

MECHANICAL ENGINEERING

MEEN 210 Computer Aided Design 2 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): ENGR 110, Grade C or better in ENGR 110

Introduction to geometric modeling for mechanical design using modern computer-aided design (CAD) and prototyping tools; covers systematic design methodology, geometric visualization (orthographic, isometric, oblique, and perspective), and three-dimensional modeling (surface and solid representations); includes dimensioning, tolerancing, and rapid prototyping with 3D printing. Prerequisite: Grade C or better in ENGR 110.

MEEN 223 Principles of Engineering Materials 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): CHEM 127 and PHYS 216 and CHEM 128

Structures of metals, polymers and ceramics, including structure-mechanical property relationships; defects and diffusion in materials; basic machining theory and processes, including geometric dimensioning and tolerancing (GD&T); overview of manufacturing processes for metals and polymers, including additive technologies.

MEEN 225 Statics 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): PHYS 216

Application of the laws of classical mechanics to simplified, plausibly real-world problems or interest to mechanical engineering, including the analysis of cables, frames, trusses, beams, machines and mechanisms.

MEEN 260 Measurement and Instrumentation 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): STAT 211

Introduction to the basic principles of engineering experimentation including instrumentation and measurement techniques, signal processing and data acquisition, statistical data analysis, and interpretation and reporting of results.

MEEN 263 Dynamics 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): MEEN 225 and MATH 261

MEEN 305 Mechanics of Materials 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): MEEN 225 and MEEN 223

MEEN 315 Engineering Thermodynamics 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): CHEM 127 and MATH 162 and PHYS 216

Theory and application of energy methods in engineering; conservation of mass and energy; energy transfer by heat, work and mass; thermodynamic properties; analysis of open and closed systems; the second law of thermodynamics and entropy; gas, vapor and refrigeration cycles.

MEEN 344 Fluid Mechanics 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): MEEN 315 and MATH 318

Application of laws of statics, buoyancy, stability, energy and momentum to behavior of ideal and real fluids; dimensional analysis and similitude and their application to flow through ducts and piping; lift and drag and related problems.

MEEN 345 Fluid Mechanics Laboratory 1 Credit

Grade Mode: Standard Letter
Prerequisite(s): MEEN 260

Introduction to basic fluid mechanics instrumentation; experimental verification and reinforcement of the analytical concepts introduced in MEEN 344.

MEEN 357 Computational Methods in Mechanical Engineering 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): MATH 318

Practical foundation for the use of numerical methods to solve engineering problems; error estimation, Taylor series, numerical solution of linear and non-linear algebraic and differential equations; introduction to engineering optimization.

MEEN 360 Manufacturing of Engineering Materials 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): MEEN 223

Selecting materials and manufacturing processes in design; emphasis on mechanical properties of materials; microstructure production and control; manufacturing processes for producing various classes of materials.

MEEN 361 Manufacturing of Engineering Materials Laboratory 1 Credit

Grade Mode: Standard Letter
Prerequisite(s): MEEN 210 and MEEN 260

Experiments in materials characterization and manufacturing processes; emphasis on material mechanical properties; microstructure production and control; manufacturing processes for producing various shapes for components and structures.

MEEN 363 Mechanical Vibrations 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): MEEN 263 and MATH 318

Application of Newtonian and energy methods to model dynamic systems (particles and rigid bodies) with ordinary differential equations; solution of models using analytical and numerical approaches; interpreting solutions; linear vibrations.

MEEN 364 Dynamic Systems and Controls 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit
Prerequisite(s): MEEN 363 and ELEN 215

Mathematical modeling and analysis of different types of dynamic systems; introduction to feedback control, time and frequency domain analysis of control systems, stability, PID control, root locus; design of computer-based controllers.

MEEN 365 Dynamic Systems and Controls Laboratory 1 Credit

Grade Mode: Standard Letter
Prerequisite(s): MEEN 260

Introduction to basic control systems instrumentation; experimental verification of control system concepts; implementation of computer-based controllers; data acquisition and analysis.

MEEN 368 Design of Mechanical Components and System I 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 305

Stress Analysis of deformable bodies and mechanical elements with application primarily to linear elastic materials; stress and strain concepts and transformations; simple tension and compression of axial members; torsion of shafts; bending of beams; combined loading; failure modes.

MEEN 381 Seminar 1 Credit

Grade Mode: Standard Letter

Presentations by practicing engineers and faculty addressing effective communications, engineering practices, professional registration, ethics, career-long competence, contemporary issues, impact of technology on society and being informed; preparation of a resume, a lifelong learning plan, two papers, two oral presentations and complete an online assessment of the mechanical engineering program.

MEEN 391 Internship 0 Credits

Grade Mode: Pass/Non Pass

Participation in an approved high-impact learning practice, such as engaging with industry, research entities, or startup companies.

MEEN 401 Senior Design Project I 3 Credits

Grade Mode: Standard Letter

Prerequisite(s): MEEN 360 and MEEN 361

The design innovation process; need definition, functional analysis, performance requirements and evaluation criteria, conceptual design evaluation, down-selected to an embodiment; introduction to systems and concurrent engineering; parametric and risk analysis, failure mode analysis, material selection, and manufacturability; cost and life cycle issues, project management.

