

Department of Mechanical and Industrial Engineering

Contact Information

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The graduate programs in Mechanical Engineering, Industrial Engineering, and Mechatronics Engineering are designed to instill fundamental concepts as well as practical knowledge of modern engineering and to prepare students for immediate engineering challenges as well as a lifetime of professional advancement. Research laboratories are available for work in robotics and automation, dynamical systems and controls, unmanned aerial vehicles, additive manufacturing, composite structures, thermal systems, computer integrated engineering design, renewable energy, simulation and optimization, and radiation effects on materials.

Degrees Offered

- The Ph.D. degree is available in Engineering.
- The Master of Science degree is available in Mechanical Engineering, Industrial Engineering, Mechatronics Engineering (jointly offered with Electrical Engineering and Computer Science), and Space and Aeronautical Engineering.

Industrial Engineering (IEEN)

IEEN 5301 Advanced Probs in Indus Eng **1-3 SCH (1-3)**

Individual or group research on advanced problems conducted under the supervision of a faculty member. Maximum credit 6 semester hours.

IEEN 5303 Advance Topics in Indus Eng **1-3 SCH (1-3)**

One or more advanced topics. May be repeated when topic changes.

IEEN 5305 Graduate Research Project **1-3 SCH (1-3)**

Designed for project option students and requires completion of research project. Prerequisite: departmental approval. May be repeated for a maximum of 7 semester hours.

IEEN 5306 Thesis **1-3 SCH (1-3)**

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 10 semester hours.

IEEN 5310 Risk Management **3 SCH (3-0)**

This course covers the advanced concepts and theories of the tools and techniques used in risk management at corporate, strategic business and project level and discusses a risk management mechanism for the sequencing of risk assessment through corporate, strategic and project stages of an investment.

IEEN 5311 Standards Prod Design & Manf **3 SCH (3-0)**

Advanced knowledge of standardization, anatomy and framework of standards, standards development process, and strategies to search standards and database.

IEEN 5312 Supply Chain Management **3 SCH (3-0)**

The management of material and information flows in multi-stage production-distribution networks. Provide students with the knowledge and the tools necessary to develop, implement, and sustain strategies for managing supply chain issues, especially the material and inventory management in supply chain.

IEEN 5313 Inventory Systems **3 SCH (3-0)**

Deterministic/stochastic systems with static/dynamic models. Use of forecasting techniques. Practice of inventory management, manual and computerized procedures and MRP. Case studies in inventory systems management. Prerequisite: 3 hours undergraduate Production and Inventory Control or equivalent.

IEEN 5314 Activity Scheduling **3 SCH (3-0)**

Deterministic/stochastic sequencing problems with static/dynamic models. Problems involving single and multiple facilities (flow shop, job shop). Problems involving different measure of effectiveness, solution techniques (optimizing, heuristic). Industrial scheduling problems.

IEEN 5319 Game Theory **3 SCH (3-0)**

An introduction to game theory and strategic thinking. Dominance, Nash equilibrium, normal-form and extensive-form games, repeated games, static games with complete and incomplete information, dynamic games with incomplete information, mechanism design. Prerequisite: Graduate standing or permission from the instructor.

IEEN 5320 Fundamentals Sustainable Eng 3 SCH (3-0)

Fundamental concepts and definitions in sustainable engineering, approaches and applications of sustainability including societal, environmental and economic sustainability, and new trends in sustainability concept development for engineering.

IEEN 5321 Computer Appl of Stats Methods 3 SCH (3-0)

Extreme value distributions, multivariate normal distribution, simple and multiple regression analyses, analysis of variance, time series analysis, a survey of nonparametric statistics, chi square, t and F distributions. Prerequisite: undergraduate course in Applied Methods in Engineering Statistics or the equivalent.

IEEN 5322 Compu Simulation of Indust Sys 3 SCH (3-0)

Introduction to simulation, a survey and application of computer languages suitable for Monte Carlo simulation of random processes, model construction, advantages and shortcomings of simulation techniques, programming with simulation languages.

IEEN 5324 Ergonomics 3 SCH (3-0)

Application of ergonomic principles to the work environment. Design of the system to fit and interact with the human operator. Collection and utilization of anthropometric data in the design of workstations, tools, safety equipment and VDT workstations. Study of the interaction between human operator and the environment including the effect of noise, improper lighting, vibration, heat and cold on physical and mental performance.

IEEN 5325 System Safety 3 SCH (3-0)

Application of engineering design and management of industrial prevention models along with ethical responsibilities to eliminate, prevent or control hazards throughout the life cycle of a project, program, procedure or activity.

