.

Masters of Engineering in Mechanical Engineering

Courses Descriptions:

ME 626: Thermodynamics 3 (3,0,0)

Introduction and revision. The Second Law and Equilibrium, Thermodynamic cycles and their efficiencies, Availability and Exergy, Rational Efficiency of a power plants, Property relationships, Thermodynamics of combustion, Chemistry of combustion, Chemical rate kinetics, Combustion and flames, Reciprocating internal combustion engines, Gas turbines, Irreversible Thermodynamics, Thermo-electricity, Fuel cells..

ME 627: Design of Parts and Products 3 (3,0,0)

This course deals with design methodology and process. It is an introduction to engineering design, Problem identification, Creativity, Concept selection, Embodiment, Mathematical modelling and Simulation, Detail design, Information gathering, Presentation techniques.

ME 628: Applied Fluid Mechanics 3 (3,0,0)

A review of principal concepts and methods of fluid dynamics. Mass conservation, momentum, and energy equations for fluid continuum, Inviscid flow and application of Bernoulli theorem, Navier-Stokes equation for viscous flows, Similarity and dimensional analysis, Boundary layers and computational fluid dynamics.

ME 629: Mechanical Engineering Technology 3 (3,0,0)

Topics include an overview of problem-solving processes, an introduction to the basic engineering design process and engineering ethics. Limits and Tolerances. tolerancing design. theories of failure. Load and Stress Analysis. Pipes and Pipe Joints. Wire ropes and pulleys. Manufacturing Considerations in Machine Design, Variable Stresses in Machine Parts, Pressure Vessels, Riveted Joints. In addition to, capstone mini design project, students solve a specific design problem.

ME 630: Applied Heat Transfer 3 (3,0,0)

Steady and unsteady heat conduction. Free and forced convection for external and internal flows. Heat exchangers. Properties and process of radiation. Radiation exchange between surfaces.

ME 631: Thermal Power Plants 3 (3,0,0)

This course focus on the design and analysis of thermal power plants, with more emphasis on plants operating on fossil fuel and nuclear energy. The main topics covers a review on fundamentals of thermal power plants and its main components, fuels and combustion phenomena, gas turbines power plants, overview of diesel power plants, overview of nuclear power plants, other types of thermal power plants, combined cycle power plants and the economics of thermal power generation.

ME 632: Topics in Water Desalination 3 (3,0,0)

This course delivers theoretical and practical aspects on the design and operation of desalination processes. A review on fundamentals of water desalination; technologies, process calculations, performance parameters of thermal desalination processes and membrane desalination processes, renewable-energy-powered desalination processes, power-desalination cogeneration analysis.

ME 633: Renewable and Alternative Energy 3 (3,0,0)

This course delivers theoretical and practical aspects on the design and operation of renewable and alternative energy processes. The main topics covers Thermo-nuclear power, solar energy, hydropower, wind, wave, tidal, geothermal power, hydrogen energy, energy from sugar cane bagasse (Biomass) and ethanol. Sustainability and environmental impact. Economic matters.

ME 649: Research Methods 3 (3,0,0)

Offer an opportunity for students to develop their knowledge and understanding of the role and conduct of different research methods. It will be introduced the language of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approach. This course will provide students with the skills to review and conduct meticulously rigorous research as a part of their professional work. The course proceeds a step-by-step methodology to the design and implementation of quantitative and qualitative techniques including case study and precedent studies in mechanical engineering, surveys, interviews, focus groups, participant observation. Students will learn how to identify problems to study, develop hypotheses and research questions, specify independent and dependent variables, check for the validity and reliability of studies, design research projects, write a comprehensive research proposal, learn how to collect data based on different data collection methods, construct these tools, and pilot them before they become ready for use, and develop a set of transferable workplace skills.

ME 634: Structures Analysis and Computational Design 3 (3,0,0)

This course presents the basis of the FEM and its application to structures analysis that can be modeled as two-dimensional (2D), axisymmetric and three-dimensional (3D) solids using the assumptions of general linear elasticity theory. It presents especially the FEM analysis of beam, plate, axisymmetric shell and different shape shell structures and solids in 2D and 3D.

ME 635: Engineering Design Processes 3 (3,0,0)

Product Development process and organization; Opportunity Identification; Product Planning; Identifying Customer Needs; Product Specifications; Concept Generation; Concept Selection; Concept Testing; Product Architecture; Industrial Design; Design for Environment; Design for Manufacturing and Supply Chain; Prototyping; Robust Design; Patents and Intellectual Property; Service Design; Product Development Economics; Project Management.

