

GRADUATE COURSES

Electrical and Computer Engineering

Spring 2020

Classes begin 1/21/2020



UMass

Dartmouth

COLLEGE OF ENGINEERING

Department contact: 508.910.6619

Dr. Antonio H. Costa, Chairperson

Dr. Liudong Xing, Graduate Program Director

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| <p>ECE 520 Wireless Networks & Mobile Security
Honggang Wang (hwang1@umassd.edu)
Thursday 3:30-6:15 PM, SENG-212</p> <p>ECE 521 Random Signals and Systems I
Paul Gendron (pgendron@umassd.edu)
Monday, Wednesday 5:00-6:15 PM, SENG-210</p> <p>ECE 530 Intro. Advanced Electronics & Optoelectronics
Yifei Li (yli2@umassd.edu)
Tuesday, Thursday 5:00-6:15 PM, SENG-222</p> <p>ECE 535 Analog Integrated Circuit Design
David Rancour (drancour@umassd.edu)
Tuesday, Thursday 9:30-10:45 AM, SENG-212</p> <p>ECE 548 Cyber Threats and Security Management
Hong Liu (hliu@umassd.edu)
Monday 3:30-6:15 PM, SENG-212</p> <p>ECE 558 Introduction to Electroacoustic Transducers
David Brown (dbrown@umassd.edu)
Monday, Wednesday 3:00-4:50 PM, SENG-114</p> <p>ECE 560 Computer Systems Performance Evaluation
Liudong Xing (lxing@umassd.edu)
Tuesday, Thursday 8:00-9:15 AM, SENG-212</p> <p>ECE 562 Advanced Computer Architecture
Honggang Wang (hwang1@umassd.edu)
Tuesday, Thursday 12:30-1:45 PM, Dion-110</p> | <p>ECE 568 Advanced Digital Design
Paul Fortier (pfortier@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM, Dion-110</p> <p>ECE 576 Machine Learning
John Buck (jbuck@umassd.edu)
Monday, Wednesday 5:00-6:15 PM, SENG-222</p> <p>ECE 591.04 Topics in Electrical and Computer Engineering
Topic: Wireless Communications
Dayalan Kasilingam (dkasilingam@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM, SENG-222</p> <p>ECE 591.03 Topics in Electrical and Computer Engineering
Topic: Fund. of Geometric Optics/Photonics
Tariq Manzur (tariq.manzur@navy.mil)
Friday 2:00-4:50 PM, CCB-115</p> <p>ECE 591.02 Topics in Electrical and Computer Engineering
Topic: Software Defined Radio
Ruolin Zhou (rzhou@umassd.edu)
Wednesday 3:30-6:15 PM, SENG-212</p> <p>ECE 620 Dependable and Secure Computing
Liudong Xing (lxing@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM, TXT-101</p> |
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COURSE DESCRIPTIONS

ECE 520 three credits

Wireless Networks and Mobile Security

3 hours lecture

Prerequisites: 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 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 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 568 three credits

Advanced Digital Design

3 hours lecture

Prerequisites: Graduate standing in computer or electrical engineering

Synthesis of state machines including data path, I/O and control path design, testing and implementation, register transfer languages, ASM chart and mixed mode design methodologies, ROM-centered, embedded processor core centered and FPGA implementations using HDL tools and techniques. Specific applications to embedded controllers and sensor interface devices for embedded and real-time systems applications will be discussed. An FPGA based laboratory and semester project experience is included.

ECE 576 three credits

Machine Learning

3 hours lecture

Prerequisites: ECE 521 (or equivalent)

Advanced pattern recognition topics. Topics include decision theoretic pattern recognition with contextual information, sequential pattern recognition, error bounds, structural pattern recognition, syntactic and grammatical pattern recognition, error correction parsing, statistical and syntactic mixed models, neural networks and statistical pattern recognition. Several pattern recognition applications are included.

ECE 591-04 three credits

Topics in Electrical and Computer Engineering

Topic: Wireless Communications

3 hours lecture

Prerequisites: Permission of instructor

Introduction to the principles and practice of wireless communications. The course presents the concepts of frequency reuse and cellular structure and covers propagation effects, multipath fading, digital and analog modulation, diversity and equalization, multiple access, and wireless networks. The course also presents modern wireless systems and standards. The focus of the course is to understand wireless communications at a systems level and is designed as a senior elective for departmental majors. Basic understanding of electromagnetic wave propagation and communication theory is expected. The course includes a project related to new technological advances in wireless systems.

ECE 591-03 three credits

Topics in Electrical and Computer Engineering

Topic: Fundamentals of Geometric Optics/Photonics

3 hours lecture

Prerequisites: Permission of instructor

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.

ECE 591-02 three credits

Topics in Electrical and Computer Engineering

Topic: Software Defined Radio

3 hours lecture

Prerequisites: ECE 320 (or equivalent) or permission of instructor

Introduction to the principles and practice of software defined radio (SDR). The course focuses on developing and building SDR communications systems using different software platforms and hardware solutions of SDR. The course is a mixture of hands-on project work and standard presentation of material and examples so the concepts and theory can be instantly translated to practice. The course presents the concept of SDR, software platforms including Matlab/Simulink and GNURadio, hardware solutions including PLUTO and Universal Software Radio Peripheral (USRP), and the development of SDR. Analog modulation and digital modulation schemes will be reviewed. Different wireless communication systems will be designed, built, and implemented using software platforms and hardware solutions of SDR. The course culminates in a class-wide radio competition.

ECE 620 three credits

Dependable and Secure Computing

3 hours lecture

Prerequisites: ECE 454 or ECE 544

Advanced topics on dependability and security modeling, analysis and design techniques for computer-based systems and networks. Topics covered include multistate systems, phased-mission systems, fault-tolerant networks, wireless sensor networks, distributed computer systems, modular imperfect fault coverage, dependent failures, and trust in social networks. The course includes research projects that aim to prepare the students to perform research in the area of dependable and secure computing. Substantial emphasis will be placed on reading research papers in a critical and analytical manner.