

GRADUATE COURSES

Electrical and Computer Engineering

Fall 2019

Classes begin 9/4/2019



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, SENG-212	ECE 570	Wireless Sensor Networks H. Wang (hwang1@umassd.edu) Tuesday, Thursday 12:30-1:45 PM, SENG-305
ECE 532	Radar Engineering D. Kasilingam (dkasilingam@umassd.edu) Tuesday, Thursday 11:00-12:15 PM, SENG-212	ECE 571	Digital Communications P. Gendron (pgendron@umassd.edu) Tuesday, Thursday 3:30-4:45 PM, SENG-212
ECE 533	VLSI Design D. Rancour (drancour@umassd.edu) Tuesday, Thursday 8:00-9:15 PM, SENG-222	ECE 578	Digital Image Processing W. McCollough (wmccollough@umassd.edu) Tuesday, Thursday 12:30-1:45 PM, SENG-212
ECE 544	Fault Tolerant Computing L. Xing (lxing@umassd.edu) Wednesday 3:00-6:00 PM, SENG-212	ECE 591-01	Topics in Electrical and Computer Engineering Topic: Microwave & RF Engineering Y. Li (yli2@umassd.edu) Tuesday 3:30-6:30 PM, SENG-113
ECE 549	Network Security H. Liu (hliu@umassd.edu) Tuesday 3:30-6:30 PM, TXT-102	ECE 621	Multimedia Communications H. Wang (hwang1@umassd.edu) Thursday 3:30-6:30 PM, SENG-108
ECE 551	Acoustic and Electromagnetic Waves D. Brown (dbrown@umassd.edu) Monday, Wednesday 3:00-4:50 PM, SENG-118	ECE 671	Information Theory J. Buck (jbuck@umassd.edu) Monday, Wednesday 5:00-6:15 PM, SENG-222
ECE 565	Operating Systems H. Liu (hliu@umassd.edu) Tuesday, Thursday 11:00-12:15 PM, SENG-222		

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 532 three credits

Radar Engineering

3 hours lecture

Fundamentals of microwave radar engineering and radar system analysis. The course covers the radar equation, radar detection theory, noise analysis, radar cross-section, continuous wave and pulsed systems, moving target indicators, pulse compression, radar transmitters and receivers. Also covered are radar systems such as pulsed Doppler radar, synthetic aperture radar (SAR), inverse

synthetic aperture radar (ISAR), polarimetric radar and interferometric radar. Applications include target detection, radar remote sensing, satellite oceanography, and terrain mapping.

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 nodes, associated middleware and a modern mote development environment.

ECE 571 three credits

Digital Communications

3 hours lecture

Fundamentals of digital communications. Topics covered include information theory, vector signal space, detection of digital signals in noise, sampling process, waveform coding techniques, digital modulation and demodulation techniques, error control coding, spread spectrum modulation, and wireless communications.

ECE 578 three credits

Digital Image Processing

3 hours lecture

Fundamentals of digital image processing. Topics include human vision models, 2-D sampling and quantization, image transforms, image enhancements, color image processing, image restoration, image and video compression, image segmentation by thresholding and region analysis, texture analysis, boundary descriptions, morphological methods, image processing system architecture.

ECE 591-01 three credits

Topics in Electrical and Computer Engineering

Topic: Microwave & RF Engineering

3 hours lecture

Prerequisite: ECE 355 (or equivalent)

Review of transmission line theory. The concept of impedance transformation is presented. The characteristics of coaxial lines, waveguides, and microstrip lines are studied in detail. Propagation and impedance properties of these lines are derived. Smith charts are used for designing matching and tuning circuits. The use of S-parameters and the analysis of multi-port networks are presented. Passive multi-port devices such as microwave power couplers and dividers are described. The fundamentals of microwave and RF filters and resonators are discussed, and their implementation using microstrip lines and waveguides is also presented.

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 671 three credits

Information Theory

3 hours lecture

Fundamental aspects of information theory. Topics include discrete and differential entropy, discrete source and channel model, information rate, mutual information and channel capacity, coding theorems for sources and channels, the data processing theorem, encoding and decoding of data for transmission over noisy channels, rate distortion theory, maximum entropy distributions, and entropy estimation techniques for unknown sources. Several applications of information theory are included.