MSEE COURSE DESCRIPTIONS

EE390 CIRCUIT THEORY-I (3.0 Credits)
This course is the first of a 2-part series on the fundamentals of electrical circuits. Topics include analysis of circuits containing resistors, capacitors, inductors, and controlled sources; Kirchoff's Laws; simple resistive circuits; node-voltage method, mesh-current method; Thevenin's and Norton's theorems; operational amplifier and its applications; transient analysis of first and second order circuits, and SPICE simulation.
Prerequisite: instructor’s consent

EE410 CIRCUIT THEORY-II (3.0 Credits)
This course is the second of a 2-part series on electrical circuits that covers advanced topics, including sinusoidal steady-state circuit analysis using phases, power calculations in AC circuits, balanced three-phase circuits, Laplace transform and its application in transient circuit analysis, frequency select circuits and filters, Fourier series and Fourier transforms, and two-port networks.
Prerequisite: EE 390

EE422 ANALOG CIRCUIT DESIGN (3.0 Credits)
This course provides students with the opportunity to use the knowledge and experience acquired in previous circuit courses to further understand the design accept of analog circuits and conduct analysis and design of differential amplifiers, current mirrors, frequency response of electronic circuits, feedback circuit analysis, output stages, integrated circuits, filters and oscillators.
Prerequisite: EE410

EE440 LOGIC DESIGN (3.0 Credits)
This course is intended to provide the students the opportunity to use the knowledge and experience acquired in previous digital circuit courses to further understand the design aspect of digital integrated circuits and devices. Hands-on design experience is provided in digital and logic circuits and their applications. The course focuses on various logic design techniques to design a variety of combinatorial and sequential circuits. Timing considerations are analyzed for asynchronous and synchronous circuit designs with emphasis on state machine design approaches. Students will be introduced to modern design techniques using HDL languages and concentration on verification of circuit designs. Simulation tools include Alters MAX + plus II, Xilinx various projects.
Prerequisite: Instructor’s consent

EE455 SIGNALS AND SYSTEMS (3.0 Credits)
This course is an introduction to basic concepts and principles of signals and systems. Both analog and digital signal processing techniques will be covered. Topics include analog signals and systems, digital signals and systems, LTI systems, Fourier transform, Z-transform, FFT, system stability, digital filter design, Network. Matlab software will be used to implement some of the DSP algorithms.
Prerequisite: Instructor’s consent

EE460 DIGITAL SIGNAL PROCESSING (3.0 Credits)
This course is a study of the concepts in deterministic and statistical techniques for describing, analyzing, and characterizing generic signals and their applications. Topics include signal processing, continuous and discrete Fourier analysis, and fundamentals of methods. Additional coverage includes the fundamentals of the algorithms and computational methods for digital FIR/IIR filter design and basic signal analysis techniques. Simulation exercises using Matlab / C Language are required.
Prerequisite: EE455

EE471 VERILOG HDL AND DIGITAL DESIGN (3.0 Credits)
This course develops the students' ability to design the basic building blocks of modern digital systems and provides them with a fundamental knowledge of the state-of-the-art design methodology, design considerations, and verification strategies for complicated digital hardware design. Topics include Verilog HDL basics, simulation, Synthesis of digital systems using Verilog HDL. The students practice using the

tools for design projects on UNIX system or Windows system. Mentor Modelsim for HDL Simulation, Cadence Verilog-XL, and Silo III Verilog Simulator from SimuCAD are available in the Labs. Hands-on practices are required.
Prerequisite: EE440

EE480 APPLICATIONS OF OPERATIONAL AMPLIFIER AND ANALOG INTEGRATED CIRCUITS (3.0 Credits)
This course emphasizes board level analog circuit analysis, design, and simulation. Topics include fundamentals of operational amplifier and its applications, active filters, stability of the feedback circuit, linear and switching regulator, and phase lock loop. Pspice and off-the-shelf analog IC are used by the students for circuit design and design verification. Hands-on practices and projects are required.
Prerequisite: EE422

