experiences that support the concepts covered in the lecture.
Prerequisite(s): A minimum grade of "C" in PHYS 2211K and MATH 2242.

MFGE 4090 Special Topics in Manufacturing Engineering
1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.
This course provides for study of Manufacturing Engineering course topics not generally offered by the program or offered on an introductory or trial basis.
Prerequisite(s): Permission of instructor and department chair.

MFGE 4091 Manufacturing Engineering Co-Op
1 Credit Hour. 0 Lecture Hours. 0 Lab Hours.
The student obtains practical work experience in the manufacturing engineering profession with a manufacturing company. May be repeated for credit when participating with the same industry employer. Requires prior department chair approval for course credit. Prerequisite(s): Sophomore standing.

MFGE 4135 Lean MFG Principals and Engineering Project Management
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The planning, evaluation, deployment, and integration of lean manufacturing theory and methods. Emphasis on manufacturing processes/equipment and systems, e.g. planning/control, product design, supply chain, and human resource management, JIT, KANBAN, theory of constraints and quick response manufacturing. The course will also include principles of engineering economy that facilitate in the selection of appropriate engineering projects to maximize ROI.
Prerequisite(s): A minimum grade of "C" in MFGE 3132.

MFGE 4321 Manufacturing Engineering Capstone I
2 Credit Hours. 0 Lecture Hours. 4 Lab Hours.
A capstone project based course that draws on all major curricular themes within the manufacturing engineering program. This course focuses on concurrent product design and development. Key areas include designing with constraints; brainstorming, problem solving, and creativity methods. Students will use design analysis tools, solid modeling, finite element analysis and supply chain management. Student will consider cell needs and limitations to design and develop a product and/or process for mass production in Manufacturing Engineering Capstone II (MFGE 4322).
Prerequisite(s): A minimum grade of "C" in MFGE 3541 and MFGE 3132 and MFGE 3131 and MFGE 3337.

MFGE 4322 Manufacturing Engineering Capstone II
2 Credit Hours. 0 Lecture Hours. 4 Lab Hours.
A capstone project based course that draws on all major curricular themes within the manufacturing engineering program. This laboratory studio based course focuses on implementation and a production run of the product and or process developed in MFGE 4321. The students will build and test the manufacturing cell to produce a discrete family of parts identified in MFGE 4321. The design of part transfer, tooling, sensing, production control and integrated inspection systems will be emphasized.
Prerequisite(s): A minimum grade of "C" in MFGE 4321 and MFGE 4135 and MFGE 4533.

MFGE 4533 Industrial Robotics and Automation
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will cover topics of the theory of the dynamic and kinematic models of industrial robot, robotic manufacturing operations such as welding and assembly and industrial robots working in unison or in concert in a manufacturing process. The laboratory activities include programming industrial robots to perform pick and place operations, to manipulate components, tools, and instruments through complex trajectories, programming PLCs to coordinate multiple manufacturing operations and programming computers to integrate the communications and information sharing between manufacturing and management systems.
Prerequisite(s): A minimum grade of "C" in MFGE 2142 and MFGE 3337 and MFGE 3421.

MFGE 4614 Senior Seminar: Professional Skills and Leadership
1 Credit Hour. 2 Lecture Hours. 0 Lab Hours.
Through readings, case studies, small group activities, discussions and guest speakers, students will explore and integrate professional skills relevant to their future careers. An emphasis will be placed upon engineering ethics, professional responsibilities, environmental impact of engineering processes, and technical leadership. a curricular overview that prepares students to take the Society of Manufacturing Engineers' Certification exam or similar.
Prerequisite(s): A minimum grade of "C" in MFGE 3531 and MFGE 3132 and MFGE 3421 and MFGE 3541 and MFGE 2421 and MFGE 3131.

MFGE 4891 Special Problems in Manufacturing Engineering
1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.
Individual and specialized study in the areas of mechanical engineering that are not otherwise covered in the curriculum. Research project based or practicum experience.
Prerequisite(s): Permission of instructor and department chair.

MFGE 5131 Lean and Six Sigma 1
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This introductory course will emphasize communication using Six Sigma principles. It will help relate six sigma principles to the overall manufactoring mission and objectives. The Five step DMAIC model for organizational and process improvement will be emphasized. A wide range of process improvement techniques with the DMAIC model will be employed.
Prerequisite(s): A minimum grade of "C" in MFGE 3132.
Cross Listing(s): MFGE 5131G.

