

GRADUATE COURSES

Electrical and Computer Engineering

Spring 2019

Classes begin 1/22/2019



UMass

Dartmouth

COLLEGE OF ENGINEERING

Department contact info: 508.910.6619
Dr. Antonio H. Costa, Chairperson
Dr. Liudong Xing, Graduate Program Director

ECE 520 **Wireless Networks and Mobile Security**
Honggang Wang (hwang1@umassd.edu)
Tuesday, Thursday 2:00-3:15 PM, SENG-212

ECE 521 **Random Signals and Systems I**
Paul Gendron (pgendron@umassd.edu)
Monday, Wednesday 5:00-6:15 PM, SENG-212

ECE 524 **Solid State Electronics**
David Rancour (drancour@umassd.edu)
Tuesday, Thursday 9:30-10:45 AM, SENG-212

ECE 530 **Introduction to Advanced Electronics & Optoelectronics**
Yifei Li (yli2@umassd.edu)
Tuesday, Thursday 5:00-6:15 PM, SENG-212

ECE 548 **Cyber Threats and Security Management**
Hong Liu (hliu@umassd.edu)
Monday 2:00-4:50 PM, SENG-117

ECE 560 **Computer Systems Performance Evaluation**
Liudong Xing (lxing@umassd.edu)
Tuesday, Thursday 12:30-1:45 PM, SENG-212

ECE 562 **Advanced Computer Architecture**
Honggang Wang (hwang1@umassd.edu)
Tuesday, Thursday 11:00-12:15 PM, SENG-210

ECE 588 **Embedded System Design Project**
Paul Fortier (pfortier@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM, SENG-212
Wednesday, 2:00-4:50 PM, SENG-218

ECE 591-01 **Topics in Electrical and Computer Engineering**
Topic: Medical Ultrasonics
David Brown (dbrown@umassd.edu)
Monday, Wednesday 3:00-4:50 PM, Dion-109

ECE 591-02 **Topics in Electrical and Computer Engineering**
Topic: Digital Processing of Speech Signals
Karen Payton (kpayton@umassd.edu)
Tuesday, Thursday 11:00-12:15 PM, SENG-113

ECE 591-03 **Topics in Electrical and Computer Engineering**
Topic: Antennas and Propagation
Dayalan Kasilingam (dkasilingam@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM, SENG-222

ECE 591-04 **Topics in Electrical and Computer Engineering**
Topic: Array Signal Processing
John Buck (jbuck@umassd.edu)
Monday, Wednesday 5:00-6:15 PM, SENG-222

ECE 620 **Dependable and Secure Computing**
Liudong Xing (lxing@umassd.edu)
Tuesday, Thursday 8:00-9:15 AM, SENG-212

COURSE DESCRIPTIONS

ECE 520 three credits

Wireless Networks and Mobile Security

3 hours lecture

Prerequisites: ECE 432 or permission of instructor

Advanced study of wireless and mobile network architectures, technologies, protocols and mobile security design at graduate level. It covers impediments of the mobile and wireless environments, problems and limitations due to such impediments, various network layers solutions, location management techniques, mobile IP, wireless TCP, wireless LANs, 802.16/WIMAX, Wireless Mesh Networks, ad-hoc networks, routing and power optimization, performance and mobile security issues.

ECE 521 three credits

Random Signals and Systems I

3 hours lecture

Prerequisites: EAS 501 or equivalent graduate level applied mathematics course and ECE 320 and ECE 321 or equivalent undergraduate linear systems course

Random variables and probabilistic description of signals and systems. The course provides the analytical tools for studying random phenomena in engineering systems and provides graduate students with an extensive treatment of probability theory, Bayes theorem, random variables, distribution and density functions, conditional distributions, moments, functions of random variables, characteristic functions, stochastic processes, Gaussian processes, stationary processes, correlation functions, power spectral density, response of systems to random inputs, mean square error estimation, filtering and prediction, and noise analysis. The course prepares students for a wide range of courses in communications, signal processing, acoustics, control, and other areas of engineering in which random signals and systems have an important role.

ECE 524 three credits

Solid State Electronics

3 hours lecture

Solid state device behavior. Among the topics covered are semiconductor fundamentals, p-n junction theory, and both the bipolar and the field effect transistor. Emphasis is placed on those transistor parameters that need to be considered in VLSI and microwave applications.

ECE 530 three credits

Introduction to Advanced Electronics & Optoelectronics

3 hours lecture

Illustration of principles of advanced electronics and photonics by showing their applications in advanced radar, wired/wireless communications, and electronic sensing. Key electronics/photonics devices including high speed transistors, diodes, lasers, high frequency modulators, photodetectors, amplifiers, and passive circuitries are discussed. System applications including advanced radar system, radio over fiber, and millimeter wave /THz signal generation and processing are deliberated and analyzed.