MEEN 402 Senior Design Project II 3 Credits

Grade Mode: Standard Letter

Prerequisite(s): MEEN 401

Product detail design and development process including case studies; project management, marketing considerations, manufacturing, detailed design specifications; failure modes, application of codes and standards, selection of design margins; product (component) development guidelines; intellectual property, product liability and ethical responsibility.

MEEN 404 Design of Experiments for Engineering Applications 3 Credits

Grade Mode: Standard Letter

Prerequisite(s): MEEN 361

Systematic design of experimental investigations; student teams identify topics and develop experiment designs including establishing the need; functional decomposition; requirements; conducting the experiment; analyzing and interpreting the results and written and oral reports documenting the objectives, procedure, analysis, and results and conclusion of two or three experiments.

MEEN 421 Thermal-Fluids Analysis and Design 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 461

Integration of thermodynamics, fluid mechanics and heat transfer through application to the design of various thermal systems comprised of several components requiring individual analyses; analysis of the entire system; representative applications of thermal-fluids analysis with a design approach.

MEEN 423 Machine Learning for Mechanical Engineers 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 357

Machine learning techniques with applications to the analysis and design of mechanical, fluid, thermal, material and multidisciplinary systems; linear and kernel support vector machines; neural networks; Bayesian techniques; decision trees and random forests; dimension reduction and model selection; data management and learner validation strategies; tools and application studies.

MEEN 433 Principles of Mechatronics 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 364

Basic principles of digital logic and analog circuits in mechanical systems; electrical-mechanical interfacing; sensors and actuators; digital control implementation; precision design and system integration.

MEEN 435 Automation and Robotics 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Industrial robotics with a focus on applications. This includes kinematics and programming of industrial robots, robotic welding, robotic assembly, and other industrial applications. Computer vision for use in robotic systems is an important area. Industrial computer systems for the implementation of robotic manufacturing systems, and mechatronics. Automation for offshore applications with a focus on top-side automation for drilling platforms and control systems for subsea production systems for oil and gas.

MEEN 444 Finite Element Analysis 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 357 and MEEN 368

Introduction to basic theory and techniques; one- and two-dimensional formulations for solid mechanics applications; direct and general approaches; broader aspects for field problems; element equations, assembly and solution schemes; computer implementation, programming and projects; error sources and application consideration.

MEEN 453 Advanced Manufacturing Processes 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 360 and MEEN 361

Machining theory; traditional and non-traditional machining processes; CNC machines and tools; geometric dimensioning and tolerance (GD&T); additive manufacturing systems and processes; materials in additive manufacturing.

MEEN 460 Corrosion Engineering 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 360 and MEEN 361

Basic corrosion phenomena are described, including mixed potential theory, types of corrosion, experimental methods, and prevention techniques.

MEEN 461 Heat Transfer 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 344

Heat transfer by conduction, convection and radiation: steady and transient conduction, forced and natural convection, and blackbody and gray body radiation; multi-mode heat transfer; boiling and condensation; heat exchangers.

MEEN 464 Heat Transfer Laboratory 1 Credit

Grade Mode: Standard Letter

Prerequisite(s): MEEN 345

Basic measurement techniques in conduction, convection, and radiation heat transfer; experimental verification of theoretical and semi-empirical results; uncertainty analysis.

MEEN 467 Mechanical Behavior of Materials 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 360 and MEEN 361

Fundamentals of flow and fracture in metals, emphasizing safe design by anticipating response of materials to complex stress and environmental service conditions; micromechanisms of flow, fatigue, creep and fracture; fracture mechanics approach to design; special emphasis given to microstructure-mechanical property relationship and damage tolerant design.

MEEN 470 Principles of Energy Conversion 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 461

An overview of conventional, renewable and advanced energy conversion techniques using fossil fuel, solar, fuel cells and thermoelectric generators will be presented. Students should gain a general understanding of energy resources availability, energy conversion techniques, device performance analysis and assessment of potential for future use.

MEEN 472 Building Science, Technology, and HVAC Systems 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 461

An overview of conventional, renewable and advanced energy conversion techniques using fossil fuel, solar, fuel cells and thermoelectric generators will be presented. Students should gain a general understanding of energy resources availability, energy conversion techniques, device performance analysis and assessment of potential for future use.

MEEN 474 Sustainable Energy Technologies and Systems 3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Prerequisite(s): MEEN 461

This course provides a comprehensive overview of sustainable energy technologies, covering solar, wind, hydro, geothermal, and biomass. Students explore the principles, applications, and integration of renewable energy sources into modern energy systems. Through lectures, case studies, and hands-on exercises, they learn about the design, operation, and socio-economic implications of renewable energy technologies. Emphasis is placed on practical skills development and real-world applications, equipping students to contribute effectively to the global transition towards a more sustainable and resilient energy future.

MEEN 489 Selected Topics in Mechanical Engineering 1-3 Credits

Grade Mode: Standard Letter, Audit/Non Audit

Advanced or applied topics in mechanical engineering offered according to student's interest and availability of instructors and equipment. Lecture hours, laboratory, and/or computation period to be arranged.