

Electrical Engineering

EE 5200 - Advanced Methods in Power Systems

Advanced analysis and simulation methods for load flow, symmetrical components, short circuit studies, optimal system operation, stability, and transient analysis. Application of commonly used software reinforces concepts and provides practical insights.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

Pre-Requisite(s): EE 4222

EE 5220 - Transient Analysis Methods

A study of transient behaviors and their analysis and prediction. Addresses analytical methods and their numerical implementation, switching and lightning surges, short circuits, and non-linear effects.

Includes computer simulations.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2007-2008 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

Pre-Requisite(s): EE 4222

EE 5223 - Power System Protection

Real-time monitoring and protection of modern power systems. Secure and reliable operation of radial and grid systems. Protection of transmission lines, buses, generators, motors, transformers, and other equipment against disturbances.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2008-2009 academic year

EE 5224 - Power System Protection Lab

Theory-based application of software and hardware used for power system protection. Fault simulations, protective relay settings and coordination, and test operation of relays under static, dynamic, and transient conditions.

Credits: 1.0

Lec-Rec-Lab: (0-0-2)

Semesters Offered: Spring - Offered alternate years beginning with the 2008-2009 academic year

Pre-Requisite(s): EE 5223(C)

EE 5230 - Power System Operations

Study of advanced engineering and economic algorithms and analysis techniques for the planning, operation, and control of the electric power system from generation through transmission to distribution.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: On Demand

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5240 - Computer Modeling of Power Systems

Topics include modeling and computer methods applied to electrical power systems, matrix formulations, network topology and sparse matrix data structures, loadflow, short-circuit and stability formulations, constrained optimization methods for loadflow and state estimation, and time-domain simulation methods for transient analysis.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2008-2009 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering

Pre-Requisite(s): EE 5200

EE 5250 - Distribution Engineering

Modeling and analysis of electrical distribution systems; load characteristics, load modeling, unbalanced three-phase overhead and underground line models, and distribution transformers. Analysis of over current protection, voltage drop, and power quality.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2007-2008 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering

Pre-Requisite(s): EE 4221

EE 5260 - Wind Power

Wind turbines are the fastest growing segment of the generator mix being added to power systems today. There is a growing need to understand the many issues caused by these additions. This course covers the theoretical background, regulations, integration experience, and modeling.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: On Demand

Restrictions: Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EE 5290 - Selected Topics in Power Systems 1

Selected topics of current interest.

Credits: variable to 4.0; May be repeated

Semesters Offered: On Demand

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5410 - Engineering Electromagnetics

A mathematically rigorous study of dynamic electromagnetic fields, beginning with Maxwell's equations. Topics include scalar and vector potentials, waves, and radiation.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

Pre-Requisite(s): EE 3140

EE 5412 - Radar Remote Sensing

Fundamentals and overview of radar systems. Radar cross-section and detectability; ambiguity function; pulse compression techniques; spectrum estimation for underspread and overspread targets; TDOA: interferometry; multi-static and passive systems. Aperture synthesis (SAR) and antenna theory if time allows.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2008-2009 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 3140 and EE 3160

EE 5430 - Electronic Materials

A study of the physical principles, operational characteristics, models, and basic applications of selected solid-state devices.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall, Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate

EE 5440 - Laser Types, Laser Design, Modeling Techniques, and Nonlinear Optics

Survey of laser types and analysis of the common physical and engineering principles, including energy states, inversion, gain, and broadening mechanisms. Design issues include resonators, packaging, cooling, pulsed power, and safety. Students will construct computational model that predicts laser performance. Nonlinear optics and selected applications also covered.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

Pre-Requisite(s): EE 3140

EE 5460 - Solid State Devices

A study of the physical principles, operational characteristics and models and basic applications of solid state devices such as p-n junctions, metal- semiconductor junctions and transistors.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

EE 5470 - Semiconductor Fabrication

Graduate level introduction to the science and engineering of semiconductor device fabrication.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

EE 5480 - Advanced MEMS

This course will cover advanced topics dealing with MEIXIS technologies, transduction mechanisms, and microfabricated sensors and actuators and is a continuation of EE4240/MY4240

Credits: 4.0

Lec-Rec-Lab: (3-1-0)

Semesters Offered: Spring

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

Pre-Requisite(s): EE 4240 or MY 4240

EE 5500 - Statistical Signal Processing

Focuses on the application of statistical techniques to the study of random signals and noise. Includes random processes in continuous and discrete time and space, second-order properties of random processes, the interaction of random processes with linear systems, parameter estimation, and the design and implementation of statistical signal-processing algorithms.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5511 - Information Theory

Mathematical models for channels and sources; entropy, information, data compression, channel capacity, Shannon's theorems, and rate-distortion theory.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring - Offered alternate years beginning with the 2007-2008 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 5500

EE 5512 - Coding Theory

General discussion on coding theory with emphasis on the algebraic theory of cyclic codes using finite field arithmetic, decoding of BCH and RS codes, convolutional codes and trellis decoding algorithms.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2008-2009 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 5511

