E E 100. Introduction to Electrical and Computer Engineering  
4 Credits (3+3P)  
Introduction to analog (DC) and digital electronics. Includes electric component descriptions and equations, Ohm's law, Kirchhoff's voltage and current laws, ideal op-amp circuits, Boolean algebra, design of combinational and sequential logic circuits and VHDL or VERILOG.  
Prerequisite(s)/Corequisite(s): C- or better in MATH 190G.

E E 112. Embedded Systems  
4 Credits (3+3P)  
Introduction to programming through microcontroller-based projects. Extensive practice in writing computer programs to solve engineering problems with microcontrollers, sensors, and other peripheral devices.  
Prerequisite(s)/Corequisite(s): C- or better in E E 112 and MATH 192G.

E E 200. Linear Algebra, Probability and Statistics Applications  
4 Credits (3+3P)  
The theory of linear algebra (vectors and matrices) and probability (random variables and random processes) with application to electrical engineering. Computer programming to solve problems in linear algebra and probability.  
Prerequisite(s): C- or better in E E 112 and MATH 190G.

E E 212. Introduction to Computer Organization  
4 Credits (3+3P)  
Concepts of modern computer organization, CPU control, pipelining, memory hierarchies, memory mapping, hardware-software interface, and operating systems.  
Prerequisite(s)/Corequisite(s): E E 100 and MATH 190G.

E E 230. Circuit Analysis and Introduction to Electronics  
4 Credits (3+3P)  
Circuit analysis techniques, RLC transients, phasors, filter response, and an introduction to discrete electronic devices.  
Prerequisite(s)/Corequisite(s): PHYS 216G. C- or better in E E 100 and MATH 192G.

E E 240. Multivariate and Vector Calculus Applications  
3 Credits (3)  
Vector algebra, cylindrical and spherical coordinates, partial derivatives, multiple integrals. Calculus of vector functions through electrostatic applications. Divergence, gradient, curl, divergence theorem, Stokes's theorem, Coulomb's Law, Gauss's Law, electric field, electric potential. Applications in Matlab.  
Prerequisite(s): C- or better in MATH 192G and E E 112.

E E 300. Cornerstone Design  
2 Credits (1+3P)  
Application and realization of engineering principles to a guided team-based design project. Formulation and implementation of test procedures, evaluation of alternate solutions and oral and written communication of the design and test results. Restricted to: E E majors. Restricted to Las Cruces campus only.  
Prerequisite(s): C- or better in E E 112, E E 212 and E E 230.

E E 317. Semiconductor Devices and Electronics I  
4 Credits (3+3P)  
Analysis and design of opamp circuits, diode circuits and single-transistor MOS and BJT amplifiers. Introduction to solid-slate semiconductor devices.  
Prerequisite(s): C- or better in E E 230 and CHEM 111G.

E E 320. Signals and Systems I  
3 Credits (3)  
Introduction to the modeling and analysis of continuous- and discrete-time signals and systems using time- and frequency-domain methods suitable for both mathematical approaches and computer-aided simulations.  
Prerequisite(s)/Corequisite(s): MATH 392. C- or better in E E 200 and E E 230.

E E 325. Signals and Systems II  
4 Credits (3+3P)  
Introduction to communication systems including amplitude and frequency modulation. Introduction to control systems including linear feedback systems, root-locus analysis, and graphical representations. Introduction to digital signal processing including sampling, digital filtering, and spectral analysis. May be repeated up to 4 credits.  
Prerequisite(s): C- or better in E E 320 and MATH 392.

E E 333. AC Circuit Analysis and Introduction to Power Systems  
3 Credits (2+3P)  
Steady-state analysis of AC circuits, three-phase circuits, and an introduction to power systems.  
Prerequisite(s): C- or better in E E 230.

