MCE - MECHANICAL ENGINEERING

MCE 1133 Mechanical Sustainability Design Project (1-4-3)
Covers the design thinking methodology to identify and address engineering problems. Includes solid modeling, rapid prototyping, understanding end users, their unarticulated needs, and creating alternative solutions. Focus on creativity, identify potential solutions, and innovation of new products and work processes. Students will apply design methodologies and innovation tools in an engineering technology problem, build and test it to gain the spirit and initiative of the course.

MCE 1203 Statics: Application and Simulation (2-2-3)
Covers the fundamentals of particles and rigid bodies equilibrium with engineering applications. Includes equilibrium of forces and moments applied to particles, rigid bodies, and engineering structures; equilibrium in two and three dimensions; free-body diagrams; friction; centroids; centers of gravity; moments of inertia. Laboratory and projects on planar equilibrium, forces in structural members, friction, center of mass, and area moments of inertia.

MCE 2113 Strength of Materials: Selection and Testing (2-2-3)
Understand material classifications based on their engineering applications and properties. Explain atomic bonding, structure, imperfections and their effect on the properties of materials and on their macro-structural behavior. Understand material selection criteria for engineering applications. Apply concepts of stress, strain, deformation, of structural members subjected to simple tension, compression, shear, pure torsion, and bending. Laboratory experiments are conducted covering these course topics.
Prerequisites: PHY 1103

MCE 2123 Dynamics: Application and Simulation (2-2-3)
Covers kinetics and kinematic analysis of particles and rigid bodies in translation and rotational mechanical systems, position,velocity, acceleration, energy, impulse and momentum. Includes case studies to solve two dimensional problems for particles and rigid bodies. Laboratory experiments on measurement of velocity and acceleration of translational and rotational motion.
Prerequisites: MTH 2103, MCE 1203

MCE 2203 Applied Statics (3-1-3)
Covers the fundamentals of particles and rigid bodies equilibrium with engineering applications. Includes equilibrium of forces and moments applied to particles, rigid bodies, and engineering structures; equilibrium in two and three dimensions; free-body diagrams; friction; centroids; centers of gravity; moments of inertia. Laboratory and projects on planar equilibrium, forces in structural members, friction, center of mass, and area moments of inertia.
Prerequisites: PHY 1103

MCE 2213 Mechanics of Materials (3-1-3)
Covers concepts of stress, strain, deformation, strain energy and load carrying capacity of structural members subjected to tension, compression, shear, torsion, and bending. Introduces stress-strain transformation relations and mechanical design concepts. Laboratory experiments are conducted covering the course topics.
Prerequisites: MCE 2203, MCE 2303

MCE 2223 Applied Dynamics (2-2-3)
Covers kinetics and kinematic analysis of particles and rigid bodies in translation and rotational mechanical systems, position,velocity, acceleration, energy, impulse and momentum. Includes case studies to solve two dimensional problems for particles and rigid bodies. Laboratory experiments on measurement of velocity and acceleration of translational and rotational motion.
Prerequisites: (MCE 2203, MTH 2103) or AET 2214

MCE 2233 Pneumatics and Hydraulics: Application and Simulation (2-2-3)
Covers fundamental concepts of fluid power and electro-fluid power systems. Cover principles of fluid power, hydraulic control, related parameters, components, circuits, symbols, and their ability to do work. Introduce troubleshooting techniques in fluid power with emphasis on safety.
Prerequisites: MCE 1203

MCE 2243 Fundamentals of Fluid Mechanics (2-2-3)
Covers fluid properties and pressure, hydrostatics, and dynamics of fluid flow, friction losses, and sizing of pipes with emphasis is on problem solving. Includes practical experiments to reinforce the theory.
Prerequisites: MCE 1203

MCE 2303 Material Selection and Testing (3-1-3)
Apply material selection criteria for specific engineering applications through the understanding and identification of materials, their mechanical properties and material defects. Explain atomic bonding, structure, imperfections, grain-size and re-crystallization and describe material failure and causes of corrosion with prevention methods.
Prerequisites: PHY 1103, CHM 1103