EE505 MICROCOMPUTER STRUCTURE AND PROGRAMMING (3.0 Credits)
This course is designed for the students to learn microprocessor architecture and gain hands-on experience with at least one popular microprocessor. Topics include microprocessor architecture and development tools - using a popular microprocessor for case study, programming with ASM/C for exercises; instruction set, hardware feature, I/O and timer, interrupt, and a survey of other microprocessors. Hands-on experience in microcomputer programming and applications through laboratory projects is required.
Prerequisite: EE440

EE510 MICROCONTROLLER INTERFACES AND APPLICATIONS (3.0 Credits)
This course is designed for students to get practice in microcontroller-based digital systems design with emphasis on interfacing and data processing. Topics include interfacing, A/D and D/A conversions, data acquisition, input devices, output devices, displays, and application firmware programming. This course is project heavy and students will complete projects, including documentation, prototyping, demonstrations of functionality, presentation, and implementation evaluation.
Prerequisite: EE440

EE511 ADVANCED ENGINEERING ANALYSIS (3.0 Credits)
This course is designed to provide graduate students in Electrical Engineering with the mathematics background and modeling techniques needed to analyze electronic circuits and other engineering systems used in contemporary engineering and technology. In addition, methods will be introduced to describe and analyze systems of importance in emerging technologies, e.g. nanotechnology. Analytical, numerical, and computational approaches will be used. The emphasis throughout this course will be on applications. Topics will include: probability, stochastic methods, Monte Carlo simulation, Laplace transform, Dirac delta function, Orthonormal functions, Fourier analysis, Z transform, partial differential equations, the importance of nanometer length scale, Schrödinger wave equation, quantum tunneling, and application of wave functions in nanotechnology.
Prerequisite: Instructors consent

EE514 ADVANCED COMPUTER ORGANIZATION AND STRUCTURE (3.0 Credits)
This course is designed to further investigate modern computer design. Topics include an in-depth study of multiprocessor architecture and interconnection networks, pipeline, data flow, algorithm structures, memory system design, cache memory design, and a comparison of the performance and design among various computer architectures. Hands-on project experience is required
Prerequisite: EE505

EE515 DIGITAL IC DESIGN (3.0 Credits)
This is the first of the VLSI design series. The course begins with an introduction to state-of-the-art CMOS VLSI engineering with emphasis on the basic CMOS VLSI design principles and methodologies. Topics include basic MOSFET theories and characteristics, CMOS semiconductor fabrication processes, sub-micron design rules, combinational and sequential CMOS logic gate design styles, data path, interconnection, power and clock distribution, array and memory design. Widely used industry standard

tools, such as Cadence's Opus, Composer, Virtuoso, Avant's HSPICE and Mentor's Calibre will be used for all homework assignments and design projects.
Prerequisite: Instructor's Consent or EE440

EE526 ADVANCED DIGITAL IC DESIGN (3.0 Credits)
This course is a continuation of the course EE515 and is designed to cultivate student's ability to design a Standard Cell Library, Data path and other special circuits that can be used as intellectual properties (IP) building blocks for ASIC, SOC (system on chip) and DSP (digital signal processing) applications. In addition to the design subject, students also learn how to generate different views of the circuits to facilitate system integration with various CAD tools for logic synthesis and physical implementations. Topics include standard cell design and characterization, technology mapping, design rules, layout, data path synthesis, memory compiler, IP development and architecture trade-off. Modern CAD tools such as Synopsys, OPUS, Composer, Virtuoso, HSPICE and Mentor's Calibre will be introduced and used for homework assignment and projects.
Prerequisite: EE515

EE537 ANALOG/MIXED SIGNAL IC DESIGN (3.0 Credits)
This course is designed to cultivate the student ability to design comes analog integrated circuits. Topics include review of opamp networks, frequency response to Linear integrated circuits, level sensing amplifiers, phase detectors, voltage controlled oscillators, charge pumping techniques, and A/D,D/A converters, HSPICE, are used for assigned homework and projects.
Prerequisite: EE526