IEEN 5326 Decision Analysis 3 SCH (3-0)

Sources of information, prediction and judgment, subjective probability bidding policy. Statistical decision theory including utility functions, risk and uncertainty, min-max and Bayes strategy. Prerequisite: IEEN 5329 or equivalent.

IEEN 5327 Adv Engineering Project Mnmt 3 SCH (3-0)

This course covers the advanced concepts and theories of project modeling and optimization, project scheduling, resource allocation, economic analyses and project decision analysis. Prerequisite: permission of the instructor.

IEEN 5328 Reliability Theory 3 SCH (3-0)

Reliability analysis with emphasis on the exponential, Weibull, gamma, log normal and extreme value distributions; reliability of systems, redundancy; maintainability and availability. Prerequisite: IEEN 5313.

IEEN 5329 Advanced Eng Economic Analysis 3 SCH (3-0)

Continuation of Engineering Economic Analysis including funds flow, utility, price changes, investment, growth, replacement, taxes, capital budgeting and managerial economics. Prerequisite: 3 hours undergraduate course in Engineering Economic Analysis or equivalent.

IEEN 5331 Compu Integrated Manuf Syst 3 SCH (3-0)

Advanced systems concept of Computer Integrated Manufacturing Advanced system, definition of manufacturing and its various levels, planning and control of product movement through the production systems, successful use of Automation, Robotics, Just-In-Time Manufacturing and Knowledge Based Systems. Prerequisite: MEEN 5303.

IEEN 5332 Mfg System Design 3 SCH (3-0)

Systematic description of the underlying behavior of manufacturing systems. Topics include basic factory dynamics, corrupting influence of variability, push and pull production systems, human element in manufacturing systems design and supply chain management.

IEEN 5333 Six Sigma and ISO Standards 3 SCH (3-0)

Introduction to six sigma approach, DMAIC model, ISO standards, and continual improvement philosophy. Study and research on using six sigma to meet ISO 9000, and use the ISO 9000 Framework to Assess a Six Sigma System. Practical case studies and projects will be pursued.

IEEN 5334 Lean Manufacturing 3 SCH (3-0)

Identifying key Lean concepts for manufacturing and defining these concepts for products/process design. Understanding Lean terminology, value stream mapping for manufacturing systems, design of Lean equipment, product cell design, operator job design and five steps to kaizen. Lean manufacturing approach to help reduce manufacturing costs, reduce or eliminate waste and increase profit margins.

IEEN 5335 Principles of Optimization 3 SCH (3-0)

Nonlinear Optimization: convexity, Kuhn-Tucker conditions, theory of duality. Linear and combinatorial optimization. Dynamic optimization. Prerequisite: 6 hours of undergraduate operations research or equivalent.

IEEN 5336 Linear Prog & Extensions 3 SCH (3-0)

Theory of linear programming including the simplex method, duality, sensitivity analysis, decomposition principles, the transportation problems and integer programming. Prerequisite: IEEN 5335 or equivalent.

Mechanical Engineering (MEEN)**MEEN 5301 Advanced Probs in Mech Eng 1-4 SCH (1-4)**

Individual or group research on advanced problems conducted under the supervision of a faculty member. Maximum credit 8 semester hours.

MEEN 5303 Advanced Topics in Mech Eng 1-3 SCH (1-3)

One or more advanced topics. May be repeated when topic changes.

MEEN 5305 Graduate Research Project 1-3 SCH (1-3)

Designed for project option students and requires completion of research project. Prerequisite: departmental approval. May be repeated for a maximum of 7 semester hours.

MEEN 5306 Thesis 1-3 SCH (1-3)

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 10 semester hours.

MEEN 5314 Finite Element Methods in Engi 3 SCH (3-0)

Principles and applications of the Finite Element Method: energy based variational principle methods, the principles of virtual work, weighted residual methods. Emphasis on structural and nonstructural elements and applications. Prerequisite: CSEN 2304 or equivalent.

MEEN 5315 Advanced Mechanism Design 3 SCH (3-0)

Mobility analysis and rotatability criteria. Vector and matrix based mechanism analysis and synthesis. Motion analysis and simulation of mechanisms. Planar, spherical and spatial mechanisms. Mechanisms for path, function and motion generations. Cam and gear mechanisms. Prerequisite: engineering graduate standing.

MEEN 5316 Mechanics Composite Materials 3 SCH (3-0)

Constituent and application of composite materials, mechanical properties of composite materials using micro-and macro-mechanics perspectives, classical theory, failure theories, manufacturing techniques and experimental testing procedures. Prerequisites: MEEN 3344 and CEEN 3311 or equivalent.