MCE 2311 Solid Modelling (0-4-1)
Covers the fundamentals of 2D/3D CAD and the steps involved in the process of designing 3D mechanical components and/or assemblies. Use CAD software for modelling of solids with parametric capabilities, creation of assemblies, design validation and finally the creation of 2D engineering views.
Prerequisites: EGN 1133 or EGN 1103

MCE 2323 Manufacturing Technology I (2-2-3)
Introduce concepts of basic manufacturing processes, basic lean manufacturing, and fabrication techniques such as metal casting, metal forming, manufacture of plastic components, and metal joining processes.
Prerequisites: MCE 2303

MCE 2403 Thermodynamics (2-2-3)
Study thermodynamics properties of pure substances, properties and equations-of-state of ideal and real gases used to solve thermodynamic problems. Learn the forms of mechanical work and heat transfer mechanisms. Apply the first law of thermodynamics (conservation of energy) to non-flow processes (closed systems) and flow processes (open systems). Apply the second law of thermodynamics to thermodynamic processes, idealized heat engines, and heat pumps.
Prerequisites: PHY 1103

MCE 2913 Mechanical Sophomore Design Project (2-2-3)
Covers design of a system to solve real-world problems including measurement of mechanical variables like pressure, temperature, force, viscosity using an electronic measurement system. Includes estimation of mechanical physical quantities measurement, accuracy, precision, and performance of the developed solution. Application of applied mechanics, materials selection, and use of programming, math, physics and chemistry in problem solution development including health and safety technology; identification and measurement of HSE variables such as noise pollution, light, work environment, etc.
Prerequisites: ELE 1253

MCE 3103 Mechanical Design: Application and Simulation (2-2-3)
Covers concepts and applications of various common mechanical elements including types of loading, flexible power transmission systems, keys and couplings, shafts, fasteners, welded joints and springs. Includes design calculations to select desired components for specified applications. Applies data and decision analysis techniques necessary to design these elements commonly found in mechanical devices and systems.
Prerequisites: MCE 2223

MCE 3123 Manufacturing Technology and Application (2-2-3)
Introduce concepts of basic manufacturing processes, basic lean manufacturing, and fabrication techniques such as metal casting, metal forming, manufacture of plastic components, and metal joining processes.

MCE 3203 Applied Mechanical Vibrations (3-1-3)
Covers the theory of mechanical vibrations occurring in single and multi-degree-of-freedom systems. Explains the principles of vibration control such as vibration isolation and vibration absorbers. Includes laboratory experiments to demonstrate the basic principles of mechanical vibrations.
Prerequisites: MCE 2223

MCE 3213 Control Systems and SCADA Solutions (2-2-3)
The course is an introduction to concepts of modern control theories. The modelling of different systems and their representation is presented. The response of the different systems is used in classification into first order and second order systems. The performance specifications of the systems are defined. Based on these specifications, design of classical controllers is implemented on the system. Explains the use of State space representation techniques in analyzing systems.

MCE 3223 Machine Elements and Mechanisms (2-2-3)
Extends methods developed in statics and dynamics for the kinematics and dynamics of machine elements. Develops fundamental principles required for the selection of individual elements that compose a machine. Various methods are used to determine displacements, velocities, and accelerations in common mechanisms. Covers Cams & followers and basic motions; static and dynamic force analysis; static and dynamic shaft balancing using laboratory experiments.
Prerequisites: MCE 2223

MCE 3243 Air Conditioning Systems (2-2-3)
Covers classification of refrigeration and air-conditioning systems and their applications in industry. Provides analyses of ideal and actual vapor compression refrigeration cycles, components, and systems. Describes simple vapor absorption systems. Study of psychometrics to determine the properties of moist air. Includes analyses of air conditioning processes, estimation of cooling loads using standard and UAE design conditions, and sizing the ducting system of a central air AC system.
Prerequisites: MCE 2403