E E 340. Fields and Waves  
4 Credits (3+3P)  
Static electromagnetic field. Maxwell's equation and time-varying electromagnetic fields. Generalized plane wave propagation, reflection, transmission, superposition and polarization. Transmission line theory. Extensions to optical wave propagation. Applications including Time Domain Reflectrometry (TDR) and fiber optic transmission. Laboratory experience with RF/microwave test equipment and optical apparatus.  
Prerequisite(s): C- or better in E E 230, E E 240 and PHYS 216G.

E E 395. Introduction to Digital Signal Processing  
3 Credits (3)  
Undergraduate treatment of sampling/reconstruction, quantization, discrete-time systems, digital filtering, z-transforms, transfer functions, digital filter realizations, discrete Fourier transform (DFT) and fast Fourier transform (FFT), finite impulse response (FIR) and infinite impulse response (IIR) filter design, and digital signal processing (DSP) applications. Laboratory will emphasize practical implementation of signal processing including real-time signal processing.  
Prerequisite(s): C- or better in E E 325.

E E 400. Undergraduate Research  
1-3 Credits  
Directed undergraduate research. May be repeated for a maximum of 9 credits.  
Prerequisite: consent of the department head.
E E 402. Capstone Design I  
3 Credits (2+3P)  
Application and realization of engineering principles to a significant team-based design project with significant student management and autonomy. Determination of performance requirements, including safety, economics, ethics and manufacturability; extensive communication of design choices and test results to broad audiences; and interfacing of design with other hardware and software. Restricted to: E E majors.  
Prerequisite(s): C- or better in E E 300, E E 317, E E 325, E E 333 and E E 340.  

E E 404. Capstone Design II  
3 Credits (2+3P)  
Realization of design project from E E 402 within time and budget constraints. Restricted to: E E majors.  
Prerequisite(s): C- or better in E E 300, E E 317, E E 325, E E 333, E E 340 and E E 402.  

E E 412. ASIC Design  
3 Credits (3)  
This course provides students with experiential knowledge of modern application specific integrated circuits. Topics include ASIC packaging and testing, I/O pads and ESD, Verilog programming and simulation, FPGA verification, Register-transfer level synthesis, timing and area optimization, floorplanning and routing, digital interfaces, full custom and standard cell design, post-layout simulation, and PCB schematics and layout. Crosslisted with: E E 512.  
Prerequisite(s)/Corequisite(s): E E 480.  

E E 425. Introduction to Semiconductor Devices  
3 Credits (3)  
Energy bands, carriers in semiconductors, junctions, transistors, and optoelectronic devices, including light-emitting diodes, laser diodes, photodetectors, and solar cells. Crosslisted with: E E 525.  
Prerequisite(s): C- or better in E E 317 and E E 340.  

E E 431. Power Systems II  
3 Credits (3)  
Analysis of a power system in the steady-state. Includes the development of models and analysis procedures for major power system components and for power networks. Crosslisted with: E E 542.  
Prerequisite(s): C- or better in E E 333.  

E E 432. Power Electronics  
3 Credits (2+3P)  
Basic principles of power electronics and its applications to power supplies, electric machine control, and power systems.  
Prerequisite(s)/Corequisite(s): E E 340.  
Prerequisite(s): C- or better in E E 325 and E E 340.  

E E 443. Mobile Application Development  
3 Credits (3)  
Introduction to mobile application development. Students will develop applications for iOS devices including iPhone and iPad. Topics include object-oriented programming using Swift, model-view-controller (MVC) pattern, view controllers including tables and navigation, graphical user interface (GUI) design, data persistence, GPS and mapping, camera, and cloud and web services. Crosslisted with: E E 593.  
Prerequisite(s): C- or better in C S 151 or C S 152 or C S 172 or C S 271 or C S 451 or C S 452.  

E E 444. Advanced Image Processing  
3 Credits (3)  
Advanced topics in image processing including segmentation, feature extraction, object recognition, image understanding, big data, and applications. Crosslisted with: E E 588.  
Prerequisite(s): C- or better in E E 446.  

