MENG Mechanical Engineering

MENG 1310 Manufacturing Processes Lab
1 Credit Hour. 0 Lecture Hours. 2 Lab Hours.
This course covers hands on introduction to various manufacturing, machining and fabrication processes including welding, thread cutting, and machining using lathe and mill.

MENG 2110 Mechanical Engineering Case Studies in Design & Analysis
1 Credit Hour. 0 Lecture Hours. 2 Lab Hours.
The course includes fundamental techniques for creating, analyzing, synthesizing, and implementing design solutions to open-ended problems through team and individual efforts utilizing flexibility, adaptability, and creativity.
Prerequisite(s): A minimum grade of "C" in ENGR 1133.

MENG 2139 Numerical Methods in Engineering
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
Mathematical modeling and numerical solution of engineering related problems with emphasis on solution of linear and nonlinear equations, matrices, vectors, statistical data analysis, curve fitting, ordinary and partial differential equations.
Prerequisite(s): MATH 2242 and ENGR 1731.

MENG 2193H Numerical Methods in Engr
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
Mathematical modeling and numerical solution of engineering related problems with emphasis on solution of linear and nonlinear equations, matrices, vectors, statistical data analysis, curve fitting, ordinary and partial differential equations.
Prerequisite(s): MATH 2242 and ENGR 1731.

MENG 3010 Leveling Topics in Statics
1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.
This course introduces the vector methods in solving Statics problems. It also covers three dimensional problems and advanced topics in friction. This is the leveling course to bridge the gap between the Statics course required for the Engineering Technology and the Engineering program.
Prerequisite(s): TENS 2142.

MENG 3011 Leveling Topics in Dynamics
1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.
This course introduces the vector methods in solving Dynamics problems. It also covers advanced topics in Dynamics, such as, impulse momentum and work energy principles for bodies and three dimensional problems. This is the leveling course to bridge the gap between the Dynamics course required for the Engineering Technology and the Engineering program.
Prerequisite(s): TENS 2142.

MENG 3012 Leveling Topics in Mechanics of Materials
1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.
This course covers the advance topics of mechanics of materials to bridge the gap between the strength of materials required for the technology program and the mechanics of materials for the engineering program. The course will cover advanced topics, such as, double integration method for beam theory, eccentrically loaded column, theories of failures and thick pressure vessel.
Prerequisite(s): TENS 2143.

MENG 3015 Leveling Topics in Electrical Circuits
1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.
This course covers the advanced topics in Electrical Circuits and Electronics. The course covers the control part of Circuit Analysis to bridge the gap between the Electrical Devices and Measurement required for the technology program and the Electronics and Electrical Circuits required in the engineering program.
Prerequisite(s): TMET 2521.

MENG 3016 Leveling Topics in Fluid Mechanics
1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.
This is the leveling course to bridge the gap between the Fluid Mechanics course required for the Engineering Technology and the Engineering program. It includes the integral form of governing equations, viscous flow with boundary layer theory, differential analysis of fluid motion equations, and dimensional analysis and similitude. Differential equations will be used to derive fluid flow problems with boundary conditions for steady flow and initial conditions for unsteady flow.
Prerequisite(s): TENS 2144, TENS 2135, TMET 3233.

MENG 3130 Mechanism Design
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course covers detailed concepts, functions and knowledge of the components of mechanisms, machine components and design tools. Analytical, mathematical and computer techniques for kinematic and dynamic analysis of mechanisms and machine components are introduced. A comprehensive project covers the mechanism synthesis and design experience using analytical and computer simulation tools.
Prerequisite(s): A minimum grade of "C" in ENGR 2232 or permission of instructor.

MENG 3135 Machine Design
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Modes of failures including both static and dynamic failure theories will be introduced in the course. Detailed design of Machine Components such as transmission shafts, keys, couplings, bearings, springs, gears, clutches, brakes and fasteners will also be discussed.
Prerequisite(s): A minimum grade of "C" in ENGR 3233 and MENG 2110 or permission of instructor.

MENG 3233 Heat Transfer
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course will be an introduction to basic energy transport by conduction, convection, and radiation with applications to heat exchanger, extended surfaces etc.
Prerequisite(s): MATH 2243 and MATH 3230 and a minimum grade of "C" in ENGR 3431 and ENGR 3235 or permission of instructor.
Cross Listing(s): 3233H.

MENG 3233H Heat Transfer (Honors)
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course will be an introduction to basic energy transport by conduction, convection, and radiation with applications to heat exchanger, extended surfaces etc.
Prerequisite(s): MATH 2243 and MATH 3230 and a minimum grade of "C" in ENGR 3431 and ENGR 3235 or permission of instructor.
Cross Listing(s): MENG 3233.

