GRADUATE COURSES
Electrical and Computer Engineering
Spring 2015
Classes begin 1/26/2015

Department contact info: 508.910.6619
Dr. Antonio H. Costa, Chairperson
Dr. Hong Liu, Graduate Program Director

ECE 442  Power Electronics
R. Helgeland (rhelgeland@umassd.edu)
Monday, Wednesday, Friday 1:00-1:50 PM, SENG-222

ECE 521  Random Signals and Systems I
J. Buck (jbuck@umassd.edu)
Tuesday, Thursday 5:00-6:15 PM, SENG-222

ECE 524  Solid State Electronics
D. Rancour (drancour@umassd.edu)
Tuesday, Thursday 12:30-1:45 PM, SENG-222

ECE 527  Antenna Theory
D. Kasilingam (dkasilingam2@umassd.edu)
Tuesday, Thursday 3:30-4:45 PM, SENG-212

ECE 540  Electromagnetics
Y. Li (yli2@umassd.edu)
Monday, Wednesday 5:00-6:15 PM, SENG-212

ECE 548  Cyber Threats and Security Management
Y. Wang (ywang2@umassd.edu)
Tuesday, Thursday 6:30-7:45 PM, SENG-212

ECE 558  Introduction to Electroacoustic Transducers
D. Brown (dbrown@umassd.edu)
Monday, Wednesday 3:30-4:45 PM, Dion-105

ECE 560  Computer Systems Performance Evaluation
L. Xing (lxing@umassd.edu)
Tuesday, Thursday 11:00-12:15 PM, SENG-212

ECE 562  Advanced Computer Architecture
H. Wang (hwang1@umassd.edu)
Tuesday, Thursday 2:00-3:15 PM, SENG-222

ECE 578  Digital Image Processing
V. McCollough
Monday, Friday 11:30 AM - 12:45 PM, SENG-212

ECE 591-01  Topics in Electrical and Computer Engineering
Topic:  Body Area Networks
H. Wang (hwang1@umassd.edu)
Tuesday, Thursday 9:30-10:45 AM, SENG-212

ECE 591-02  Topics in Electrical and Computer Engineering
Topic:  Dependable Computing & Networks
L. Xing (lxing@umassd.edu)
Tuesday, Thursday 5:00-6:15 PM, SENG-212

Course Descriptions

ECE 442  three credits
Power Electronics
3 hours lecture
Prerequisite: ECE 311
Electronic circuit design techniques using power semiconductor devices for industrial and residential applications. Typical applications include switching DC power supplies, power conditioners, DC-to-AC inverters, DC-to-DC converters, motor controllers, AC-to-AC converters, and utility-intertie.

ECE 521  three credits
Random Signals and Systems I
3 hours lecture
Prerequisites: EAS 501 or equivalent graduate level applied mathematics course and ECE 320 and ECE 321 or equivalent undergraduate linear systems course
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.

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ECE 524 three credits
Solid State Electronics
Prerequisite: Permission of instructor
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 537 three credits
Antenna Theory
Prerequisite: Permission of instructor
3 hours lecture
Prerequisite: ECE 336 or permission of instructor
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, multi-dimensional arrays, and phased arrays. Several types of antennas are studied, including wire and microstrip antennas.

ECE 540 three credits
Electromagnetics
3 hours lecture
Prerequisite: ECE 336 or permission of instructor
Advanced electromagnetics concepts, with in-depth studies of electromagnetic waves, radiation, and scattering. Time-varying electromagnetic fields, electrical properties of matter, and electromagnetic theorems are presented. Wave equations are discussed, along with wave propagation, polarization, reflection, and transmission. Multiconductor transmission lines, waveguides, cavity resonators, and radiation and antenna principles are studied. Geometrical optics, diffraction theory, and physical optics are introduced. Topics in scattering include scattering by planar surfaces, cylinders, wedges, and spheres.

ECE 548 three credits
Cyber Threats and Security Management
Prerequisite: Graduate standing in computer engineering
3 hours lecture
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 life cycle. 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 Electroacoustic Transducers
Prerequisite: Graduate standing in engineering or physics
3 hours lecture
An introductory course on the 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. The course will require lectures, laboratory exercises, calibration experiments and a class project. Cross-listed as ECE 499.

ECE 560 three credits
Computer Systems Performance Evaluation
3 hours lecture
Prerequisites: ECE 460 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
Prerequisite: ECE 561 or permission of instructor
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 multiprocessors, message passing multi-computers, and superscalar, supervector, VLIW and dataflow designs will be explored.

ECE 578 three credits
Digital Image Processing
Prerequisite: ECE 320 or permission of instructor
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: Body Area Networks
3 hours lecture
Prerequisites: ECE 468 or ECE 562; or permission of instructor
Design of wireless body area network (BAN) systems and development of research on the advanced and newly emerging techniques. The fundamentals of low power communications protocols, energy harvesting and optimization, body sensor network management, and applications in healthcare including algorithms for biomedical signal processing will be covered. Topics in seamless coverage of sensing, low-power and practical deployment, biosensor and communication design, interfacing and nanotechnology, energy harvesting and power delivery, ultra-low power bio-inspired processing, wearable, ingestible sensor integration and exemplar applications will be presented. The focus will be on the project aspect of wireless BAN systems for healthcare applications.

ECE 591-02 three credits
Topics in Electrical and Computer Engineering
Topic: Dependable Computing & Networks
3 hours lecture
Prerequisites: ECE 454 and ECE 544; or permission of instructor
Advanced topics on the dependability analysis and design techniques for computer based systems and networks. Topics covered include reliability of wireless sensor networks, distributed computer systems, multistate systems, phased-mission systems, fault-tolerant networks, modular imperfect fault coverage, dependent failures, decision diagrams, dynamic fault tree analysis, and sensitivity analysis.

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