EE548 VLSI PHYSICAL DESIGN-PLACE AND ROUTE (3.0 Credits)
This course is the third in the VLDI Design series and it introduces ASIC place and route. The course introduces the students to state-of-the-art physical design automation tools and techniques. Topics include design flow, library review, tool graphical interface, floor planning, power planning, timing driven placement, static time analysis (STA), CT-Gen, special routing, final routing, engineering change order (ECO), and run batch mode jobs. Hands-on exercises and projects are required.
Prerequisite: Senior standing or Instructor's Consent

EE552 APPLICATION SPECIFIC INTEGRATED CIRCUIT DESIGN (3.0Credits)
This course is designed for students who intend to become logic designers using HDL based design methodologies. Topics include ASIC/CPLD/FPGA Library modeling, Cell characterization, static timing analysis, place and route algorithms design for testability, fault modeling, industry standard formats for design information interchange, and a survey of the most popular EDA tools. Industry grade design tools such as Synopsys Design Compiler, Cadence Verilog-XL, Synopsys Design Time (under dc_shell), Synopsys Prime Time, Cadence Silicon Ensemble, Mentor Calibre LVS/DRC, and Synplicity Synplify are used for homework assignments and projects
Prerequisite: EE471

EE555 HIGH-SPEED DIGITAL SYSTEM DESIGN (3.0 Credits)
This course offers the concepts of advanced technology in high-speed digital system design. It focuses on the issue of signal integrity, which is most critical in such system design. Topics include an overview of digital system engineering, modeling and analysis of interconnections, circuit analysis, power distribution in high-speed systems, noise in high-speed digital systems, Buffering model, digital timing analysis, and design methodologies.
Prerequisite: EE410

EE566 POWER/SIGNAL INTEGRITY IN ADVANCED IC PACKAGING AND PCB DESIGN (3.0 Credits)
This course is an extension of the subjects covered in EE555.It covers the concepts of advanced Technology in high-speed digital system design with emphasis on the applications of advanced
PCB and high-speed packaging design. The course objective is to develop the students' abilities to work on high speed PCB and packaging design.
Prerequisite: EE555

EE571 DATA COMPRESSION (3.0 Credits)
This course surveys current image, data and voice compression standards and studies key components in image, data and voice compression. The course emphasizes minimum redundancy coding, Huffman coding, arithmetic coding, statistical modeling, dictionary-based compression, sliding window compression, LZ78 compression, speech compression, lossy graphics compression, JPEG, wavelet methods, and archiving package. Matlab programming will also be introduced.
Prerequisite: EE460

EE575 IMAGE PROCESSING AND APPLICATIONS (3.0 Credits)
This course offers the fundamentals of image processing. Besides introducing basic concepts and principles, the course takes a practical approach to emphasize various applications of digital image processing. Topics include image fundamentals, image transformations, image enhancement image restoration, information technology, data compression, image segmentation, image presentation and pattern recognition and interpretation. Matlab software is employee for implementing numerous algorithms.
Prerequisite: EE571

EE580 DIGITAL SIGNAL PROCESSOR DESIGN AND IMPLEMENTATION (3.0 Credits)
This course is designed to give advanced graduate students in engineering a thorough examination of all the design considerations of fixed-point (integer) digital signal processors as well as develop their abilities to design a general fixed-point digital signal processor. Topics include a review of general DSP algorithms (FIR, IIR, DFT, IDFT, DCT, IDCT, wavelet), processor architectures, address generation schemes, memory structures, instruction set definition and encoding, single and multiple instruction repetitions, and minimum and maximum searching. Students will design a 16-bit fixed-point digital signal processor that requires incorporation of all design considerations taught in this course.
Prerequisite: EE526

