Master of Engineering (MENG)

Courses

MENG 400. Engineering Law. 3 or 4 hours.
Overview of the legal system. Legal principles affecting the engineering profession. Professional ethics in engineering. Intellectual property law. Basic contract and tort principles. Environmental law. Course Information: Same as ENGR 400. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. This is an online web-based course. Prerequisite(s): Senior standing or above.

MENG 401. Engineering Management. 3 or 4 hours.
Theory, strategy, and tactics of the use of project management including project planning, matrix management concept, and team meetings. Course Information: Same as ENGR 401. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. This is an online web-based course. Prerequisite(s): Senior standing or above.

MENG 402. Intellectual Property Law. 3 or 4 hours.
Patent, copyright, trade secret, mask work, and cyber-squatting legal and procedural principles; protection for novel software, biotech inventions, and business methods; and trademark protection for domain names. Course Information: Same as ENGR 402. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. This is an online web-based course. Prerequisite(s): Senior standing or above.

MENG 403. Reliability Engineering. 3 or 4 hours.
Probability overview; statistics overview; system reliability modeling and prediction-static methods; system reliability modeling and prediction-dynamic methods; maintainability and availability; reliability optimization; and risk analysis. Course Information: Same as ENGR 403. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. This is an online web-based course. Prerequisite(s): Senior standing or above.

MENG 404. Math Fundamentals for AI Engineers and Data Scientists. 4 hours.
Concise refresher on the basics of the mathematical tools underpinning modern machine learning and artificial intelligence. Course Information: Extensive computer use required. Recommended Background: BS degree in a STEM discipline.

MENG 405. Foundations of Emergency Management. 4 hours.
Introduces the principles of emergency management including the history of EM in the United States; the roles of federal, state, and local EM agencies; national response concepts; andpreparedness, recovery, and mitigation strategies. Course Information: Extensive computer use required. Online web-based course.

MENG 406. Critical Infrastructure. 4 hours.
Designed to enable students to formulate policies and strategies aiming to protect the leading critical infrastructure sectors in the U.S. (e.g. energy, water, telecommunications, internet, etc.). Course Information: Extensive computer use required. Online web-based course.

MENG 407. Innovation Tools and Methods. 4 hours.
Introduction to tools and methods used for innovation in the development of products, systems, and services, including an introduction to the design thinking methodology.

MENG 411. Non-Newtonian Fluids. 3 or 4 hours.
Fluid mechanics and transport processes involving non-Newtonian fluids. Purely viscous and viscoelastic behavior. Viscometric functions and rheometry. Heat and mass transfer in non-Newtonian fluids. Course Information: Same as CHE 440. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CHE 410 or MENG 410 or consent of the instructor.

MENG 412. Computational Molecular Modeling. 3 or 4 hours.
Provide students with a fundamental understanding of the methods, capabilities and limitations of molecular simulations. Course Information: Same as CHE 438. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): CHE 301. Recommended background: Engineering/Science.

MENG 413. Fundamentals and Design of Microelectronics Processes. 3 or 4 hours.
Design and practical aspects of the most advanced state of micro- and nano-electronics processing with emphasis on thin film deposition, substrate passivation, lithography and etching with thermodynamics, kinetics, reactor design, and optimization. Course Information: Same as CHE 456. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Graduate standing or consent of the instructor. Recommended background: Engineering/Science.

MENG 416. Introduction to Machine Learning. 4 hours.
Introduces common machine learning tasks and learning techniques and broader paradigms that have been developed for these tasks. Ties machine learning techniques to specific real-world applications through hands-on experience. Course Information: Extensive computer use required. Meets eight weeks of the semester. Prerequisite(s): MENG 404; and consent of the instructor.

MENG 417. Introduction to Deep Neural Networks. 4 hours.
Introduces fundamental principles of neural networks. Topics include perceptron, multilayer networks, convolutional neural networks, and recurrent neural networks. Course Information: Extensive computer use required. Meets eight weeks of the semester.

MENG 418. Image Analysis and Computer Vision. 4 hours.
Students will learn the fundamentals of computer vision and will be able to develop image and object recognition, stereo depth estimation methods, and understand the vision methods used in autonomous driving systems. Course Information: Extensive computer use required. Meets eight weeks of the semester.

MENG 419. Artificial Intelligence. 4 hours.
Introduces students to the field of Artificial Intelligence (AI). Ties the theoretical foundations that underlie AI and practice in building components of rational agents. Course Information: Extensive computer use required. Meets eight weeks of the semester.

MENG 420. Natural Language Processing. 4 hours.
Students will be introduced to fundamental statistical and neural methods for language processing. Students will also get an overview of numerous machine learning and deep learning algorithms for efficiently solving language processing tasks. Course Information: Extensive computer use required. Meets eight weeks of the semester.

MENG 421. Quasi-Static Electric and Magnetic Fields. 4 hours.
Quasi-static approximations to Maxwell's equations. Scalar potential; capacitance; conduction; polarization; mixing formulas. Magnetization; vector potential; Biot-Savart law. Forces, energy and power. Poynting's theorem. Course Information: Previously listed as ECE 401. Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended background: Calculus through Differential Equations. College Physics.

MENG 423. Foundations of Electromagnetic Compatibility. 4 hours.
EMC requirements for electronic systems; non-ideal behavior of components; radiated and conducted emissions; susceptibility; coupling and shielding; electrostatic discharge; system design for EMS; Projects required. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended background: Undergraduate background in Electromagnetic Fields.