MCE 3343 Industrial Plant Maintenance (2-2-3)
Covers the importance of maintaining equipment and machinery in industry. Introduce the importance and impact of industrial maintenance performed in some prime movers and various mechanical equipment used in different industrial plants. Covers different types of maintenance such as predictive, preventive, scheduled, corrective, and machine health monitoring. Explores common problems and use of troubleshooting techniques encountered in industrial plants.
Prerequisites: MCE 2323

MCE 3413 Applied Heat Transfer (3-1-3)
The course covers basic heat transfer laws and applications, including steady-state and transient heat conduction in solids, free and forced convection in fluids, radiation heat exchange and analysis of industrial heat exchangers. Includes engineering applications involving design and selection of heat exchangers and insulation materials.
Prerequisites: MCE 3403 or EMC 3023 or EMC 2053 or AET 2111

MCE 3913 Mechanical Junior Design Project (2-2-3)
This course equips students with the skills to design practical solutions for real-world challenges. Through a blend of theory and hands-on projects, students will learn to estimate mechanical quantities, assess accuracy and precision, and optimize solution performance. Drawing from principles of applied mechanics, materials science, and interdisciplinary knowledge in programming, mathematics, and physics, students will tackle complex problems while integrating sustainability, health and safety considerations.

MCE 4303 Computer Integrated Manufacturing (2-2-3)
Introduces computerized applications in Manufacturing, Design, Process planning, Manufacturing cost, Layout and Material Handling systems. Includes class projects and laboratory experiments.
Prerequisites: MCE 2323

MCE 4323 Non Destructive Testing (2-2-3)
Covers various Non Destructive Testing methods, theory and industrial applications. Demonstrates differences between non-destructive testing and mechanical testing methods. Applies testing techniques for surface, liquid dye penetration method, thermography, eddy current testing, ultrasonic testing, acoustic emission and radiography testing methodologies.
Prerequisites: MCE 2213, MCE 2323

MCE 4333 Production Planning and Control (2-2-3)
This course covers the design, development, implementation and management of production planning systems including forecasting, master production scheduling, aggregate planning, material requirements planning, capacity and inventory planning and production activity control. Students will be introduced to contemporary approaches such as just-in-time engineering, theory of constraints and the relationship of enterprise-level planning and control systems to the overall materials flow.

MCE 4413 Turbomachinery (2-2-3)
Covers concepts, procedures, data and dimensional analysis techniques to evaluate the flow and energy transfer through turbo machines. Includes Euler's turbine equation, thermodynamics, fluid flow in turbomachines, and power-absorbing turbomachines and power-producing machines analyses.
Prerequisites: MCE 3403 or EMC 2053

MCE 4423 Power Plant Engineering (2-2-3)
Covers the laws of thermodynamics in the design and optimization of basic energy conversion processes within various power plants. Studies fundamental thermodynamic properties including cycle efficiency and the concepts of nuclear power plants operation as well as economics of power plants.
Prerequisites: MCE 2403

MCE 4433 Internal Combustion Engines (2-2-3)
Introduce students to fundamentals of Internal Combustion (IC) Engines. Apply thermal-fluid concepts to different types of internal combustion engines. Study various factors like fuels, combustion, heat transfer, friction phenomenon relevant to IC engine power, efficiency and emissions. Run laboratory experiments to learns skills in examination of design features and testing characteristics of different types of IC engines.
Prerequisites: MCE 3413, MCE 2403

MCE 4443 Computational Fluid Dynamics (2-2-3)
The course will introduce the fundamental concepts, techniques and method of Computational Fluid Dynamics (CFD). Using Industrial CFD Package. the course implements numerical methods employed in Thermo-Fluids to simulate real engineering applications. The course is designed for Students with no or little CFD knowledge who want to learn CFD application to solve engineering problems.
Prerequisites: MCE 3413