EE585 INTRODUCTION TO NANOTECHNOLOGY (3.0 Credits)
This course is a general introduction to nanotechnology, open to all graduate students. The course will begin with an overview of the field of nanotechnology. The following general areas of nanotechnology, illustrating the scope and depth of the field, will be introduced: electronics and systems, life sciences and medicine, materials and technologies, and business and ventures. Within these general areas, specific topics will be introduced, at a basic level, including: nano electronics, photonics, fabrication, and systems; biosensors, nanotechnology in health and medicine; imaging; nano materials and devices, energy technology and applications, environment and society, nanoscale characterization; business, investment, and intellectual property. Extensive use will be made of audio-visual presentations. The course will include class field trips to nanotechnology companies and research laboratories in the San Francisco Bay Area.
Prerequisite: A general knowledge of the sciences or engineering or business

EE590 ELECTRONS, PHOTONS, AND NANOTECHNOLOGY (3.0Credits)
Electrons and photons play a key role in nanotechnology. This course introduces the basics of the application of electrons and photons to nanotechnology. Topics include: Introduction and motivation. Why are electrons and photons so important in nanotechnology? The electron: basic electron properties, electrons as waves and their description and application. The photon: basic photon properties, particle and wave aspects. Hands-on computer simulation in nanotechnology, introduction to instruments and techniques, dedicated to the characterization and manipulation of nanostructures, exploiting the basic properties of electrons and/or photons. Electron interactions, application of electron properties in microscopes to study nano devices, application of electron spin property in function of nano devices, photon interactions. Using of photon properties in microscopes to study nano devices, including photon spin property. Combined use electrons and photons to study non-volatile memory devices, impacting on the storage device industry. The course will include class visits to nanotechnology companies, and to state-of-the-art nanotechnology centers at the national research laboratories and universities in the San Francisco Bay area.
Prerequisite: EE585

EE597 MASTER’S PROJECT (3.0 Credits)
This course is designed to develop the creativity of graduate students in Electrical Engineering. Students will design a project under the close supervision of a project advisor from the engineering faculty. The design project must be open-ended, and the design approach must employ modern design techniques and methodologies. Completion of the design project entrails: 1.) Formulation of a design problem statement including realistic constraints such as economic factors, safety, and reliability issues, 2.) Design specifications 3.) Consideration of alternative solutions 4.) Manufacturing procedures, and 5.) Operation instructions. The project advisor must approve the research topic and proposal. The project advisor and tech writer must approve format of the report. Upon completion of the project, the student is required to conduct and open-forum presentation of the project.

EE599A MASTER’S THESIS – I (3.0 Credits)
This is the first part of a 2-part master's thesis course designed for a graduate student in the Electrical Engineering program who plans to pursue his/her research interests in depth. Each part requires one trimester's effort to complete half of the entire project work. In this first part, the advisor will assist the student to identify the research topic, shape research ideas, and define the research objectives and scope. The student then performs the following: topic studies, identifying software and/or hardware requirements, defining the project objectives and procedures, writing a project proposal and submitting it to the administration after obtaining his/her advisor's approval, working on research and implementation of the project, and documenting findings. Regular meetings with the advisor are required.

EE599B MASTER’S THESIS – II (3.0 Credits)
This is a continuation of the first part of the master's thesis course. At the beginning of the semester, the student should draw a conclusion on the research and development work for the project and begin to write a thesis report following the required format. The student should make and analysis of the project work and results. Through this process, the student will gain in-depth knowledge of the selected subject and develop independent thinking and research capabilities. The advisor and a tech writer must approve the report. Upon completion of the project, the student is required to conduct an open-forum presentation of the project.