MENG 3331 Materials Science Studio
0.3 Credit Hours. 0.2 Lecture Hours. 0.3 Lab Hours.
The study of engineering materials such as metals, alloys, polymers, ceramics, and composites. Atomic structure and arrangement; control of the microstructure and mechanical properties, solidification, cooling curves and phase diagrams, mechanical testing, and strengthening mechanisms. Laboratory includes problem solving sessions and experiments on materials related to strengths, toughness, solidification, and metallography.
Prerequisite(s): A minimum grade of "C" in CHEM 1147 and ENGR 3233.

MENG 3333 Materials Processing Studio
0.3 Credit Hours. 0.2 Lecture Hours. 0.3 Lab Hours.
The course covers the study of traditional and modern processing techniques. The course will cover applications and use of different materials and their processing, metal-casting processes and equipment, forming and shaping processes and equipment, joining processes and equipment, molding, extrusion and fabrication of polymers, and composites processing and techniques. Laboratory includes problem solving sessions, experiments, and hands-on processing of materials.
Prerequisite(s): MENG 3331 and MENG 1310 or Permission of Instructor.
MENG 3333H Materials Processing Studio
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
The course covers the study of traditional and modern processing techniques. The course will cover applications and use of different materials and their processing, metal-casting processes end equipment, forming and shaping processes and equipment, joining processes and equipment, molding, extrusion and fabrication of polymers, and composites processing and techniques. Laboratory includes problem solving sessions, experiments, and hands-on processing of materials.
Prerequisite(s): MENG 3331 and MENG 1310 or Permission of Instructor.

MENG 3521 Mechatronics Studio Laboratory
2 Credit Hours. 0 Lecture Hours. 4 Lab Hours.
Laboratory instruction in the theory and practice of engineering measurements and their application to controlled activities. A familiarity with traditional measuring devices, and a proficiency with data acquisition packages will be developed. The packaging of results in reports and presentations will be emphasized.
Prerequisite(s): A minimum grade of "C" in ENGR 2131 and ENGR 3233 or permission of instructor.

MENG 4210 Energy Science Laboratory
1 Credit Hour. 0 Lecture Hours. 2 Lab Hours.
The course includes laboratory activities in support of instruction in Thermodynamics and heat transfer.
Prerequisite(s): A minimum grade of "C" in MENG 3233, ENGR 3431, ENGR 3521 or permission of instructor.

MENG 4430 Engineering Quality Control and Project Management
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The course will introduce students to basic tools of engineering economy such as: interest rates, cash flow analysis, cost benefit analysis, and depreciation analysis that are used in comparing and evaluating multiple engineering projects on the basis of quantitative monetary parameters. Students will additionally be introduced to basic quality control techniques such as quality control charts and Six Sigma techniques for assuring product quality.
Prerequisite(s): MENG 2110, MENG 3135, MENG 3333.

MENG 4612 Mechanical Engineering Senior Seminar
1 Credit Hour. 0 Lecture Hours. 0 Lab Hours.
Students are introduced to topics essential for improving performance on the Fundamentals of Engineering Exam. Topics such as engineering economy, ethics, and global citizenship are reinforced, while topics such as electrical devices, mechanics, energy science, and numerical methods are reviewed.
Prerequisite(s): MATH 2243 and a minimum grade of "C" in ENGR 2131, ENGR 2232, ENGR 3233, ENGR 3235, MENG 2139, MENG 3233, MENG 3331.

MENG 4889 Directed Study in Mechanical Engineering
1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
An individualized study involving research and applications pertaining to Mechanical Engineering.
Prerequisite(s): Senior standing, prior identification of a problem or study area, and permission of instructor.

MENG 5090 Selected Topics in Mechanical Engineering
1-3 Credit Hours. 1-3 Lecture Hours. 1-6 Lab Hours.
This course provides for study of Mechanical Engineering course topics not generally offered by the program.
Prerequisite(s): Senior standing or Permission of instructor.
Cross Listing(s): MENG 5090G.

MENG 5135 Vibration and Preventive Maintenance
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
Free and Forced Vibration of one and multi-degree of freedom systems will be covered. Applications of vibration analysis for preventive maintenance of mechanical systems will be introduced. Laboratories include basic vibration analysis and its applications.
Prerequisite(s): MENG 3521, MENG 3130, MATH 3230 or Permission of instructor.
Cross Listing(s): MENG 5135G.

MENG 5136 Introduction to Finite Element Analysis
0.3 Credit Hours. 0.1 Lecture Hours. 0.4 Lab Hours.
This course will introduce students to the fundamentals of Finite Element Analysis. The students will develop a working knowledge of a commercial FEA software package and will model and analyze mechanical and thermal engineering systems using that software. The students will additionally develop an ability and competence in interpretation and analysis of FEA results.
Prerequisite(s): A minimum grade of "C" in ENGR 2112, ENGR 3235, MENG 2139, MENG 3135, MENG 3233 or permission of instructor.
Cross Listing(s): MENG 5136G, MENG 5136H.