MFGE 5131G Lean and Six Sigma Green Belt-1
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This introductory course will emphasize communication using Six Sigma principles. It will help relate six sigma principles to the overall business mission and objectives. The Five step DMAIC model for organizational and process improvement will be emphasized. A wide range of process improvement techniques with the DMAIC model will be employed. Graduate students will be expected to independantly research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): A minimum grade of "C" in MFGE 3132 or permission of the instructor for graduate students.
Cross Listing(s): MFGE 5131.

MFGE 5132 Lean and Six Sigma 2
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Graphic and numerical tools to implement DMAIC procedure will be introduced. This includes introduction to Normal distribution, process capability analysis, measurement systems analysis, correlation and regression analysis, statistical process control, value stream mapping as well as the use of six sigma in service based industries.
Prerequisite(s): A minimum grade of "C" in MFGE 5131.
Cross Listing(s): MFGE 5132G.

MFGE 5132G Lean and Six Sigma Green Belt-2
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Graphic and numerical tools to implement DMAIC procedure will be introduced. This includes introduction to Normal distribution, process capability analysis, measurement systems analysis, correlation and regression analysis, statistical process control, value stream mapping as well as the use of six sigma in service based industries. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): A minimum grade of "C" in MFGE 5131 or MFGE 5131G.
Cross Listing(s): MFGE 5132.

MFGE 5238 Facilities Maintenance
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
An advanced topic course in the area of scheduled and preventative maintenance of automated manufacturing systems.
Prerequisite(s): A minimum grade of "C" in MFGE 3337 and MFGE 3423 and MFGE 4533.
Cross Listing(s): MFGE 5238G.

MFGE 5238G Facilities Maintenance
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
An advanced topic course in the area of scheduled and preventative maintenance of automated manufacturing systems. Graduate students will be expected to independantly research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): A minimum grade of "C" in MFGE 3337 and MFGE 3423 and MFGE 4533 or permission of instructor for graduate students.
Cross Listing(s): MFGE 5238.

MFGE 5331 Advanced Robotics for Manufacturing
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course provides an introduction to fundamental concepts in in the use of spatial robotic manipulators with emphasis on industrial robotics. Students study robot manipulator kinematics, dynamics, and control. The theory of spatial kinematics and dynamics of robot manipulators is studied in depth. Advanced control strategies such as force control and compliance control are also investigated. Topics are augmented using computer graphics tools and laboratory experiments with robot manipulators with emphasis on application to manufacturing.
Prerequisite(s): MFGE 4533. Cross Listing(s): MFGE 5331G.

MFGE 5331G Advanced Robotics for Manufacturing
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course provides an introduction to fundamental concepts in in the use of spatial robotic manipulators with emphasis on industrial robotics. Students study robot manipulator kinematics, dynamics, and control. The theory of spatial kinematics and dynamics of robot manipulators is studied in depth. Advanced control strategies such as force control and compliance control are also investigated. Topics are augmented using computer graphics tools and laboratory experiments with robot manipulators with emphasis on application to manufacturing. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MFGE 4533. Cross Listing(s): MFGE 5331.

MFGE 5332 Manufacturing Floor Control
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will review relevant concepts and techniques to control the flow of materials and information as well as the motion of automated devices on the manufacturing floor. This includes relevant concepts on automation, machine motion control, warehousing, MRP and WIP control in in production systems among others.
Prerequisite(s): MFGE 3421 and MFGE 4533. Cross Listing(s): MFGE 5332G.

MFGE 5332G Manufacturing Floor Control
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will review relevant concepts and techniques to control the flow of materials and information as well as the motion of automated devices on the manufacturing floor. This includes relevant concepts on automation, machine motion control, warehousing, MRP and WIP control in in production systems among others. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MFGE 3421 and MFGE 4533. Cross Listing(s): MFGE 5332.

MFGE 5333 Additive Manufacturing Studio
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
A comprehensive overview of additive manufacturing, spanning from fundamentals to applications and technology trends. Students will learn the principles of additive manufacturing of polymers, metals, and ceramics and how process capabilities (rate, cost, quality) are determined by the material characteristics, process parameters, and machine designs.
Prerequisite(s): A minimum grade of "C" in MFGE 2421 and MFGE 3131 or ENGR 2112 and MENG 3135 and MENG 3333.
Cross Listing(s): MFGE 5333G.