E E 446. Digital Image Processing  
3 Credits (3)  
Two-dimensional transform theory, color images, image enhancement, restoration, segmentation, compression and understanding. Crosslisted with: E E 596.  
Prerequisite(s): E E 395.  

E E 447. Neural Signal Processing  
3 Credits (3)  
Cross-disciplinary course focused on the acquisition and processing of neural signals. Students in this class will learn about basic brain structure, different brain signal acquisition techniques (fMRI, EEG, MEG, etc.), neural modeling, and EEG signal processing. To perform EEG signal processing, students will learn and use Matlab along with an EEG analysis package. Crosslisted with: E E 597.  
Prerequisite(s): C- or better in E E 325.  

E E 449. Smart Antennas  
3 Credits (3)  
Smart antenna and adaptive array concepts and fundamentals, uniform and planar arrays, optimum array processing. Adaptive beamforming algorithms and architectures; gradient-based algorithms, sample matrix inversion, least mean square, recursive least mean square, sidelobes cancellers, direction of arrival estimations, effects of mutual coupling and its mitigation. Crosslisted with: E E 549.  
Prerequisite(s): C- or better in E E 325 and E E 340.  

E E 452. Introduction to Radar  
3 Credits (3)  
Prerequisite(s): C- or better in E E 325 and E E 340.  

E E 453. Microwave Engineering  
3 Credits (3)  
Techniques for microwave measurements and communication system design, including transmissions lines, waveguides, and components. Microwave network analysis and active device design. Crosslisted with: E E 521.  
Prerequisite(s): C- or better in E E 325 and E E 340.  

E E 454. Antennas and Radiation  
4 Credits (3+3P)  
Prerequisite(s): C- or better in E E 325.  

E E 458. Hardware Security and Trust  
3 Credits (3)  
This course introduces and investigates recent technology development for the design and evaluation of secure and trustworthy hardware and embedded systems. Topics include IoT security, cryptography, hardware security primitives, authentication and key generation, invasive and non-invasive attacks and countermeasures, IC piracy and intellectual property protection, hardware trojans, and secure boot. Crosslisted with: E E 558.  
Prerequisite(s): C- or better in E E 212.
E E 460. Space System Mission Design and Analysis
3 Credits (3)
Satellite system design, including development, fabrication, launch, and operations. A systems engineering approach to concepts, methodologies, models, and tools for space systems.

Prerequisite: junior standing.

E E 461. Systems Engineering and Program Management
3 Credits (3)
Modern technical management of complex systems using satellites as models. Team projects demonstrate systems engineering disciplines required to configure satellite components.

Prerequisite(s): Junior standing.

E E 462. Computer Systems Architecture
3 Credits (3)
The course covers unprocessors, caches, memory systems, virtual memory, storage systems, with introduction to multiprocessor and distributed computer architectures; models of parallel computation; processing element and interconnection network structures, and nontraditional architectures. Crosslisted with: E E 562.

Prerequisite(s): C- or better in E E 212.

E E 465. MACHINE LEARNING I
3 Credits (3)
An undergraduate-level introduction to machine learning algorithms, including supervised and unsupervised learning methods. Topics covered include clustering, linear regression models, linear discriminant functions, feed-forward neural networks, statistical pattern classification and regression, maximum likelihood, naive Bayes, non-parametric density estimation, mixture models, decision trees, and ensemble learning.

Crosslisted with: E E 565.

Prerequisite(s): E E 200.

E E 467. ARM SOC Design
3 Credits (3)
The course aims to produce students who are capable of developing ARM-based SoCs from high level functional specifications to design, implementation and testing on real FPGA hardware using standard hardware description and software programming languages. Crosslisted with: E E 567.

Prerequisite(s): C- or better in E E 212 and E E 317.

E E 469. Communications Networks
3 Credits (3)
Introduction to the design and performance analysis of communications networks with major emphasis on the Internet and different types of wireless networks. Covers network architectures, protocols, standards and technologies; design and implementation of networks; networks applications for data, audio and video; performance analysis. Crosslisted with: E E 569.

