Graduate Courses
Electrical and Computer Engineering
Fall 2020

Classes begin 9/2/2020

UMass Dartmouth
COLLEGE OF ENGINEERING

Department contact info: 508.999.9164
Dr. Antonio H. Costa, Chairperson
Dr. Liudong Xing, Graduate Program Director

ECE 471 **Communication Theory**
P. Gendron (pgendron@umassd.edu)
Tuesday, Thursday 9:30-10:45 AM

ECE 531 **RF Photonics**
Y. Li (yli2@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM

ECE 533 **VLSI Design**
D. Rancour (drancour@umassd.edu)
Monday, Wednesday 8:30-9:45 AM, SENG-212

ECE 544 **Fault Tolerant Computing**
L. Xing (lxing@umassd.edu)
Wednesday 3:30-6:30 PM

ECE 549 **Network Security**
H. Liu (hliu@umassd.edu)
Tuesday 3:30-6:30 PM

ECE 551 **Acoustic and Electromagnetic Waves**
D. Brown (dbrown@umassd.edu)
Monday, Wednesday 3:00-4:50 PM

ECE 565 **Operating Systems**
H. Liu (hliu@umassd.edu)
Tuesday, Thursday 11:00-12:15 PM

ECE 570 **Wireless Sensor Networks**
H. Wang (hwang1@umassd.edu)
Tuesday, Thursday 12:30-1:45 PM

ECE 574 **Discrete-Time Signal Processing**
K. Payton (kpayton@umassd.edu)
Tuesday, Thursday 11:00-12:15 PM

ECE 584 **Estimation Theory**
P. Gendron (pgendron@umassd.edu)
Tuesday, Thursday 5:00-6:15 PM

ECE 591-01 **Topics in Electrical and Computer Engineering**
Topic: Active Microwave Components
Y. Li (yli2@umassd.edu)
Tuesday, Thursday 5:00-6:15 PM

ECE 591-02 **Topics in Electrical and Computer Engineering**
Topic: Fiber Optics & Network Communications
T. Manzur (tariq.manzur@navy.mil)
Friday 2:00-5:00 PM

ECE 621 **Multimedia Communications**
H. Wang (hwang1@umassd.edu)
Thursday 3:30-6:30 PM, CCB-115

ECE 653 **Satellite Oceanography**
S. Lohrenz (slohrenz@umassd.edu)
Tuesday, Thursday 2:00-3:15 PM

Course Descriptions

ECE 471 three credits
Communications Theory
3 hours lecture
Prerequisites: ECE 321 and ECE 384
Probability theory, signals and linear networks, Fourier transforms, random processes and noise are reviewed. Analog communications including amplitude and frequency modulation with and without noise are studied. Digital communications including baseband pulse modulation, quantization, sampling theory, digital pulse shaping, matched filter, Nyquist criterion and error rates due to noise are covered.

ECE 531 three credits
RF Photonics
3 hours lecture
Photonics technologies for radio frequency applications. Principles of radio frequency (RF) photonics are illustrated through their applications in advanced radar, wired/wireless communications, and electronic sensing. Key RF photonics devices including 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 considered and analyzed.

ECE 533 three credits
VLSI Design
3 hours lecture
Prerequisite: ECE 311
Design of Very Large-Scale Integrated Circuits (VLSI), taught at the transistor level. Computer tools are used to create and simulate integrated circuit layouts. Levels of design automation covered include Full Custom layout, Schematic Driven layout, Standard Cells and fully automated synthesis of HDL code. Required readings from the current literature lead to a formal written report on recent developments in VLSI. Students are required to complete and present at least one project. Some designs may be fabricated.

ECE 544 three credits
Fault Tolerant Computing
3 hours lecture
Techniques for designing and analyzing dependable and fault-tolerant computer-based systems. Topics addressed include: fault, error, and failure cause-and-effect relationships; fault avoidance techniques; fault tolerance techniques, including hardware redundancy, software redundancy, information redundancy, and time redundancy; fault coverage; time-to-failure models and distributions; reliability modeling and evaluation techniques, including fault trees, cut-sets, reliability block diagrams, binary decision diagrams, and Markov models. In addition, availability modeling, safety modeling, and trade-off analysis are presented.