MENG 425. Transmission Lines for Communication and Power. 4 hours.
Two-conductor lines. Impedance matching. Wideband systems. Scattering matrix. Three-phase systems. Course Information: Extensive computer use required. Prerequisite(s): MENG 421 or consent of instructor. Recommended background: Undergraduate knowledge of electricity and magnetism.

MENG 426. Antennas and Arrays. 4 hours.
Antenna definitions and parameters. Linear antennas; self and mutual impedances. Arrays. Microstrip, broadband, and reflector antennas. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing and MENG 421, or consent of instructor. Recommended background: Undergraduate knowledge of electromagnetic fields.

MENG 435. Wireless Communication Networks. 4 hours.
Radio technology fundamentals; channel and propagation models; channel multiple access technologies; wireless mobile communication fundamentals; generic wireless mobile network; cellular/PCS wireless mobile network standards. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor.

MENG 436. Wireless Data. 3 or 4 hours.
Data communications, existing Wireless Data Networks, planning, topology, performance, and operation. Course Information: Same as ENGR 436. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. This is an online web-based course. Prerequisite(s): Senior standing or above and a course in digital communications and an introductory course in wireless communications.

MENG 480. Introductory Bioinformatics. 4 hours.
Practical analysis of genomic sequences and other high throughput data. Basics of sequence alignment, biological database search, protein motif search, gene expression analysis, and structural bioinformatics. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended background: Background in Computer Science and Biology.

MENG 481. Introduction to Biostatistics. 4 hours.
Introduce basics about statistical treatment, model estimation, and parameter inference from observed biological data. Provide practical skills for summarizing and inference of experimental data. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended background: Calculus III and R programming language.

MENG 483. Bioinformatics Approach to Molecular Modeling. 4 hours.
Protein structure prediction and comparison. Monte Carlo and molecular dynamics simulations. Course Information: Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended background: Background in Computer Science and Biology.

MENG 490. Math Preparation for AI/ML. 4 hours.
A preparatory math class for students to prepare for MENG 404. Course Information: No graduation credit is given to students enrolled in the Master Engineering. Extensive computer use required. Meets eight weeks of the semester. This class should be taken by students in limited admissions prior to MENG 404 or for students seeking a refresher course.

MENG 505. Environmental Risk. 4 hours.
Covers vulnerability and risk management (RM) methodologies with an emphasis on the decision tree technique and its potential to facilitate the analysis and identification of optimal RM alternatives. Course Information: Extensive computer use required. Online web-based course.

MENG 506. Disaster Response. 4 hours.
teaches the development and implementation of a standards-based, auditable and actionable Business Continuity Management (BCM) system which is a cornerstone for building disaster resilient communities. Course Information: Extensive computer use required. Online web-based course.

MENG 510. Transport Phenomena. 4 hours.
Continuum theory of momentum, energy, and mass transfer. Viscous behavior of fluids. Laminar and turbulent flow. thermal conduction and convention, diffusion and coupled operations. Course Information: Same as CHE 520. Previously listed as MENG 410. Prerequisite(s): Consent of the instructor. Recommended Background: B.S. degree in chemical engineering or a related discipline.

MENG 512. Microhydrodynamics, Diffusion and Membrane Transport. 4 hours.
Theoretical and numerical fluid mechanics of microstructure: potential flow and virtual mass, quasistatic versus transient Stokes flow, integral theorems, multipole expansions, singularity solutions, fluctuations, and current applications. Course Information: Same as CHE 512. Prerequisite(s): CHE 410 or MENG 410 and CHE 445 or consent of the instructor.

MENG 520. Electromagnetic Fields. 4 hours.
Maxwell's equations. Potentials. Constitutive relations. Boundary conditions. Polarization. Radiation from antennas. Waveguides and resonators. Exterior boundary - value problems. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended background: Undergraduate-level knowledge of electromagnetic fields.

MENG 526. Electromagnetic Scattering and Radar Signatures. 4 hours.
Exact solutions of exterior boundary-value problems; low and high frequency methods; hybrid techniques; theory of radar targets; radar cross-sections. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended Background: MENG 520.

MENG 527. Photonics. 4 hours.
Optical resonators. Radiation and atomic systems. Laser oscillation. Nonlinear optics. Electrooptics and acoustooptics. Periodic media. Course Informtion: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended Background:undergraduate background in electromagnetics.

MENG 535. Advanced Wireless Communication Networks. 4 hours.
2nd generation: IS-95-based wireless mobile network; 2nd generation: GSM-based wireless mobile network; 2.5 generation: wireless mobile data/voice network; 3rd generation: broadband wireless mobile multimedia network. Course Information: Previously listed as ECE 535. Extensive computer use required. Prerequisite(s): MENG 435; and graduate or professional standing; and consent of the instructor.

MENG 551. Engineering Thermodynamic. 4 hours.
Thermophysical properties; First and second laws; Closed vs open system; Thermodynamic cycles; Fluid phase equilibria and stability; Nonideal solutions and activity coefficeints; Electrolytes; Gibbs-Duhem relations. Engineering applications. Course Information: Extensive computer use required. A basic understanding of thermodynamics, such as one might get in ME 325 or the equivalent.

MENG 582. Computational Genomics. 4 hours.
Modern statistical and computational methods relevant to analysis of functional genomics data; cluster analysis of gene expression profiles; methods of construction of co-expression network. Course Information: Extensive computer use required. Prerequisite(s): Graduate or professional standing; and consent of the instructor. Recommended background: BIOE 480 and BIOE 439 and R programming languages.

MENG 594. Adv Special Topics Engineering. 4 hours.
Particular topics vary from term to term depending on the interests of students and specialties of the instructor. Course Information: Extensive computer use required. Online web-based course.