GRADUATE COURSES

Electrical and Computer Engineering

UMass Dartmouth
COLLEGE OF ENGINEERING

Fall 2024

Classes begin 9/4/2024

Department contact: 508.999.9164
Dr. Dayalan Kasilingam, Chairperson
Dr. Paul J. Gendron, Graduate Program Director

ECE 471 **Communication Theory**
P. Gendron (pgendron@umassd.edu)
Tuesday, Thursday 11:00 AM-12:15 PM, SENG-212

ECE 524 **Solid State Electronics**
D. Rancour (drancour@umassd.edu)
Tuesday, Thursday 3:30 PM-4:45 PM, SENG-222

ECE 544 **Fault-Tolerant Computing**
L. Xing (lxing@umassd.edu)
Monday, Wednesday 3:30-4:45 PM, SENG-212

ECE 549 **Network Security**
H. Liu (hliu@umassd.edu)
Tuesday 3:30-6:30 PM, SENG-305

ECE 551 **Acoustic and Electromagnetic Waves**
D. Brown (dbrown@umassd.edu)
Monday, Wednesday 3:00-4:50 PM, SENG-117

ECE 565 **Operating Systems**
H. Liu (hliu@umassd.edu)
Tuesday, Thursday 11:00-12:15 PM, TXT-101

ECE 574 **Discrete-Time Signal Processing**
A. Doblas (adoblas@umassd.edu)
Monday, Wednesday 5:00-6:15 PM, SENG-212

ECE 591-01 **Topics in ECE**
Topic: **Systems Engineering**
S. Cookinham (scookinham@umassd.edu)
Monday, Wednesday 6:30-7:45 PM, CCB-149

ECE 591-03 **Topics in ECE**
Topic: **Fiber Optics & Optical Communications**
T. Manzur (tmanzur@umassd.edu)
Friday 2:00-4:30 PM, SENG-109

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 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 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 454

ECE 549 three credits
Network Security
3 hours lecture
Prerequisite: Graduate standing in computer engineering or permission of the instructor
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 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 591-01 three credits
Topics in Electrical and Computer Engineering
Topic: Systems Engineering
3 hours lecture
Prerequisite: Permission of instructor
Understanding the framework of a system is key to the overall success of a project, product or system. A multi-disciplined approach is required to understand all of the facets and complexities each unique system requires. Every system in existence started out with some type of need or purpose, which then is broken down into manageable capabilities, functions and requirements. Before system development can take place, designs need to be produced. Before systems can be designed, requirements need to be generated. Linking system requirements to the end operation of a system is systems engineering. This course will introduce the fundamentals of systems engineering and how to apply them to projects and product development. The idea of systems engineering looks at the life cycle of a system as a whole from its inception until it no longer serves a purpose or a need. Critical thinking of understanding the true need of why we need a particular system is the foundational framework to system success. Applying scientific analysis helps to guide the overall design and development of systems to accommodate the usefulness of a system, its reliability and the overall effectiveness of its operation. Ideally, once a system has accommodated the overall intended purpose with minimal to no re-work and operated for the planned lifecycle of the system, it has been deemed successful. This course will provide an overview of what systems engineering is and the analysis of applying systems engineering to project and product design, and system development.

ECE 591-03 three credits
Topics in Electrical and Computer Engineering
Topic: Fiber Optics & Communications
3 hours lecture
Prerequisite: Permission of instructor
Principles of fiber optics, system components, and applications of fiber optics in data and network communication systems.