Prerequisite(s): C- or better in E E 100, E E 112 and (E E 200 or STAT 371).

E E 473. Introduction to Optics
3 Credits (3)
The nature of light, geometrical optics, basic optical instruments, wave optics, aberrations, polarization, and diffraction. Elements of optical radiometry, lasers and fiber optics. Crosslisted with: PHYS 473.

Prerequisite(s): C- or better in PHYS 216G or PHYS 217.

E E 475. Automatic Control Systems
3 Credits (3)

Prerequisite(s): C- or better in E E 325.

E E 476. Computer Control Systems
3 Credits (3)
Representation, analysis and design of discrete-time systems using time-domain and z-domain techniques. Microprocessor control systems.

Prerequisite(s): C- or better in E E 325.

E E 478. Fundamentals of Photonics
4 Credits (3+3P)

Crosslisted with: PHYS 478.

Prerequisite(s): PHYS 216G or PHYS 217.

E E 479. Lasers and Applications
4 Credits (3+3P)

Prerequisite(s): C- or better in E E 340 or in PHYS 461.

E E 480. Introduction to Analog and Digital VLSI
3 Credits (3)

Prerequisite(s): C- or better in E E 212 and E E 317.

E E 482. Electronics II
3 Credits (3)
Feedback analysis, application of operational amplifiers, introduction to data converters, analog filters, and oscillator circuits.

Prerequisite(s): C- or better in E E 317.

E E 485. Analog VLSI Design
3 Credits (2+3P)
Analysis, design, simulation, layout and verification of CMOS analog building blocks, including references, opamps, switches and comparators. Teams implement a complex analog IC. Crosslisted with: E E 523.

Prerequisite(s): C- or better in E E 320 and E E 480.

E E 490. Selected Topics
1-3 Credits
May be repeated for a maximum of 9 credits. Graduate students may not use credits of E E 490 toward an M.S. or Ph.D. in electrical engineering.

Prerequisite: consent of instructor.
E E 493. Power Systems III
3 Credits (3)
Analysis of a power system under abnormal operating conditions. Topics include symmetrical three-phase faults, theory of symmetrical components, unsymmetrical faults, system protection, and power system stability. Taught with E E 543.
Prerequisite(s)/Corequisite(s): E E 431. Prerequisite(s): C- or better in E E 333 or E E 391.

E E 496. Introduction to Communication Systems
3 Credits (3)
Introduction to the analysis of signals in the frequency and time domains. A study of baseband digital transmission systems and digital/analog RF transmission systems. Introduction to telecom systems as well as satellite systems.
Prerequisite(s): C- or better in E E 325.

E E 497. Digital Communication Systems I
3 Credits (3)
Prerequisite(s): C- or better in E E 200 and E E 325.

E E 501. Research Topics in Electrical and Computer Engineering
1 Credit (1)
Ethics and methods of engineering research; contemporary research topics in electrical and computer engineering.

E E 510. Introduction to Analog and Digital VLSI
3 Credits (3)

E E 512. ASIC Design
3 Credits (3)
This course provides students with experiential knowledge of modern application specific integrated circuits. Topics include ASIC packaging and testing, I/O pads and ESD, Verilog programming and simulation, FPGA verification, Register-transfer level synthesis, timing and area optimization, floorplanning and routing, digital interfaces, full custom and standard cell design, post-layout simulation, and PCB schematics and layout. Recommended foundation: E E 480. Crosslisted with: E E 412.

E E 514. Biosensor Electronics
3 Credits (3)
Course provides students with knowledge of basic integrated analog and RF blocks and how to combine these circuits into sensory systems for biomedical applications. Target areas are in physiology, brain-machine interfaces, neural recording and stimulation. Lecture includes details on amplifiers, current-mode circuits, A/D converters, low-power radio transmitters and receivers, and simulation and layout of VLSI circuits. Lectures are in the form of recent paper reviews and discussion. Includes teamwork, written and oral communication, and realistic technical requirements. Recommended foundation: E E 480 and E E 485.