MFGE 5333G Additive Manufacturing Studio
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
A comprehensive overview of additive manufacturing, spanning from fundamentals to applications and technology trends. Students will learn the principles of additive manufacturing of polymers, metals, and ceramics and how process capabilities (rate, cost, quality) are determined by the material characteristics, process parameters, and machine designs. Graduate students will be expected to independantly research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): A minimum grade of "C" in all of the following: MFGE 2421 and MFGE 3131 or ENGR 2112 and MENG 3135 and MENG 3333 or permission of instructor for graduate students.
Cross Listing(s): MFGE 5333.

MFGE 5334 Additive Manufacturing of Lightweight Structures
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course concentrates on the design, optimization, manufacturing, and performance testing of lightweight structures fabricated by additive manufacturing technologies. The general guidelines of functional design and topology optimization will be introduced. Additive manufacturing methodologies will be instructed and accommodated to the design fabrication. Students will be grouped in teams to complete an assigned project of evaluating the mechanical and material performance of self-designed lightweight structures.
Prerequisite(s): MFGE 5333. Cross Listing(s): MFGE 5334G.

MFGE 5334G Additive Manufacturing of Lightweight Structures
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course concentrates on the design, optimization, manufacturing, and performance testing of lightweight structures fabricated by additive manufacturing technologies. The general guidelines of functional design and topology optimization will be introduced. Additive manufacturing methodologies will be instructed and accommodated to the design fabrication. Students will be grouped in teams to complete an assigned project of evaluating the mechanical and material performance of self-designed lightweight structures. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MFGE 5333. Cross Listing(s): MFGE 5334.

MFGE 5531 Advanced CNC Machining and Programming
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
Advanced Computer Numerical Control (CNC) course includes a range of advanced manufacturing technology such as CNC set-up and programming, use of CAD/CAM software for tool planning, multi-axis machining, CNC Coordinate Measuring Machines (CMM), and concepts of Computer-Integrated Manufacturing (CIM). This course will include CNC lathe, milling, and extend to 5-axis milling machine demonstration and utilization with lab experience. The course activities and design give emphasis to the development of skills and knowledge competence prescribed by industry performance standards.
Prerequisite(s): MFGE 2534. Cross Listing(s): MFGE 5531G.

MFGE 5531G Advanced CNC Machining and Programming
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
Advanced Computer Numerical Control (CNC) course includes a range of advanced manufacturing technology such as CNC set-up and programming, use of CAD/CAM software for tool planning, multi-axis machining, CNC Coordinate Measuring Machines (CMM), and concepts of Computer-Integrated Manufacturing (CIM). This course will include CNC lathe, milling, and extend to 5-axis milling machine demonstration and utilization with lab experience. The course activities and design give emphasis to the development of skills and knowledge competence prescribed by industry performance standards. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MFGE 2534. Cross Listing(s): MFGE 5531.

MFGE 5532 Introduction to MEMS
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course is designed to study fabrication techniques and operating principles of micro-electro-mechanical devices and systems and their applications. Microfabrication techniques and other emerging fabrication processes for MEMS are studied along with their process physics. Principles of operations of various MEMS devices such as mechanical, optical, thermal, magnetic, chemical/biological sensors/actuators are studied. Topics include: bulk/surface micromachining, microsensors and microactuators mechanisms.
Prerequisite(s): MFGE 3531.
Cross Listing(s): MFGE 5532G.

MFGE 5532G Introduction to MEMS
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course is designed to study fabrication techniques and operating principles of micro-electro-mechanical devices and systems and their applications. Microfabrication techniques and other emerging fabrication processes for MEMS are studied along with their process physics. Principles of operations of various MEMS devices such as mechanical, optical, thermal, magnetic, chemical/biological sensors/actuators are studied. Topics include: bulk/surface micromachining, microsensors and microactuators mechanisms. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MFGE 3531. Cross Listing(s): MFGE 5532.

MFGE 5534 Packaging
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will introduce functions of packaging and its fundamental characteristics; materials, processes, and technology used in package development; applications of various materials and systems used to package manufactured products.
Prerequisite(s): A minimum grade of "C" in MENG 5138 and MFGE 3531.
Cross Listing(s): MFGE 5534G.

