GRADUATE COURSES

Electrical and Computer Engineering

UMass | Dartmouth
COLLEGE OF ENGINEERING

Spring 2024

Classes begin 1/22/2024

Department contact: 508.999.9164
Dr. Dayalan Kasilingam, Chairperson
Dr. Liudong Xing, Graduate Program Director

ECE 521 **Random Signals and Systems I**
P. Gendron (pgendron@umassd.edu)
Monday, Wednesday 5:30-6:45 PM
SENG-212

ECE 530 **Intro. Advanced Electronics & Optoelectronics**
Y. Li (yifei.li@umassd.edu)
Tuesday, Thursday 8:00-9:15 AM
SENG-212

ECE 534 **RF Circuit Design**
Staff
Tuesday, Thursday 5:00-6:15 PM
SENG-222

ECE 535 **Analog Integrated Circuit Design**
D. Rancour (drancour@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM
SENG-222

ECE 548 **Cyber Threats and Security Management**
H. Liu (hliu@umassd.edu)
Monday 4:00-6:45 PM
SENG-222

ECE 558 **Intro. to Electroacoustic Transducers**
D. Brown (dbrown@umassd.edu)
Monday, Wednesday 3:30-5:20 PM
TBA

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

ECE 562 **Advanced Computer Architecture**
S. Goren (sgoren@umassd.edu)
Monday, Wednesday 2:00-3:15 PM
SENG-222

ECE 591-01 **Topics in ECE**
Topic: Verification and Test of Digital Systems
S. Goren (sgoren@umassd.edu)
Wednesday, Friday 3:30-4:45 PM
TBA

ECE 591-02 **Topics in ECE**
Topic: Digital Forensics
Staff
Tuesday 5:00-7:30 PM
SENG-212

ECE 591-03 **Topics in ECE**
Topic: Linear Optical Systems
A. Doblas (adoblas@umassd.edu)
Monday, Wednesday 2:00-3:15 PM
TBA

COURSE DESCRIPTIONS

ECE 521 three credits
Random Signals and Systems I
3 hours lecture
Prerequisites: ECE 384 (or equivalent) and ECE 321 (or equivalent)
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 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 534 three credits
RF Circuit Design
3 hours lecture
Prerequisite: ECE 435 or permission of instructor
Design and analysis of radio-frequency discrete components and integrated circuits. The course focuses on practical high frequency circuit techniques and physical understanding of active devices such as diodes and transistors. Topics include RF passive circuits and RF active circuits such as amplifiers, mixers, and oscillators. RF integrated circuit design will precede two design projects based on the Agilent ADS EAD package.

ECE 535 three credits
Analog Integrated Circuit Design
3 hours lecture
Introduction to the design of CMOS analog integrated circuits (IC's), with occasional references to bipolar IC's to make comparisons. Required readings from the current literature lead to a formal written report on recent developments in analog IC's. Students are required to complete the design of a complex IC and make a class presentation of its design methodology and simulation results.

ECE 548 three credits

Cyber Threats and Security Management

3 hours lecture

Prerequisites: Graduate standing in computer engineering or permission of instructor 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 558 three credits

Introduction to Electroacoustics Transducers

3 hours lecture

Design, modeling, properties, and application of electromechanical piezoelectric transducers and arrays used for underwater acoustic sound, navigation, and ranging. The course focus is on piezoelectric ceramic devices and the use of lumped parameter equivalent electrical circuit analysis. This introductory course will require lectures, laboratory exercises, calibration experiments and class project.

ECE 560 three credits

Computer Systems Performance Evaluation

3 hours lecture

Prerequisites: MTH 331 (or equivalent) 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

Prerequisites: ECE 456 (or equivalent)

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 591-01 three credits

Topics in Electrical and Computer Engineering

Topic: Verification and Test of Digital Systems

3 hours lecture

Prerequisite: Permission of instructor

This course will cover the basics of verifying and testing digital systems, from theory to industry practice. Verification topics include SystemVerilog interfaces, SystemVerilog testbenches including using assertions and functional coverage, concurrency and OOP in SystemVerilog, and the Universal Verification Methodology. Testing topics include the theory and practice of fault analysis, test generation, and design for testability for digital VLSI circuits and systems. Assignments will deal with applications of the ideas in the lectures, and these will be based on verification and testing tools currently used in the industry.

ECE 591-02 three credits

Topics in Electrical and Computer Engineering

Topic: Digital Forensics

3 hours lecture

Prerequisite: Permission of instructor

Digital Forensics: Practical applications, methods and scope; Legal parameters and boundaries; File Systems & Windows Forensics; Mobile Device Forensics - Android OS; Mobile Device forensics - iOS (Apple); Social Media Applications / Cloud Data Forensics / SQLite Breakdowns; Cell Site Location Information Network Analysis & Cellular Records Analysis; Evidence Management & Lab fundamentals; Practical Usage of Tools/Programs/Readers

ECE 591-03 three credits

Topics in Electrical and Computer Engineering

Topic: Linear Optical Systems

3 hours lecture

Prerequisite: Permission of instructor

Reviews Fourier techniques for the analysis and design of linear systems. We will extend the Fourier transformation from a one-dimension to a two-dimension approach to evaluate two-dimensional linear optical systems. We will investigate two-dimensional Fourier techniques for optical data processing.