E E 515. Electromagnetic Theory I
3 Credits (3)

E E 516. Electromagnetic Theory II
3 Credits (3)
Continuation of E E 515.

E E 518. Integrated Power Management Circuits
3 Credits (3)
Design and analysis of power management integrated circuits, including linear voltage regulators, voltage references, buck, boost, and buck-boost DC-DC converters, and charge pumps. Extensive use of CAD tools are used to simulate these circuits. Recommended foundation: E E 480 and E E 485.

E E 519. RF Microelectronics
3 Credits (3)
Prerequisite(s): E E 485 or E E 523.

E E 520. A/D and D/A Converter Design
3 Credits (3)
Practical design of integrated data converters in CMOS/BJT technologies, OP-AMPS, comparators, sample and holds, MOS switches, element mismatches. Nyquist rate converter architectures: flash, successive approximation, charge redistribution, algorithmic, two step, folding, interpolating, pipelined, delta-sigma converters. Restricted to: Main campus only.
Prerequisite(s): E E 523.

E E 521. Microwave Engineering
3 Credits (3)
Techniques for microwave measurements and communication system design, including transmission lines, waveguides, and components. Microwave network analysis and active device design. Recommended foundation: E E 340. Crosslisted with: E E 453.

E E 522. Advanced Analog VLSI Design
3 Credits (3)
Design of high-performance operational amplifiers; class-AB, rail-to-rail, low-voltage, high-bandwidth, fully-differential. Design of linear operational transconductance amplifiers, high-frequency integrated filters, four-quadrant multipliers, and switched-capacitor circuits.
Prerequisite(s): E E 523.

E E 523. Analog VLSI Design
3 Credits (2+3P)
Analysis, design, simulation, layout and verification of CMOS analog building blocks, including references, opamps, switches and comparators. Teams implement a complex analog IC. Recommended foundation: E E 320 and E E 480. Crosslisted with: E E 485.

E E 525. Introduction to Semiconductor Devices
3 Credits (3)
E E 528. Fundamentals of Photonics
4 Credits (3+3P)
Ray, wave and guided optics, lasers and thermal sources, radiometry, photon detection and signal-to-noise ratio. Elements of photonic crystals, polarization, acousto-optics, electro-optics, and optical nanostructures. Taught with E E 478 with differentiated assignments for graduate students. Recommended foundation: (PHYS 216 or PHYS 217) and E E/PHYS 473. Crosslisted with: PHYS 528.

E E 529. Lasers and Applications
4 Credits (3+3P)
Laser operating principles, characteristics, construction and applications. Beam propagation in free space and fibers. Laser diode construction and characteristics. Hands-on laboratory. Recommended foundation: E E 351 or PHYS 461. Taught with: E E 479 with differentiated assignments for graduate students. Crosslisted with: PHYS 529

E E 532. Dynamics of Power Systems
3 Credits (3)
Transient and dynamic stability of power systems; synchronous machine modeling and dynamics; prediction and stabilization of system oscillations. Recommended foundation: E E 493.

E E 533. Power System Operation
3 Credits (3)
AGC, economic dispatch, unit commitment, operations planning, power flow analysis and network control, system control centers. Recommended foundation: E E 493.

E E 534. Power System Relaying
3 Credits (3)

E E 537. Power Electronics
3 Credits (2+3P)
Basic principles of power electronics and its applications to power supplies, electric machine control, and power systems. Recommended foundation: E E 325, E E 317, and E E 333. Crosslisted with: E E 432.

E E 541. Antennas and Radiation
4 Credits (3+3P)

E E 542. Power Systems II
3 Credits (3)

E E 543. Power Systems III
3 Credits (3)
Analysis of a power system under abnormal operating conditions. Topics include symmetrical three-phase faults, theory of symmetrical components, unsymmetrical faults, system protection, and power system stability. Recommended foundation: E E 431. Crosslisted with: E E 493.