MFGE 5534G Packaging
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will introduce functions of packaging and its fundamental characteristics; materials, processes, and technology used in package development; applications of various materials and systems used to package manufactured products. Graduate students will be expected to independantly research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): A minimum grade of "C" in MENG 5138 and MFGE 3531 or permission of the instructor for graduate students.

MFGE 5535 NanoManufacturing
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course provides a survey introduction of nanoscience and technologies of micro-fabrication and nano-manufacturing.
Prerequisite(s): A minimum grade of "C" in MFGE 3531 and MENG 5138.
Cross Listing(s): MFGE 5535G.

MFGE 5535G NanoManufacturing
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course provides a survey introduction of nano-science and technologies of micro-fabrication and nano-manufacturing. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): A minimum grade of "C" in MFGE 3531 and MENG 5138 or permission of the instructor for graduate students.
Cross Listing(s): MFGE 5535.

MFGE 5536 Characterization of Advanced Manufacturing Materials
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will introduce the basic characterization principles of advanced manufacturing materials and the common characterization techniques available. The course covers microstructure, defects, crystal structure, crystallography, texture development and phase analysis. Applications and limitations of microscopic-based techniques and their ancillary equipment namely, Optical Microscopy, Scanning Electron Microscopy, and Scanning Probe Microscopy are described. The principles of other important characterization equipment such as x-ray diffraction are described.
Prerequisite(s): MFGE 3132.
Cross Listing(s): MFGE 5536G.

MFGE 5536G Characterization of Advanced Manufacturing Materials
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will introduce the basic characterization principles of advanced manufacturing materials and the common characterization techniques available. The course covers microstructure, defects, crystal structure, crystallography, texture development and phase analysis. Applications and limitations of microscopic-based techniques and their ancillary equipment namely, Optical Microscopy, Scanning Electron Microscopy, and Scanning Probe Microscopy are described. The principles of other important characterization equipment such as x-ray diffraction are described. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MFGE 3132. Cross Listing(s): MFGE 5536.

MFGE 5537 Design for Environment and Green Manufacturing
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will provide the student with systematic approaches for designing and developing environmentally responsible products. In particular, design trade-offs will be explored, including those arising in materials life cycle and design, manufacturing processes and end-of-life scenarios. Life cycle assessment is introduced as a quantifying approach for assessment.
Prerequisite(s): MFGE 3131 and MFGE 3132. Cross Listing(s): MFGE 5537G.

MFGE 5537G Design for Environment and Green Manufacturing
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course will provide the student with systematic approaches for designing and developing environmentally responsible products. In particular, design trade-offs will be explored, including those arising in materials life cycle and design, manufacturing processes and end-of-life scenarios. Life cycle assessment is introduced as a quantifying approach for assessment. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MFGE 3131 and MFGE 3132. Cross Listing(s): MFGE 5537.

MFGE 7331 Manufacturing System Design and Analysis
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
This course is about contemporary design and analysis methodologies used to organize systems for the economic manufacture of products. Students will be exposed to the techniques used to design and analyze manufacturing systems for the economic manufacture of products. Students also will learn to design manufacturing systems (both human and automated) to satisfy different types of product demand.Prerequisite(s): MFGE 5332.

MFGE 7332 Advanced Additive Manufacturing
3 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
Advanced Additive Manufacturing course builds upon knowledge of the state-of-art additive manufacturing (AM) technologies and surveys the novel techniques applied for AM or 3D printing. Innovative AM research outcomes and presentation will be collected from the journal publications and conference proceedings, and then lectured to students along with discussions. Case studies of AM application to the manufacturing process will be talked. Student will work in collaboration with classmates to summarize a specified utilization of AM to improve manufacturing efficiency and economy, and to propose a potential application of the existing or novel AM technologies. Prerequisite(s): MFGE 5334.

MFGE 7991 Advanced Manufacturing Engineering Practicum
3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
In this course the student is fully engaged on-site at a manufacturing location of a partnering organization. Advanced Manufacturing Engineering work scope assignment(s) for the company is discussed/agreed to ahead of time in cooperation with the partnering organization and requires prior approval from the department to begin the course. Reporting of progress throughout the semester by the student occurs for course including mid-term report, a term paper report due at end of the semester, and a presentation to company stakeholders. Prerequisite(s): Graduate standing in AME Program.