EE614 ADVANCED VLSI PHYSICAL DESIGN-PHYSICAL SYNTHESIS AND LOW POWER DESIGN (3.0 Credits)
This course is designed to further investigate ASIC front-to -back design automation. The course aims to develop the students’ design ability in ASIC by using state-of-the-art EDA backend design tools and methodology (such as Cadence SE-PKS). It also introduces concepts in advanced industrial deep sub micro backend design. Topics include library review, floor planning in SE, physical synthesis, CTPKS, timing closure, RCextraction, back annotated from back to front, non-default routing rule implementation, double-cut-via implementation for 0.13u and below technology, shielding, and route. Hands-on practices are required.
Prerequisite: EE548

EE681 MAGNETORESISTIVE RANDOM ACCESS MEMORY (3.0 Credits)
This course is intended for advanced graduate students of electrical engineering. In this course the specific example of a leading candidate for next generation non-volatile memory MRAM storage cell devices. Topics will include multilayer Magnetic nanostructures, exchange bias, Ferro magnet and anti Ferro magnet materials, magnetic domains, magnetic thin films, ultra fast manipulation of magnetization in the multilayer magnetic nanostructure by spin polarized electron currents and magnetic circular dichroism techniques.
Prerequisite: instructor’s consent

New Courses Updated

EE395A INTERNSHIP I (3.0 Credits)
This course is designed for students in the School of Engineering to develop on the job skills by participating in real world business activities. Internship project reports are required. Students are required to report to the University internship coordinator on a regular basis. Only P or F grade can be earned in this course. Students are allowed to enroll in one internship course each semester. No graduate credit can be earned for this course.
Prerequisite: Advance approval from the internship coordinator.

EE395B INTERNSHIP II (3.0 Credits)
This is the second in a series designed for students in the School of Engineering to develop on the job skills by participating in real world business activities. Internship project reports are required. Students are required to report to the University internship coordinator on a regular basis. Only P or F grade can be earned in this course. Students are allowed to enroll in one internship course each semester. No graduate credit can be earned for this course.
Prerequisite: EE395A and advance approval from the internship coordinator.

EE395C INTERNSHIP III (3.0 Credits)
This is the third in a series designed for students in the School of Engineering to develop on the job skills by participating in real world business activities. Internship project reports are required. Students are required to report to the University internship coordinator on a regular basis. Only P or F grade can be earned in this course. Students are allowed to enroll in one internship course each semester. No graduate credit can be earned for this course.
Prerequisite: EE395B and advance approval from the internship coordinator.

EE 497A SENIOR DESIGN PROJECT I (3.0 Credits)
This is the first part of a 2 trimester senior design project series. The project course is designed to develop the creativity of every graduating senior in Electrical Engineering through the exercise of the design effort on a self-selected project. The design project must be open ended, whereas the design approach must employ the modern design techniques and methodologies in the related fields. The student is encouraged to do a real life project by working with an organization to develop and implement the project objectives. Completion of the design project series entails (1) formulation of a design problem statement including realist constraints such as economic factors, safety, and reliability issues, (2) design specifications, (3) consideration of alternative solutions, (4) manufacturing procedures, and (5) operation instructions. The research topic and proposal must be approved by the project advisor. The student must follow the design project work progress guideline through the period of research, implementation, testing, report writing, and related procedures and meet with the advisor regularly. In the first part of the series, the student must complete the specification and initial design with sufficient detail to estimate the effectiveness of the project; the student should also complete the initial draft of the project report.
Prerequisites: Advisor’s approval

EE 497B SENIOR DESIGN PROJECT II (3.0 Credits)
This is the second part of a 2 trimester senior design project series. The student continues the design and construction of the project, system, or device, and completes the final report, including the design, implementation, and management of the project. Upon completion of the project, the student is required to conduct an open forum presentation of the project.
Prerequisite: EE397A and advisor’s approval

EE397 PROFESSIONAL DEVELOPMENT (3.0 Credits)
The course instructs the student to develop his/her professional career. Topics cover personality assessment, professional ethics, understanding the engineering professional world, recognizing company culture and organizational structure, how to survive office politics, career paths and pitfalls, resume writing and cover letters and interview techniques.
Prerequisite: None

EE409 SPECIAL TOPICS (3.0 Credits)

Special topics courses are offered to students in Electrical Engineering programs by current faculty members or invited guest speakers to expose the students to emerging technologies related to their studies.
Prerequisite: None