E E 544. Distribution Systems
3 Credits (3)
Concepts and techniques associated with the design and operation of electrical distribution systems. Recommended foundation: E E 542 and E E 543.

E E 545. Digital Signal Processing II
3 Credits (3)
Non-ideal sampling and reconstruction, oversampling and noise shaping in A/D and D/A, finite word length effects, random signals, spectral analysis, multirate filter banks and wavelets, and applications. Recommended foundation: E E 395.

E E 546. Introduction to Smart Grid
3 Credits (3)
The course will serve as an introduction to the technologies and design strategies associated with the Smart Grid. The emphasis will be on the development of communications, energy delivery, coordination mechanisms, and management tools to monitor transmission and distribution networks. Crosslisted with: E E 426 and E S 514.

E E 548. Introduction to Radar
3 Credits (3)

E E 549. Smart Antennas
3 Credits (3)

E E 551. Control System Synthesis I
3 Credits (3)
An advanced perspective of linear modern control system analysis and design, including the essential algebraic, structural, and numerical properties of linear dynamical systems.

E E 554. Binary Systems
3 Credits (3)
This course introduces and investigates recent technology development for the design and evaluation of secure and trustworthy hardware and embedded systems. Topics include IoT security, cryptography, hardware security primitives, authentication and key generation, invasive and non-invasive attacks and countermeasures, IC piracy and intellectual property protection, hardware trojans, and secure boot. Recommended foundation: E E 212. Crosslisted with: E E 458.

E E 562. Computer Systems Architecture
3 Credits (3)
The course covers uniprocessors, caches, memory systems, virtual memory, storage systems, with introduction to multiprocessor and distributed computer architectures; models of parallel computation; processing element and interconnection network structures, and nontraditional architectures. Recommended foundation is E E 212. Crosslisted with: E E 462.
E E 563. Computer Performance Analysis I
3 Credits (3)
Issues involved and techniques used to analyze performance of a computer system. Topics covered include computer system workloads; statistical analysis techniques such as principal component analysis, confidence interval, and linear regression; design and analysis of experiments; queuing system analysis; computer system simulation; and random number generation. Recommended foundation: E E 200 and E E 462.

E E 564. Advanced Computer Architecture I
3 Credits (3)
Multiprocessor and distributed computer architectures; models of parallel computation; processing element and interconnection network structures, and nontraditional architectures. Recommended foundation: E E 462. Crosslisted with: C S 573.

E E 565. Machine Learning I
3 Credits (3)
A graduate-level introduction to machine learning algorithms, including supervised and unsupervised learning methods. Topics covered include clustering, linear regression models, linear discriminant functions, feed-forward neural networks, statistical pattern classification and regression, maximum likelihood, naive Bayes, non-parametric density estimation, mixture models, decision trees, and ensemble learning. Recommended foundation: E E 571 and MATH 480. Crosslisted with: E E 465.

E E 566. Machine Learning II
3 Credits (3)

E E 567. ARM SOC Design
3 Credits (3)
The course aims to produce students who are capable of developing ARM-based SoCs from high level functional specifications to design, implementation and testing on real FPGA hardware using standard hardware description and software programming languages. Recommended foundation is E E 212 and E E 317. Crosslisted with: E E 467.

E E 569. Communications Network
3 Credits (3)
Introduction to the design and performance analysis of communications networks with major emphasis on the Internet and different types of wireless networks. Covers network architectures, protocols, standards and technologies; design and implementation of networks; networks applications for data, audio and video; performance analysis. Recommended foundation: E E 100, E E 112 and (E E 200 or STAT 371). Crosslisted with: E E 469.

E E 570. Fourier Methods in Electro-Optics
3 Credits (3)
Linear systems theory, convolution and Fourier transformation are applied to one-dimensional and two dimensional signals encountered in electro-optical systems. Applications in diffraction, coherent and incoherent imaging, and optical signal processing. Recommended foundation: E E 320 and E E 528. Crosslisted with: PHYS 577.