MEEN 5318 Advanced Dynamics 3 SCH (3-0)

Equations of motion in three dimensions. Derivation and application of Lagrange's equations. Vibrations of mechanical systems. Orbital mechanics. Prerequisite: MEEN 3355.

MEEN 5320 Theory of Elasticity 3 SCH (3-0)

Discussion of the concept of stress, strain, deformations, strain compatibility and constitutive relations; formulation and solution of extension, bending, torsion and two-dimensional elasticity problems. (Credit may not be obtained in both MEEN 5320 and CEEN 5310.)

MEEN 5321 Advanced Fluid Mechanics 3 SCH (3-0)

Equations of fluid mechanics: equations of continuity, motion, Navier-Stokes, energy and Bernoulli. Incompressible, laminar, turbulent and compressible flows.

MEEN 5322 Turbulent Flow 3 SCH (3-0)

Stationary random functions. Correlation tensors. Wave number Space. Mechanics of turbulence. Energy spectrum. Dissipation and energy cascade. Turbulence measurements. Isotropic turbulence. Turbulent transport processes. Mixing and free turbulence. Wall-constrained turbulence.

MEEN 5326 Control Systems Engineering 3 SCH (3-0)

Analysis and design of controlled, dynamic, linear mechanical, electric, fluid and/or thermal systems; introduction to concepts of stability, controllability, observability and to discrete time, sampled data control systems, optimal control systems and nonlinear control theory. Prerequisite: MEEN 5328.

MEEN 5328 Dynamic Systems Engineering 3 SCH (3-0)

Analysis of dynamic-mechanical, electric, fluid and thermal system elements; modeling, analysis and design of physical, dynamic systems composed of these elements.

MEEN 5330 Continuum Mechanics 3 SCH (3-0)

Presentation of the fundamental laws of physics as applicable to a continuous medium in a unified viewpoint. Material is discussed in terms of Cartesian tensors. Topics covered include: vectors and indicial notation of tensors, tensor operations, stress, strain and deformation of continuous media in Eulerian and Lagrangian descriptions. Applications to solid mechanics, fluid mechanics and thermodynamics are explored.

MEEN 5331 Advance Materials Science 3 SCH (3-0)

Formation of metallic materials, polymers and composite materials, both applications and properties including chemical resistance and mechanical properties such as elasticity, creep and fracture. Prerequisite: MEEN 3344.

MEEN 5333 Polymer Science 3 SCH (3-0)

Structure properties of polymeric materials, polymer-solvent thermodynamics, physical and mechanical properties such as viscosity, glass transition, viscoelasticity, fatigue, creep, toughening principles. Prerequisite: graduate standing in science or engineering with materials science (MEEN 3344) or equivalent taken in undergraduate study.

MEEN 5335 Advnd Robotics and Automation 3 SCH (3-0)

Analysis of methods of design and operation of robots and robotic systems. Kinematics and dynamics of manipulators, trajectory planning and motion control, sensing and vision, discussion of command languages and planning of job assignments.

MEEN 5337 Engin Analysis in Applied Mech 3 SCH (3-0)

Simultaneous Equations - Equilibrium, Eigenvalues and Eigenvectors; Extreme Values of Functions; Calculus of Variations; Extremum Principles of Thermodynamics; Stationarity and Extremum Principles of Solid Mechanics; Equations of Motion and the Stationarity Principles of Lagrange and Hamilton. Prerequisites: graduate standing and approval of instructor.

MEEN 5339 Comp Aided Geometric Design 3 SCH (3-0)

Introduction of affine maps, barycentric coordinates, piecewise linear interpolation, tessellation and triangulation. Bezier and B-Spline curves and surfaces. Techniques for constructing curves, surfaces and solids.

MEEN 5341 Tribology: Friction Wear & Lub 3 SCH (3-0)

Surface properties and surface topography, contact mechanics, friction of surfaces in contact, heat dissipation, lubrication, wear and surface damages, surface engineering. Prerequisite: graduate standing in engineering with machine design (MEEN 4351) or equivalent course taken in undergraduate study.

MEEN 5345 Cond and Convection Heat Trans 3 SCH (3-0)

Theory of steady-state and transient heat conduction and theory of convective transport combined with boundary layer theory. Prerequisite: MEEN 3348.

MEEN 5347 Advanced Thermodynamics 3 SCH (3-0)

The equations of state for various systems are given extensive treatment. Prerequisite: MEEN 3347.