MENG 5136H Intro to FEA (Honors)
0.3 Credit Hours. 0.1 Lecture Hours. 0.4 Lab Hours.
This course will introduce students to the fundamentals of Finite Element Analysis. The students will develop a working knowledge of a commercial FEA software package and will model and analyze mechanical and thermal engineering systems using that software. The students will additionally develop an ability and competence in interpretation and analysis of FEA results.
Prerequisite(s): A minimum grade of "C" in ENGR 2112, ENGR 3235, MENG 2139, MENG 3135, MENG 3233 or permission of instructor.
Cross Listing(s): MENG 5136G, MENG 5136H.

MENG 5137 Mechanical System Design
3 Credit Hours. 0 Lecture Hours. 6 Lab Hours.
This is a senior design course requiring that students call upon all of their academic preparations in developing the solution of mechanical system problems. Graduate students will be required to complete a case study or other individualized advanced activity that undergraduate students will not be required to complete.
Prerequisite(s): MENG 3130, MENG 3135, MENG 3333, MENG 3521, a minimum grade of "C" in ENGR 2112, ENGR 3235.
Cross Listing(s): MENG 5137H, MENG 5137G.

MENG 5137H Mechanical System Design
3 Credit Hours. 0 Lecture Hours. 6 Lab Hours.
This is a senior design course requiring that students call upon all of their academic preparations in developing the solution of mechanical system problems.
Prerequisite(s): MENG 3130, MENG 3135, MENG 3333, MENG 3521, a minimum grade of "C" in ENGR 2112, ENGR 3235.
Cross Listing(s): MENG 5137H, MENG 5137G.

MENG 5138 Composite Materials: Manufacturing, Analysis, and Design
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
This course introduces basics of fiber reinforced, and laminated composites, anisotropic theory, stress analysis, design and testing of composite materials. Topics include an overview of structure and processing of composite materials, classification of anisotropy, anisotropic constitutive models, classical laminate theory, failure theories, and test methods. The knowledge will be applied to a design of simple composite structural elements. Graduate students will be required to complete a case study or other individualized advanced activity that undergraduate students will not be required to complete.
Prerequisite(s): A minimum grade of "C" in MENG 3135, MFGE 3131, MENG 3333, MFGE 3531, permission of instructor.
Cross Listing(s): MENG 5138G.
MENG 5233 Wind Energy
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course provides an in-depth introduction to modern wind turbine technology and the development of the wind power industry. Students will learn general characteristics of the wind resource and the atmospheric boundary layer. They will also learn how to analyze wind data, estimate wind resources and use statistical techniques to estimate wind turbine energy production. Aerodynamic characteristics of various turbine (HAWT and VAWT) models design, blade design, airfoils design, blade number effect and optimization techniques will be discussed theoretically and computationally for various applications. This course provides the general principles of wind turbine loads, mechanics, rotor dynamics, and methods for modeling turbine structural response. Electrical aspects of wind turbines, turbine control, turbine materials and components will also be studied, as well as, turbine design and testing, wind turbine siting, system design, and integration. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MATH 2243, MENG 3130, MENG 3135 and MENG 3521 and a minimum grade of "C" in ENGR 2231, ENGR 3233 ENGR 3235, ENGR 2112.
Cross Listing(s): MENG 5233G.

MENG 5234 Heating, Ventilating, and Air Conditioning
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
This course is an introductory course in Heating, Ventilating, and Air Conditioning (HVAC) systems. In this course HVAC processes are analyzed and load calculations are performed in accordance with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) practices. Graduate students will be required to complete a case study or other individualized advanced activity that undergraduate students will not be required to complete.
Prerequisite(s): A minimum grade of "C" in ENGR 3431, ENGR 3235, MENG 3233 or permission of instructor.
Cross Listing(s): MENG 5234G.

MENG 5235 Applied Combustion
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
This course is an introduction to the fundamentals of combustion processes, thermochemistry, chemical kinetics, simple chemical reactors, premixed and nonpremixed combustion, turbulent combustion and its practical applications including pollutant emissions. Graduate students will be required to complete a case study or other individualized advanced activity that undergraduate students will not be required to complete.
Prerequisite(s): ENGR 3235, ENGR 3431, MENG 3233 or Permission of Instructor.
Cross Listing(s): MENG 5235G.