ECE 549 three credits
Network Security
Prerequisite: Graduate standing in computer engineering
3 hours lecture
Principles and practices of security in computer networks. This course covers the theoretical foundations of securing computer networks including cryptography and models. It steps through the practical process of defending networking resources. It also reveals various case studies, large and small, to familiarize the techniques that attackers use. An Internet Testbed is facilitated for students to experiment attacks and defenses.

ECE 551 three credits
Acoustic and Electromagnetic Waves
3 hours lecture
Principles of oscillations, radiation, and propagation of waves in acoustics and electromagnetics for bounded and unbounded media. Introduction to the derivation of the wave equation from Maxwell's equations in electromagnetics and vibration theory in acoustics and the application of the wave equation to wave propagation in SONAR and RADAR environments. Examples include acoustic and electromagnetic propagation in air and ocean environments, waveguides and optical fibers, transducers and antennas, radiation and reception of signals, dispersion, phase and group velocity, attenuation, reflection, refraction, and scattering.

ECE 565 three credits
Operating Systems
3 hours lecture
Operating system design and implementation using the specifics of current operating systems. The course covers file, process, memory and Input/Output management; multitasking, synchronization, and deadlocks; scheduling, and inter-process communication. Projects include team system's programming assignments to investigate the kernel interface, files, processes, and inter-process communication for a current operating system.

ECE 570 three credits
Wireless Sensor Networks
3 hours lecture
Theory, programming and operation of wireless sensors and wireless sensor networks. This course covers the theory, design, implementations and limitations of state-of-the-art wireless sensors and wireless sensor networks. Additionally, students will develop specific hands-on skills in programming and using wireless sensor motes, associated middleware and a modern mote development environment.

ECE 574 three credits
Discrete-Time Signal Processing
3 hours lecture
Representation, analysis and design of discrete signals and systems. Topics include a review of the z-transform and the discrete-time Fourier transform, the fast Fourier transform, digital filter structures, digital filter design techniques, quantization issues and effects of finite word-length arithmetic, sampling and oversampling, decimation and interpolation, linear prediction, the Hilbert transform, and the complex cepstrum. Students gain experience in analyzing and designing digital signal processing systems through computer projects.

ECE 584 three credits
Estimation Theory
3 hours lecture
Basic concepts and principles of estimation theory. Topics include least squares estimation, recursive least squares estimation, best linear unbiased estimator, Bayes estimation, maximum likelihood estimation, maximum a posteriori estimation, conditional mean, Gauss-Markov random process, Kalman filtering, prediction, smoothing, and nonlinear estimation. Estimator bounds and properties are discussed.

ECE 591-01 three credits
Topics in Electrical and Computer Engineering
Topic: Active Microwave Components
3 hours lecture
Active RF and microwave devices for radar and wireless communications. The active components include microwave amplifiers, microwave oscillators, mixers, and detectors. The course focuses on the hands-on CAD design and performance modeling of these devices.

ECE 591-02 three credits
Topics in Electrical and Computer Engineering
Topic: Fiber Optics & Network Communications
3 hours lecture
Principles of fiber optics, system components, and applications of fiber optics in data and network communication systems

ECE 621 three credits
Multimedia Communications
3 hours lecture
Principles of multimedia communications systems and their design. Students will learn how to design multimedia communications systems and develop research on advanced and newly emerging techniques. The course will provide surveys and a comprehensive introduction of current topics related to multimedia communications. It will focus on the fundamentals of multimedia communications systems such as multimedia processing in communication, distributed multimedia systems, multimedia communication standards, multimedia communication across networks, and audio-visual integration.

ECE 653 three credits
Satellite Oceanography
3 hours lecture
Prerequisite: MAR 555 or permission of instructor
Provides an overview of the use of satellite-based remote sensing for making measurements within the marine environment. Each of the primary satellite sensors used by oceanographers is introduced along with the principles behind their operation, measurement retrieval, data handling, and data interpretation/usage. Emphasis is placed on physical and biogeochemical applications of satellite-based data, along with their analysis and advantages, rather than engineering and physical/optical theory of measurement. This course relies heavily on outside readings from the primary oceanographic literature to showcase satellite data analysis and specific applications of these data types. Included in the course are a series of student-led presentations and discussions of assigned class readings and a possible class project utilizing a satellite-derived data set and data processing techniques.