MCE 4453 Desalination Engineering (2-2-3)
Covers different methods of water treatment with emphasis on desalination processes, such as, multi-stage flash and multi-effect distillation, reverse osmosis, and electrodialysis. Includes the environmental, sustainability, and economical factors that may influence the performance, affordability, and availability of desalination processes. Explores renewable energy technologies used in desalination.
Prerequisites: MCE 2403, MCE 3403

MCE 4513 Integrated Design for Manufacture and Assembly (2-2-3)
This course introduces and explains the concepts and technology of a modern product manufacturing environment that shows how design and manufacturing are integrated within it. Also, it demonstrates the benefits and applications of computer technology in modern product & process manufacturing and design industries. In addition, it facilitates the understanding of commercial demands on modern manufacturing where economical part manufacturing and assembly using modern tools and techniques are discussed.
Prerequisites: MCE 3303 or EMC 3013

MCE 4613 Robotics and Automation (2-2-3)
Introduce theoretical concepts and applications of robotic systems. Describe and analyze power sources, drives and transmissions used in various industrial applications. Study the kinematics and kinetics of robotic systems. Learn about sensors, switches, devices, assemblies and maintenance of robotic systems.
Prerequisites: MCE 3343, MCE 3513

MCE 4703 Advanced Manufacturing and 3D Printing (2-2-3)
The course offers a comprehensive, overview of advanced manufacturing technologies that are crucial for contemporary industries. The course covers additive manufacturing (AM) techniques, including fusion deposition and laser sintering, gaining insights into their applications across plastics and metals. Additionally, the course covers specialized manufacturing methods involving abrasive materials, powder metallurgy (PM), and sintering processes. Participants will develop a comprehensive understanding of these techniques and their applications in producing rotating machinery, piping systems.
Prerequisites: MCE 2323

MCE 4713 Thermal Sciences in Engineering Practice (2-2-3)
The course covers diverse engineering applications of thermal sciences, including analysis of gas power cycles for internal combustion engines and gas turbines, analysis of vapor power cycles for steam turbines, and analysis of refrigeration systems using power-absorbing cycles. The course also covers concepts of energy conservation and management for different practical engineering applications.
Prerequisites: MCE 2403

MCE 4723 Engineering for Sustainability (2-2-3)
This course introduces sustainability principles within the field of engineering. It explores the role of engineers in addressing pressing environmental, social, and economic challenges to create a more sustainable future. The course covers sustainable clean energy and manufacturing systems, green building design and construction, sustainable infrastructure, life cycle analyses, rules and regulations pertaining to implementation of sustainable processes.
Prerequisites: MCE 1133 or MTE 1133

MCE 4743 Corrosion Control and Monitoring (2-2-3)
It covers an understanding of corrosion phenomena, its mechanisms, prevention, and monitoring techniques. Emphasis will be placed on practical approaches to corrosion control in engineering applications.

MCE 4753 Automotive Engineering (2-2-3)
The objective of this course is to provide a fundamental understanding of the various systems of a typical automobile. To understand and learn learn about different components of IC Engines and different automobile engine systems line diagrams
Prerequisites: MCE 2403

MCE 4773 Green Materials and Manufacturing (2-2-3)
Covers the sustainability of materials including material conservation, recovery, recycling, and reuse. Includes sustainable manufacturing using different types of green materials such as metals, polymers, ceramics, and composites.

MCE 4913 Mechanical Capstone Design Project I (2-2-3)
Coordinate to form project teams to propose, plan and design an engineering product. Gain the knowledge to identify design problems to meet industrial needs. Define design projects" criteria, components, resources, implementation schedule, and estimated costs.
Prerequisites: EGN 4816

MCE 4923 Mechanical Capstone Design Project II (2-2-3)
Continue on the engineering design project carried forward from the preceding semester. Implement, build, test, evaluate, and analyze the proposed design. Develop and gain organizational, communicational and interpersonal skills.