

DEPARTMENT OF MECHANICAL ENGINEERING AND INDUSTRIAL ENGINEERING

Contact Information

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The graduate programs in Mechanical Engineering and Industrial 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, intelligent systems and controls, dextrous robotic hands, computer integrated engineering design and radiation effects on materials. Excellent computer facilities are available.

Degrees Offered

- The Ph.D. degree is available in Sustainable Energy Systems Engineering.
- The Master of Science degree is available in both Mechanical Engineering and Industrial Engineering.

Faculty Graduate Faculty

Elkassabgi, Yousri Professor, Department of Mechanical and Industrial Engineering; B.S., Alexandria University (Egypt); M.S., University of Waterloo (Canada); Ph.D., University of Houston.

He, Fei Assistant Professor, Department of Mechanical and Industrial Engineering; B.S., Hunan University of Science and Technology (China); M.S., University of Rhode Island; Ph.D., The State University of New York.

Lee, Sangsoo Associate Professor, Department of Mechanical and Industrial Engineering; B.En., Sogang University (South Korea); M.S., Sogang University (South Korea); Ph.D., Georgia Institute of Technology.

Oh, Joon-Yeoul Associate Professor, Department of Mechanical and Industrial Engineering; B.S., Chong-Ju University (South Korea); M.S., Chong-Ju University (South Korea); M.S., New Mexico State University; Ph.D., New Mexico State University.

Associate Member

Park, Choongbae Assistant Professor, Department of Mechanical and Industrial Engineering; Bachelors, Kyungpook National University (South Korea); M.S., Purdue University; Ph.D., Purdue University.

Courses

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 3 SCH (3)

Designed for project option students and requires completion of research project. Prerequisite: departmental approval. May be repeated for a maximum of 6 semester hours.

IEEN 5306 Thesis 3 SCH (3)

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 6 semester hours.

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. Prerequisite: IEEN 5313.

IEEN 5315 Nonlinear Programming 3 SCH (3-0)

Quantitative procedures for optimization techniques; steepest ascent/descent; gradient methods. Nonlinear problems such as quadratic programming, geometric programming, convex programming, separable programming, etc. Prerequisite: 6 hours of undergraduate operations research or equivalent and graduate standing.

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 5323 Occupational Biomechanics 3 SCH (3-0)

Study of the structure and function of musculo-skeletal system of the human body, kinetic and kinematic models, link segment diagrams and 3-D static modeling. Applying bio-instrumentation to determine the human performance, work capacity and muscle strength evaluation. Biomechanical considerations in machine control and work place design.

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 Economic Decision Theory 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 5330 Computer Intergrated Design 3 SCH (3-0)

Overview to the fundamental principles and concepts underlying CAD/CAD/CAE systems. Emphasis on three dimensional parametric and feature-based CAD/CAM systems. Introduction to the concurrent design approach - design for manufacturing, design for assembly, design for reliability, design for maintainability are introduced. Applications of artificial intelligence in CAD/CAM system. Enhancement of student's application and development skills of CAD/CAM software.

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 3 SCH (3)

Designed for project option students and requires completion of research project. Prerequisite: departmental approval. May be repeated for a maximum of 6 semester hours.

MEEN 5306 Thesis 3 SCH (3)

Designed for thesis option students. The course requires completion of thesis research. Prerequisite: departmental approval. May be repeated for maximum of 6 semester hours.

MEEN 5313 Numerical Methods in Mech Eng 3 SCH (3)

Numerical methods for advanced analysis and design applications in Mechanical Engineering. Prerequisite: MATH 5372. (Credit may not be obtained in both MEEN 5313 and CEEN 5313.)

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

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 5318 Advanced Dynamics 3 SCH (3)

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)

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)

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)

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 5325 Compu Integrated Manuf Syst 3 SCH (3)

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

MEEN 5326 Control Systems Engineering 3 SCH (3)

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)

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)

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)

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 5335 Advnd Robotics and Automation 3 SCH (3)

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)

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)

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 5345 Cond and Convection Heat Trans 3 SCH (3)

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)

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

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

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)

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

Degree Requirements

Engineering Project Management, Professional Certificate

The department offers a graduate level Engineering Project Management Professional Certificate. Upon completing this certificate, students and professionals are able to:

- Provide technical oversight and coordination of project engineering work
- Monitor progress against project schedules and budgets
- Recommend allocation of resources as required to accomplish goals

This certificate is open to all majors and professionals. Students will receive the certificate upon completing all courses (*B* or better) stated on course requirements.

Engineering Management, Certificate

The graduate Engineering Management Certificate is a 9-hour program open to all majors and professionals. This certificate will give graduate students the opportunity to learn both engineering technical knowledge and project management skills. Students who earn this certificate will be able to provide technical oversight and coordination of project engineering work; monitor progress against project schedules and budgets; recommend allocation of resources as required to accomplish goals. Contact the department for information and advising.

Admission Requirements

- A four-year degree in Engineering or closely related field, or
- Students satisfying concurrent enrollment criteria of Texas A&M University-Kingsville graduate classes.

Course Requirements

In order to get the certificate, students need to complete three courses (9 credit hours) with a *B* or above grade including IEEN 5327, IEEN 5329 and one of IEEN 5303 and IMEN 5315. The courses may be counted to students' major degree plan **only** with the approval from their major graduate coordinator.

Manufacturing Standards and Standardization, Certificate

The department offers a graduate level Manufacturing Standards and Standardization Certificate program. Upon completing this certificate, students and professionals are able to

- Develop critical thinking towards standards and standardization concepts
- Identify and interpret different standards in manufacturing
- Provide technical oversight and coordination to ensure manufacturing process meet national and international standards

This certificate is open to all majors and professional. Students will receive the certificate upon completing all courses state on course requirements with B or above grade.

Manufacturing Standards and Standardization Certificate

The graduate level transcribed Manufacturing Standards and Standardization Certificate program is a 9-hour program open to all major graduate students and professionals who meet with the admission requirements below. This certificate will give graduate students and professional an opportunity to learn both standards and standardization concepts and skills. The objective of this certificate program to promote standards and standardization concepts and increase students' awareness of the importance of standards and standardization by introducing knowledge related to the creation, modification, interpretation of standards and standardization in manufacturing field.

Admission Requirements:

- A four-year degree in Engineering or closely related fields, and at least four years industrial working experience, or
- Students satisfying concurrent enrollment criteria at TAMUK graduate classes.

Course Requirements:

In order to get the certificate, students need to complete three of the following courses (9 credit hours) with A or B grades,

Code	Title	Semester Credit Hours
IEEN 5332	Mfg System Design	3
IEEN 5333	Six Sigma and ISO Standards	3
Select one of the following:		3
IEEN 5303	Advance Topics in Indus Eng ¹	
MEEN 5301	Advanced Probs in Mech Eng ²	
Total Semester Credit Hours		9

¹ Topic: Standards and Standardization in Manufacturing

² Topic: Advanced Manufacturing

And submit request form to Mechanical and Industrial Engineering Department (Dr. Hua Li, hua.li@tamuk.edu, 361-593-4057). The courses may be counted in students' major degree plan **only** with the approval from their major graduate coordinators.