ME 636: Applied Mechanical Vibrations 3 (3,0,0)

Vibration Engineering, Time Response, Frequency Response, Vibration Signal Analysis, Modal Analysis, Damping, Vibration Instrumentation, Signal Conditioning and Modification, Vibration Testing, Experimental Modal Analysis, Vibration Design and control, Modal analysis using FEM.

ME 637: Reliability Design of Mechanical Systems 3 (3,0,0)

Fundamentals of probability theory, Reliability in Design- Probabilistic models of load (stress) and resistance (strength) variables, Stress-strength interference models in probabilistic design, Monte Carlo, Weibull, Normal, Gamma, Rayleigh simulations, Hazard functions and reliability models for random and, Hazard plotting and reliability estimation, System reliability – series, and parallel systems, Failure rate endurance testing and failure data analysis, Accelerated life testing, Reliability in systems operation: availability, spare parts computation and maintenance strategies, Use of reliability software in analysis and predictions.

ME 638: Cogeneration and Energy Storage 3 (3,0,0)

This course focus on the cogeneration energy systems and energy storage technologies. A review of the basic power cycles, introduction to cogeneration, cogeneration technologies, issues and applications; introduction to energy storage, types of storage systems, applications in conventional and nonconventional systems and economic analysis.

ME 639: Refrigeration and Air Conditioning Systems and Applications 3 (3,0,0)

Part I (Refrigeration): Introduction to Mechanical Vapor Compression systems – Absorption systems – Steam jet refrigeration systems – Introduction to Thermoelectric cooling.

Part II (Air conditioning): Basics of Air conditioning systems – Thermal loads calculation for heating and cooling – Classifications of central air conditioning systems – All-air central air-conditioning systems – All-water central air-conditioning systems – Applications on central air conditioning systems – Advantages and Disadvantages of A/C systems..

ME 640: Principles of Turbomachinery 3 (3,0,0)

This course introduces the working principles, performance and design of turbomachinery. A review of essential fluid and thermo-dynamics. Concepts relevant to all turbomachines. Axial turbines and compressors are studied in depth, including their kinematics, performance and design. The equations describing the energy transfer between the fluid and the rotating component are applied to centrifugal and axial pumps, fans, axial compressors, gas and steam turbines, hydraulic turbines and wind turbines.

ME 641: Aerodynamics 3 (3,0,0)

Fundamentals of aerodynamics applied to wings and bodies in subsonic and supersonic flow. Fluid mechanics analytical methods for aerodynamic analysis. Two-and three-dimensional wing theory, slender-body theory, lifting surface methods, vortex and wave drag. Special topics such as unsteady aerodynamics, vortex wake behavior, and propeller and rotor aerodynamics.

ME 642: Material Properties and Selection 3 (3,0,0)

Engineering materials and their properties; principles of materials selection, materials selection charts; selection criteria; materials selection case studies.

ME 643: Manufacturing Processes 3 (3,0,0)

Most important manufacturing methods and processes as well as their development and potential with respect to materials selection, economy and environmental considerations. Introduction and overview of manufacturing, metal casting fundamentals & processes, bulk metal forming processes, sheet metal working processes, fundamentals of machining; machining processes, manufacturing process planning, welding processes, and rapid prototyping.

MTE 644: Selected Topics in Mechanical Engineering I 3 (3,0,0)

Study of selected topics in Mechanical Engineering that are not covered in other courses (the course content should be approved by the department council each time this course is offered).

MTE 645: Selected Topics in Mechanical Engineering II 3 (3,0,0)

Study of selected topics in Mechanical Engineering that are not covered in other courses (the course content should be approved by the department council each time this course is offered).

ME 650: Graduation Project 3 (3,0,0)

This course represents the applied knowledge for what have been learned over the different courses where the student will apply his mechanical engineering background to establish a solution for a design engineering problem. This will include searching the state of the art in the topic of problem, suggesting different solution and then apply the most appropriate solution to establish a practical solution.

ME 651: Graduation Project (2) 3 (3,0,0)

This course represents the implementation of the plan specified in Research Project 1. The student must work on implementing the project plan and choose the optimal solution to the project problem, or choose the most appropriate design and implement it, and complete its manufacturing procedures if that is possible, or develop the optimal vision for the process based on an industrial application.