ECE 548 three credits

Cyber Threats and Security Management

3 hours lecture

Prerequisites: Graduate standing in computer engineering

Fundamentals and practices in information assurance (IA) and cyber defense (CD). This course covers threats in the cyber realm, design principles to create trustworthy systems, and security lifecycle. Topics include threat models, attack surface, social engineering, vulnerability identification, risk assessment, and fail secure system design. Hands-on exercises will demonstrate the interaction between security and system usability as well as the effects of security mechanisms in specific scenarios.

ECE 560 three credits

Computer Systems Performance Evaluation

3 hours lecture

Prerequisites: ECE 460 and graduate standing

Development of a broad working knowledge of probability, queuing theory, petri-nets, simulation and empirical modeling as applied to computer systems hardware and software performance modeling and assessment. The course is oriented toward a practical application of theory and concepts with an emphasis placed on the use of computer tools to model performance and to perform tradeoff analysis.

ECE 562 three credits

Advanced Computer Architecture

3 hours lecture

Prerequisite: ECE 561 or permission of instructor

Advanced computer design, emphasizing fundamental limitations and tradeoffs in designing high performance computer systems. Students develop an understanding of the theoretical foundations in both hardware and software by studying parallel computer models; program partitioning, granularity, and latency; processor architectures and interconnects; and memory hierarchy, interleaving and bandwidth. Specific architectures such as shared memory multi-processors, message passing multi-computers, and superscalar, supervector, VLIW and dataflow designs will be explored.

ECE 588 three credits

Embedded System Design Project

3 hours lecture

Prerequisite: ECE 568

Provides students with a complete design experience from initial concept development through finished product, expanding on topics taught in ECE 568. The course format is a hands-on laboratory format (3 credits) with 2 hours of lecture and 3 hours of lab. Students will develop their own designs, fabricate the design and formulate and carry out test strategies to validate designs.

ECE 591-01 three credits

Topics in Electrical and Computer Engineering

Topic: Medical Ultrasonics

3 hours lecture

Prerequisite: Permission of instructor

Underlying principles and engineering adaptations of ultrasound, including generation, propagation, detection of sound, transducers, clinical methods, and techniques used in a variety of medical acoustic applications including imaging- sonography, lithotripsy, acoustophoresis filtration, therapeutic and surgery, and cleaning.

ECE 591-02 three credits

Topics in Electrical and Computer Engineering

Topic: Digital Processing of Speech Signals

3 hours lecture

Prerequisites: Permission of instructor

Applications of digital signal processing to speech signals. Course goals are to reinforce concepts learned in prerequisite courses, to introduce new tools needed to deal with time-varying signals and to have students apply what they have learned to their own voices. A semester design project is a large component of this course. Topics include a brief introduction to articulatory and acoustic phonetics, hearing and speech perception, time-domain methods for speech processing, short-time Fourier analysis, homomorphic speech processing, linear predictive coding of speech, and applications.

ECE 591-03 three credits

Topics in Electrical and Computer Engineering

Topic: Antennas and Propagation

3 hours lecture

Prerequisites: Permission of instructor

Solution of Maxwell's equations for radiation problems. Hertzian dipole as a fundamental radiation element is described. Radiation patterns, directivity, gain, antenna impedance, radiation efficiency, and antenna polarization are defined. The course reviews wire dipole antennas, loop antennas, antennas above ground plane, and corner reflector antennas. Topics include receiving antenna properties, antenna arrays, and microstrip patch and slot antennas. Rectangular horn antennas and parabolic reflector antennas are studied. Also discussed are ground-wave propagation and ionospheric propagation.

ECE 591-04 three credits

Topics in Electrical and Computer Engineering

Topic: Array Signal Processing

3 hours lecture

Prerequisites: ECE 574 and ECE 521 or permission of instructor

Fundamentals of signal processing for sensor arrays, including beam pattern design, space-time random processes, array shading, deterministic null-steering, adaptive beamformers and sparse arrays. Applications include sonar, radar, and communications systems. Special emphasis on transferring intuition from classical discrete-time signal processing to narrowband array processing for uniform linear arrays.

ECE 620 three credits

Dependable and Secure Computing

3 hours lecture

Prerequisites: ECE 454 or ECE 544

Advanced topics on dependability and security modeling, analysis and design techniques for computer-based systems and networks. Topics covered include multistate systems, phased-mission systems, fault-tolerant networks, wireless sensor networks, distributed computer systems, modular imperfect fault coverage, dependent failures, and trust in social networks. The course includes research projects that aim to prepare the students to perform research in the area of dependable and secure computing. Substantial emphasis will be placed on reading research papers in a critical and analytical manner.