MEEN 5348 Auto. Sys. and Ind. Controls 3 SCH (3-0)

Industrial Control Systems, Hardware Components of Automation and Process Controls, Instrument Calibration, Programmable Logic Controllers, PLC interfacing, Computer Numerical Control, Automated Machine Systems, Industrial Networking.

MEEN 5349 Mechanical Vibrations 3 SCH (3-0)

Free and Forced Vibration of Single/Multi Degree of Freedom Systems, Harmonic Excitation, Vibration of Continuous Systems, Vibration Control, Nonlinear and Random Vibrations.

MEEN 5359 Advanced Manufacturing Processes 3 SCH (2-3)

Development of advanced processes and detailed selection criteria for manufacturing processes, processing of castings, additive manufacturing, sheet metal working, polymer and polymer-matrix composites production, machining and laser cutting processes. Prerequisites: MEEN 1310 or equivalent, MEEN 3344 or equivalent.

MEEN 5385 Advanced Manufacturing of Composites 3 SCH (2-3)

Advanced development of composites manufacturing processes; hand lay-up, air and oven curing, 3D printing/ additive manufacturing of composites, filament winding and compression molding. In-depth materials selection and fabrication of marine, aerospace, chemical and civil structures. Practical case studies and individual projects. Prerequisites: MEEN 3344 or equivalent and CEEN 3311 or equivalent.

Mechatronics Engineering (MHEN)**MHEN 5306 Thesis Research 3 SCH (3-0)**

Designed for Plan 1 students. The course requires completion of thesis research. Prerequisite: Departmental approval. May be repeated for a maximum of 6 semester hours.

MHEN 5370 Adv Eng Analysis 3 SCH (3-0)

Ordinary and Linear Differential Equations, Complex Analysis, Laplace Transforms, Z-transforms, Fourier Series, Fourier Transform, Vector Calculus and Linear Algebra, Calculus of Variations, Numerical Analysis, Probability Statistics.

MHEN 5371 Mechatronic Systems 3 SCH (3-0)

Mechanical Processes and Components; Electrical Systems and Sensors; Actuators; Data Acquisition; Machine Vision; Noise, Analysis and Design Considerations; Power Electronics.

MHEN 5372 Sensors & Actuators Mechatron 3 SCH (3-0)

Sensors, Linear Actuators, Stepper Motors, Continuous-Drive Actuators, Mechanical Transmission Components, Rotary Actuators, MEMS, Interfacing.

MHEN 5373 Embedded Mechatronic Sys 3 SCH (3-0)

Design and implementation of embedded systems in the context of mechatronic products, with emphasis on advanced technologies and computer aided design tools. It covers embedded system architecture and programming, sensor networks, input/output, analog and digital interfacing and peripherals in hardware integration.

Space and Aeronautical Engineering (SAEN)**SAEN 5306 Thesis 1-3 SCH ()**

Designed for students to complete M.S. degree requirement.

SAEN 5380 Adv Aerospace Struct Design 3 SCH (3-0)

Advanced mechanics of materials analysis and design of thin-walled and light-weight elastic aerospace structures such as airplanes or rockets. Use of 3D elasticity including strain-displacement relations, stress-strain relations, stress transformation, and equations of equilibrium, plane stress and plane strain elasticity, stress concentration factors, aerospace materials and failure criteria, margins of safety analysis, plate bending, structural stability. Torsion and bending of asymmetrical thin-walled sections. Design project. Prerequisites: MEEN 3360 or equivalent and MEEN 4303 or equivalent.

SAEN 5381 Advanced Aerodynamics 3 SCH (3-0)

Studies the dynamics of incompressible and compressible flows. Theoretical and approximate solutions for steady and unsteady incompressible flows and steady compressible flows; applications to airfoil, wing and aircraft aerodynamics; introduction to approximate methods for boundary layers; introduction to aerodynamic design concepts. Prerequisites: MEEN 4347, MEEN 3392, equivalent of these or with permission of instructor.

SAEN 5382 Aerospace Dynamics and Control 3 SCH (3-0)

Fundamentals of aerospace vehicles dynamics and control. Rigid body kinematics and dynamics, attitude control, orbital dynamics, maneuvers, and controls. Simulation of aerospace vehicles and control design. Prerequisites: MEEN 4344 or equivalent.

SAEN 5383 Aerospace Propulsion 3 SCH (3-0)

Fundamentals of propulsion. Introduction to combustion and combustors. Performance and cycle analysis of various flight propulsion systems: turbojets, turbofans, turboprops, ramjets, scramjets, rockets, and propellers. Design of supersonic inlets and nozzles. Prerequisites: MEEN 3392, MEEN 3347, MEEN 3348, or equivalent of these.