EE 5520 - Fourier Optics

Analysis and modeling of diffraction effects on optical systems, emphasizing frequency-domain analytic and computational approaches. Presents wave propagation, imaging, and optical information processing applications.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

Pre-Requisite(s): EE 3190

EE 5521 - Detection & Estimation Theory

Detecting and estimating signals in the presence of noise. Optimal receiver design. Applications in communications, signal processing, and radar.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering

Pre-Requisite(s): EE 5500

EE 5522 - Digital Image Processing

Image formation, enhancement, and reconstruction. Applications in medical imaging, computer vision, and pattern recognition.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering

Pre-Requisite(s): EE 3190 and EE 3160

EE 5525 - Wireless Communications

Principles of wireless communications systems. Projects may include cell phones, computer networks, paging systems, satellite communications, radio, television and telemetry.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate

EE 5527 - Digital Communications

This course focuses on the basic principles that underlie the analysis and design of digital communication systems. Topics covered include: characterization of communication signals and systems, modulation schemes, optimum receiver design and performance analysis in AWGN and band-limited channels, concepts of information theory and channel coding, carrier and symbol synchronization, and ISI channel equalization.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 4250

EE 5530 - Wireless Digital Communication

Detailed study of modulation, transmission, detection and demodulation in wireless digital networks. Emphasizes doppler shift, multipath, beamsteering and current topics.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5535 - Wireless Communications II - Advanced Topics

The objective of this course is to identify and understand some of the key research issues and recent research advances in wireless communications. This course will provide a brief introduction to wireless communication systems, visions and challenges, wireless channel modeling, channel estimation, diversity and fading. MIMO multi-antenna systems and space-time coding, as well as selected topics of contemporary interest, such as turbo coding, multi-carrier OFDM, and ultra-wideband systems.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 4250 and EE 5527

EE 5540 - Statistical Optics

Study of the effects of randomness in optical systems. Covers coherence theory, photon statistics, wave propagation, and imaging through random media. Presents analytic and computational approaches.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5550 - Optical Information Processing

Geometric and wave optics. Optical devices with applications in imaging, beamforming, and optical communication systems.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering, Physics

EE 5560 - Multi-user Detection

Demodulation of mutually interfering digital streams of information that occur in areas such as wireless communications and high-speed data transmission. Design and analysis of receivers for multi-access channels, with focus on fundamental models and algorithms. Topics include optimal multiuser detection and the optimal attainable performance in Gaussian multiuser channels, suboptimal linear multiuser detection, blind and adaptive methods, multiuser receiver for multiple-antenna reception, and the performance measure of asymptomatic multiuser efficiency.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: On Demand - Offered alternate years beginning with the 2001-2002 academic year

Restrictions: Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering

Pre-Requisite(s): EE 5520

EE 5711 - Mathematical Techniques for Computer Engineering

Mathematical theory and methods frequently used in computer engineering research and development. Picks up where undergraduate courses usually stop. Includes selected topics from formal logic, theorem proving, probability, statistics, modeling and simulation. Contains a significant programming component.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Pre-Requisite(s): MA 2320 and MA 3520 and (MA 3710 or MA 3720) and CS 2141

EE 5715 - Linear Systems Theory and Design

Overview of linear algebra, Modern Control: state-space based design of linear systems, observability, controllability, pole placement, observer design, stability theory of linear time-varying systems, Lyapunov stability, optimal control, Linear Quadratic regulator, Kalman filter, Introduction to robust control.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2007-2008 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 4261 or MEEM 4700 or MA 4330

EE 5722 - Computer Networks

Focuses on the fundamental network architecture concepts and the core design principles and issues in the emerging communication/data networks. The course systematically gives students the complete picture of data and computer networks.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

Pre-Requisite(s): (MA 3710 or MA 3720) and EE 2150

EE 5723 - Computer and Network Security

Learn fundamental of cryptography and its application to network security. Understand network security threats, security services, and countermeasures. Acquire background knowledge on well known network security protocols. Address open research issues in network security.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 2150 and (MA 3710 or MA 3720)

EE 5725 - Mobile Robotics & Multi-Robot Systems

Introduction to mobile robotics and multi-robot systems. Introduce spatial description, mobile robot locomotion, kinematics, localization and mapping, motion planning and navigation. Topics in multirobot systems include biological inspirations, control structure, inter-robot communication, learning in multi-robot systems, and modeling and analysis.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: On Demand

Pre-Requisite(s): (EE 3160 or EE 4261) and (MA 3710 or MA 3720) and (CS 1129 or CS 2141)

EE 5726 - Embedded Sensor Networks

Introduces the concepts of wireless sensor networks. Topics include sensor network coverage and sensor deployment, time synchronization and sensor node localization, network protocols, data storage and very, collaborative signal processing. Introduce sensor network programming network reliability and tolerance.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: On Demand

Pre-Requisite(s): (CS 4461 or EE 4272 or EE 5722) and (EE 3170 or EE 3173) and (CS 1129 or CS 2141)

EE 5731 - Real-Time and Embedded Systems

Theory and practice of building real-time embedded systems with sensors and actuators with real-time operating systems (RTOS) to obtain hard-real-time behavior. The lab class puts theory into practice.

