Graduate Courses
Electrical and Computer Engineering
Fall 2021

Classes begin 9/1/2021

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 11:00 AM - 12:15 PM, SENG-212

ECE 520 **Wireless Networks and Mobile Security**
H. Wang (hwang1@umassd.edu)
Tuesday, Thursday 12:30-1:45 PM, TBA

ECE 533 **VLSI Design**
D. Rancour (drancour@umassd.edu)
Monday, Wednesday, Friday 10:00-10:50 AM, TBA

ECE 537 **Antenna Theory**
D. Kasilingam (dkasilingam@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM, TBA

ECE 544 **Fault Tolerant Computing**
L. Xing (lxing@umassd.edu)
Monday, Wednesday 3:30-4:45 PM, TBA

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

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

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

ECE 571 **Digital Communications**
P. Gendron (pgendron@umassd.edu)
Monday, Wednesday 5:00-6:15 PM, TBA

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

ECE 591-02 **Topics in Electrical and Computer Engineering**
Topic: Fundamentals of Optics & Photonics
T. Manzur (tariq.manzur@navy.mil)
Friday 2:00-5:00 PM, TBA

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 520 three credits
Wireless Networks and Mobile Security
3 hours lecture
Prerequisite: 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 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 537 three credits
Antenna Theory
3 hours lecture
Antenna fundamentals, antenna arrays, and basic types of antennas for wireless communication. Mathematical solution of Maxwell's equations for radiation problems is introduced. Basic antenna parameters are defined and discussed. Electrically small antennas are analyzed. Theory of receiving antennas is presented. Topics in antenna arrays include the array factor, pattern multiplication, multidimensional arrays, and phased arrays. Several types of antennas are studied, including wire and microstrip antennas.

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 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 591-01 three credits
Topics in Electrical and Computer Engineering
Topic: Microwave & RF Engineering
3 hours lecture
Prerequisite: ECE 335
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 591-02 three credits
Topics in Electrical and Computer Engineering
Topic: Fundamentals of Optics & Photonics
3 hours lecture
Geometric optics is the study of light in its simplest form by treating light as rays. Light rays travel in straight lines until they encounter an interface (such as a mirror or a lens) where they may be redirected by reflection and refraction. This course describes the physical principles that determine how rays behave at various interfaces. These principles are then used to model simple optical systems with varying degrees of fidelity. Natural optical phenomena (rainbows, mirages, total-internal reflection, etc.) and classic optical systems (prisms, telescopes, cameras, etc.) will be analyzed throughout the course. Linear systems will be introduced to analyze more complex optical systems. This course provides the fundamentals needed for optical engineering and optical system design.