

# Master of Engineering (MENG)

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## 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; and preparedness, 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 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 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 convection, 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 Information: 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 coefficients; 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.