Credits: 4.0

Lec-Rec-Lab: (3-0-2)

Semesters Offered: On Demand

Pre-Requisite(s): EE 3173 and EE 4261

EE 5751 - Verilog HDL Design

Use of Verilog Hardware Description Language (HDL) to model, simulate, and synthesize combinational and sequential digital hardware systems. Emphasis is on developing Verilog models of encryption and authentication cryptographic algorithms.

Credits: 3.0

Lec-Rec-Lab: (2-0-2)

Semesters Offered: Fall, Spring

Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

Pre-Requisite(s): EE 2171

EE 5752 - Digital Storage Technologies

Digital Storage Technologies including solid state memory devices, magnetic and optical disks will be covered. The usage of the available technologies in a microprocessor system memory hierarchy will be explored using architectural simulation tools.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall - Offered alternate years beginning with the 2008-2009 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate; May not be enrolled in one of the following Class(es): Freshman, Sophomore, Junior

Pre-Requisite(s): EE 3173 and EE 3175

EE 5755 - Fault-Tolerant Systems

Covers both the theory and the practice of how to design, model, evaluate, and implement reliable systems out of unreliable components. Includes: Fault Models, Redundancy Management, Agreement, Consensus, Voting, Clock synchronization and reliable broadcast. Material is reinforced with real-world case studies.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: On Demand

Pre-Requisite(s): CS 3421 and CS 4411 and (EE 3175 or EE 5910)

EE 5772 - Parallel Computer Organizations

The range of multiprocessor computer architecture (CMP & SMP to Deep Blue to Beowulf Clusters) will be examined in conjunction with the communication protocols necessary to enable operation of these machines. Focus of this course will be on the hardware implementation rather than programming techniques or algorithms.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall, Spring - Offered alternate years beginning with the 2007-2008 academic year

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Class(es): Senior

Pre-Requisite(s): EE 3173 and EE 3175

EE 5805 - Directed Study in Electrical & Computer Engineering

Directed study on a topic mutually agreed upon by the student and the instructor.

Credits: variable to 3.0; Repeatable to a Max of 6

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required; Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5900 - Special Topics in Electrical Engineering

Special topics in electrical engineering selected by the student and approved by his/her advisor and the faculty member who will approve the study.

Credits: variable to 5.0; May be repeated

Semesters Offered: Fall, Spring, Summer

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5920 - Power Systems Seminar

An analytical study of any current high-level problem or series of problems associated with the advance of knowledge in power systems.

Credits: 1.0; May be repeated

Lec-Rec-Lab: (0-1-0)

Semesters Offered: Fall, Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5940 - Electrophysics Seminar

An analytical study of any current high-level problem or series of problems associated with the advance of knowledge in electrophysics.

Credits: 1.0; May be repeated

Lec-Rec-Lab: (0-1-0)

Semesters Offered: Fall, Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5950 - Signals and Systems Seminar

An analytical study of any current high-level problem or series of problems associated with the advance of knowledge in signals and systems.

Credits: 1.0; May be repeated

Lec-Rec-Lab: (0-1-0)

Semesters Offered: Fall, Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

EE 5970 - Computer Engineering Seminar

An analytical study of any current high-level problem or series of problems associated with the advance of knowledge into computer engineering.

Credits: 1.0; Repeatable to a Max of 2

Lec-Rec-Lab: (1-0-0)

Semesters Offered: Fall, Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering

EE 5990 - Thesis Research in Electrical Engineering

Study of some acceptable electrical engineering problem and preparation of a thesis.

Credits: variable to 10.0; May be repeated; Graded Pass/Fail Only

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required

EE 5991 - Project Research in Electrical Engineering

Study of some acceptable electrical engineering problem and preparation of a report.

Credits: variable to 6.0; May be repeated; Graded Pass/Fail Only

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required

EE 5992 - Practical Experience in Electrical Engineering

A collaboration with industry on some acceptable electrical engineering task and preparation of a report.

Credits: variable to 4.0; May be repeated; Graded Pass/Fail Only

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of department required

EE 6210 - Power System Dynamics and Stability

A study of the dynamic behavior of power systems. A review of synchronous machine modeling, system dynamic equations, and method of analysis. Examines overall system behavior via small signal and transient stability and energy functions. Also studies voltage stability and non-linear effects.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: On Demand

Restrictions: Must be enrolled in one of the following Level(s): Graduate; Must be enrolled in one of the following Major(s): Electrical Engineering, Electrical Engineering

Pre-Requisite(s): EE 5200

EE 6460 - CMOS Devices

An in-depth treatment of field-effect devices.

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Level(s): Graduate

Pre-Requisite(s): EE 5460

EE 6480 - Thin Films

Material science of thin films

Credits: 3.0

Lec-Rec-Lab: (3-0-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Level(s): Graduate

EE 6990 - Doctoral Research

Original research leading to the preparation of a dissertation in partial fulfillment of the requirements for the PhD degree.

Credits: variable to 15.0; May be repeated; Graded Pass/Fail Only

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required

Graduate Course Descriptions Effective Fall 2007

https://www.banweb.mtu.edu/pls/owa/stu_ctg_utils.p_online_all_courses_gr

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