E E 571. Signal Compression
3 Credits (3)
Fundamentals of information source encoding and decoding. Includes information theory bounds on source coding, lossless coding algorithms, scalar quantizing and vector quantizing. Prerequisite: E E 571.

E E 575. Machine Learning II
3 Credits (3)

E E 581. Digital Communication Systems I
3 Credits (3)

E E 583. Wireless Communication
3 Credits (3)
Cellular networks, wireless channels and channel models, modulation and demodulation, MIMO, diversity and multiplexing, OFDM, wireless standards including LTE and WiMAX. Recommended foundation: E E 571 and E E 325.

E E 584. Mathematical Methods for Communications and Signal Processing
3 Credits (3)
Applications of mathematical techniques from estimation theory, optimization principles and numerical analysis to the problems in communications and signal processing. Recommended foundation: MATH 480. Prerequisite(s): E E 571.

E E 585. Telemetering Systems
3 Credits (3)
Covers the integration of components into a command and telemetry system. Topics include analog and digital modulation formats, synchronization, link effects, and applicable standards. Recommended foundation: E E 395, E E 496, and E E 497.
E E 586. Information Theory
3 Credits (3)
This class is a study of Shannon’s measure of information and discusses mutual information, entropy, and channel capacity, the noiseless source coding theorem, the noisy channel coding theorem, channel coding and random coding bounds, rate-distortion theory, and data compression. Restricted to: Main campus only. Crosslisted with: MATH 509
Prerequisite(s): E E 571 or STAT 515.

E E 588. Advanced Image Processing
3 Credits (3)
Advanced topics in image processing including segmentation, feature extraction, object recognition, image understanding, big data, and applications. Crosslisted with: E E 444.
Prerequisite(s): E E 446 or E E 596.

E E 590. Selected Topics
1-9 Credits
May be repeated for a maximum of 18 credits.

E E 593. Mobile Application Development
3 Credits (3)
Introduction to mobile application development. Students will develop applications for iOS devices including iPhone and iPad. Topics include object-oriented programming using Swift, model-view-controller (MVC) pattern, view controllers including tables and navigation, graphical user interface (GUI) design, data persistence, GPS and mapping, camera, and cloud and web services. Recommended foundation: C S 451 or C S 452. Crosslisted with: E E 443.

E E 596. Digital Image Processing
3 Credits (3)

E E 597. Neural Signal Processing
3 Credits (3)
Cross-disciplinary course focused on the acquisition and processing of neural signals. Students in this class will learn about basic brain structure, different brain signal acquisition techniques (fMRI, EEG, MEG, etc.), neural modeling, and EEG signal processing. To perform EEG signal processing, students will learn and use Matlab along with an EEG analysis package. Crosslisted with: E E 447.

E E 598. Master’s Technical Report
1-9 Credits (1-9)
Individual investigation, either analytical or experimental, culminating in a technical report. May be repeated for a maximum of 18 credits. Graded PR/S/U. May be repeated up to 18 credits. Thesis/Dissertation Grading.

E E 599. Master’s Thesis
1-15 Credits (1-15)

E E 600. Doctoral Research
1-15 Credits
Research.

E E 615. Computational Electromagnetics
3 Credits (3)
The numerical solution of electromagnetics problems. Topics include differential equation techniques, integral equation methods, hybrid techniques, algorithm development and implementation, and error analysis. Particular algorithms, including FEM, finite differences, direct solvers, and iterative solvers, are studied.

E E 675. Machine Learning III
3 Credits (3)
A research-oriented treatment of machine learning algorithms, including supervised, unsupervised, and reinforcement learning methods. Topics covered include Markov decision processes, deep reinforcement learning, neural logic networks, genetic algorithms, genetic programs, generative adversarial networks, and adaptive resonance theory models.
Prerequisite(s): E E 575.

E E 690. Selected Topics
1-9 Credits
May be repeated for a maximum of 9 credits.

E E 700. Doctoral Dissertation
1-15 Credits (1-15)