SAEN 5384 Hypersonic Flows 3 SCH (3-0)

The course introduces hypersonic flows, including the fundamental physics, shock wave phenomena, aerodynamic heating, and advanced computational methods used for analyzing hypersonic vehicles. Topics covered include shock interactions, boundary layer effects, heat transfer, thermochemical nonequilibrium, and high-temperature gas dynamics.

SAEN 5385 Computational Fluid Dynamics 3 SCH (3-0)

The course introduces computational fluid dynamics (CFD) with applications in space and aeronautical engineering. Topics include governing equations of fluid dynamics, numerical methods for solving the Navier-Stokes equations, discretization techniques, turbulence modeling, grid generation, and validation. Emphasis is placed on practical CFD applications for analyzing aerodynamic and space-related flow problems, including high-speed flows and external aerodynamics of aerospace vehicles. Prerequisites: Advisor approval needed.

Graduate Programs

- Industrial Engineering, M.S.
- Mechanical Engineering, M.S.
- Robotics and Autonomous Systems, M.S.
- Space and Aeronautical Engineering, M.S.

Academic Certificates

- Engineering Project Management, Academic Certificate

Planned Course Offerings

This section provides a comprehensive list of graduate courses offered by the Department of Mechanical Engineering and Industrial Engineering, along with a two-year schedule indicating when each course is expected to be available. Please note that course offerings and scheduling are subject to change based on faculty availability and student demand. To ensure steady progress toward degree completion, students are strongly encouraged to work closely with their advisor to develop a personalized academic plan.

Industrial Engineering (IEEN)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
IEEN 5301	X	X	X	X
IEEN 5303	X	X	X	X
IEEN 5305	X	X	X	X
IEEN 5306	X	X	X	X
IEEN 5310		X		X
IEEN 5311		X		X
IEEN 5312	X		X	
IEEN 5313		X		X
IEEN 5314		X		X
IEEN 5319		X		X
IEEN 5320		X		X
IEEN 5321	X	X	X	X
IEEN 5322		X		X
IEEN 5324		X		X
IEEN 5325	X		X	
IEEN 5326		X		X
IEEN 5327	X		X	
IEEN 5328	X		X	
IEEN 5329		X		X
IEEN 5331		X		X
IEEN 5332		X		X
IEEN 5333	X		X	
IEEN 5334		X		X

IEEN 5335	X	X	X	X
IEEN 5336		X		X

Mechanical Engineering (MEEN)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
MEEN 5301	X			
MEEN 5303	X	X	X	X
MEEN 5305	X	X	X	X
MEEN 5306	X	X	X	X
MEEN 5314		X		X
MEEN 5315 ¹				
MEEN 5316		X		
MEEN 5318		X		X
MEEN 5320	X			
MEEN 5321		X		X
MEEN 5322		X		X
MEEN 5326		X		X
MEEN 5328	X			
MEEN 5330	X		X	
MEEN 5331	X		X	
MEEN 5333		X		
MEEN 5335	X		X	
MEEN 5337	X		X	
MEEN 5339 ¹				
MEEN 5341		X		X
MEEN 5345	X		X	
MEEN 5347	X			
MEEN 5348	X			
MEEN 5349		X		X
MEEN 5359		X		
MEEN 5385	X			

¹ This course is available during the summer term only.

Mechatronics Engineering (MHEN)

Course	Fall 2026	Spring 2027	Fall 2027	Spring 2028
MHEN 5306	X	X	X	X
MHEN 5370	X		X	
MHEN 5371	X		X	
MHEN 5372		X		X
MHEN 5373		X		X

Marketable Skills

Texas A&M University-Kingsville is dedicated to equipping graduate and doctoral students with the advanced marketable skills necessary for professional and academic excellence beyond the university setting. These skills encompass a range of high-level interpersonal, analytical, and applied competencies that are sought after in today's competitive workforce.

Our graduate programs are structured to cultivate these capabilities through rigorous academic inquiry, experiential learning, faculty-mentored

research, professional internships, and opportunities for scholarly and community engagement.

Below are the marketable skills cultivated through each of the department's graduate academic programs.

Industrial Engineering, M.S.

- Ability to apply industrial engineering fundamentals
- Strong grounding in engineering fundamentals
- Communication and interpersonal skills
- Project management skills
- Analytical skills
- Computing skills

Mechanical Engineering, M.S.

- Professionalism and work ethic
- Digital technology
- Effective communication
- Identify, formulate, and solve complex engineering problems
- Produce quality scholarship through independent effort
- Acquire techniques, skills, and modern engineering tools necessary for engineering practice
- Design a system, component or process to meet desired needs within realistic constraints