MENG 5238 Engine Development and Performance
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
The design, development, operation, and environmental impact of internal combustion engines will be presented in this course with an engineering emphasis. Additionally, cycle evaluation and analysis of the energy systems, the efficiency and power generation, their benefits and costs will be determined. Graduate students will complete a more challenging final exam and they will be required to complete a more advanced capstone design project that involves a class presentation and more advanced technical analysis.
Prerequisite(s): MENG 3521 and MENG 3233.
Cross Listing(s): MENG 5238G.

MENG 5239 Biofuels Testing
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
The development of biofuels for engine operation and their environmental impact will be presented with an engineering emphasis. Additionally, life cycle evaluation, analysis of the energy systems and their efficiency with biofuels, together with benefits and costs will be determined. Graduate students will be required to complete a more advanced capstone design project that involves a class presentation and a more advanced technical analysis.
Prerequisite(s): MENG 3233 and a minimum grade of "C" in ENGR 3431.
Cross Listing(s): MENG 5239G.

MENG 5331 Automation and Computer Integrated Manufacturing Systems
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
This course will cover the fundamental concepts in manufacturing, automation, and various topics in production and control systems. These include numerical control, industrial robots, computer integrated manufacturing systems, flexible manufacturing system, and process monitoring and control. Graduate students will be required to complete a case study or other individualized advanced activity that undergraduate students will not be required to complete.
Prerequisite(s): A minimum grade of "C" in ENGR 1133, ENGR 1731, MFGE 2534, MENG 3333, MFGE 2533 or permission of instructor.
Cross Listing(s): MENG 5331G.

MENG 5333 Wind Energy
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
The design, development, operation, and environmental impact of internal combustion engines will be presented in this course with an engineering emphasis. Additionally, cycle evaluation and analysis of the energy systems, the efficiency and power generation, their benefits and costs will be determined. Graduate students will complete a more challenging final exam and they will be required to complete a more advanced capstone design project that involves a class presentation and more advanced technical analysis.
Prerequisite(s): MENG 3521 and MENG 3233.
Cross Listing(s): MENG 5238G.

MENG 5334 Robotics Dynamics, Design and Analysis
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course will cover the fundamental concepts in robotics, dynamics and control with an emphasis on analysis, design and programming of robots and their applications. Topics include planar and spatial kinematics, and motion planning; mechanism design for manipulators and mobile robots; forward and inverse kinematics, differential kinematics, manipulability, workspace design; planar and spatial multi-rigid-body dynamics, dynamic models of robots; introduction to computer vision; robot programming; and robot control. Students will be engaged in laboratory activities to study kinematics, dynamics, programming and real-time control of robotic systems that include manipulators, mobile robots, and unmanned aerial vehicles (UAVs). Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MENG 3521 and MENG 3130.
Cross Listing(s): MENG 5333G.
MENG 5432 Applied Computational Fluid Dynamics
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course introduces the numerical techniques applied to the solution of fluid flow and heat transfer problems. The Finite Difference and Finite Volume methods are used to discretize and numerically solve the governing equations of heat transfer and fluid mechanics. Commercial computational fluid dynamics software is utilized for the analysis of heat transfer and fluid mechanics problems. Graduate students will be expected to independently research an additional topic, write a summary report, and present their findings to the class.
Prerequisite(s): MENG 3233.
Cross Listing(s): MENG 5432G.

MENG 5536 Mechanical Controls
0.3 Credit Hours. 0.2 Lecture Hours. 0.3 Lab Hours.
An understanding of the elements of classical control theory will be developed. Students will be introduced to the concept of feedback and its properties; the concept of stability and stability margins; and the different tools that can be used to analyze these properties. Students will also develop a working knowledge of the basics of linear control techniques. Graduate students will be required to complete a case study or other individualized advanced activity that undergraduate students will not be required to complete.
Prerequisite(s): MENG 3521, MENG 3130, MENG 2139 or Permission of Instructor.
Cross Listing(s): MENG 5536G, MENG 5536H.

MENG 5536H Mechanical Controls (Honors)
0.3 Credit Hours. 0.2 Lecture Hours. 0.3 Lab Hours.
An understanding of the elements of classical control theory will be developed. Students will be introduced to the concept of feedback and its properties; the concept of stability and stability margins; and the different tools that can be used to analyze these properties. Students will also develop a working knowledge of the basics of linear control techniques.
Prerequisite(s): MENG 3521, MENG 3130, MENG 2139 or Permission of Instructor.
Cross Listing(s): MENG 5536, MENG 5536G.

MENG 5891 Special Problems in Mechanical Engineering
1-6 Credit Hours. 0 Lecture Hours. 2-12 Lab Hours.
Individual and specialized study in the areas of mechanical engineering not otherwise covered in the students’ curriculum. Graduate students will be required to complete a case study or other individualized advanced activity that undergraduate students will not be required to complete.
Prerequisite(s): Senior standing and identification of a problem or study area and permission of instructor.
Cross Listing(s): MENG 5891G.