basis for lifelong learning.
2. Experienced in-depth training in state-of-the-art specialty areas in electrical engineering. This is implemented through our senior electives. Students are required to take two sequences of at least two courses each at the senior level.
3. Benefited from imaginative and highly supportive laboratory experiences where appropriate throughout the program. The laboratory experience will be closely integrated with coursework and will make use of up-to-date instrumentation and computing facilities. Students should experience both hardware-oriented and simulation-oriented exercises.
4. Experienced design-oriented challenges that exercise and integrate skills and knowledge acquired in several courses. These may include design of components or subsystems with performance specifications. Graduates should be able to demonstrate an ability to design and conduct experiments as well as analyze the results.
5. Learned to function well in teams. Also, students must develop communication skills, written and oral, both through team and classroom experiences. Skills including written reports, webpage preparation, and public presentations are required.
6. Completed a well-rounded and balanced education through required studies in selected areas of fine arts, humanities, and social sciences. This provides for the ability to understand the impact of engineering solutions in a global and societal context. A course in engineering ethics is also required of all undergraduates.

Undergraduate Program

Bachelor of Science—Electrical Engineering

A minimum of 194 units is required for graduation. A complete list of requirements for the major can be found on page 52. Schedules should be planned to meet both General Education and major requirements.

The department academic advisor can suggest a recommended study plan for electrical engineering freshmen and sophomores. Each student is assigned a departmental faculty advisor who must be consulted in planning the junior and senior year programs.

The required 32 units (8 courses) of departmental electives are taken primarily in the senior year, and they permit students to develop depth in specialty areas of their choice. A student’s elective course program must be approved by a departmental faculty advisor. The advisor will check the program to ensure satisfaction of the departmental requirements. A wide variety of elective programs will be considered acceptable.

Three matters should be noted: (1) students who fail to attain a grade-point average of at least 2.0 in the major may be denied the privilege of continuing in the major; (2) a large majority of electrical and computer engineering courses have prerequisites which must be completed successfully. Successful completion of prerequisite courses means receiving a grade of C- or better in prerequisite courses except for Mathematics 3A-B-C and Mathematics 5A and 5B which require a grade of C or better to apply these courses as prerequisites; (3) courses required for the pre-major or major, inside or outside of the Department of Electrical Engineering, cannot be taken for the passed/not passed grading option. They must be taken for letter grades.

Bachelor of Science—Computer Engineering

This major is offered jointly by the Department of Computer Science and the Department of Electrical and Computer Engineering. For information about this major, see page 25.

Many of the ECE courses are restricted to ECE majors only. Instructor and quarter offered are subject to change.

Electrical & Computer Engineering Courses

LOWERING DIVISION

1A. Computer Engineering Seminar
(1) STAFF
Prerequisite: Open to computer engineering majors only. Seminar: 1 hour
Introductory seminar to expose students to a broad range of topics in Computer Engineering.

1B. Ten Problem-Solving in Computer Engineering
(1) PARHAMI
Prerequisite: Open to pre-computer engineering and computer engineering majors only.
Not open for credit for those who have taken ECE 1
Gaining familiarity with, and motivation to study, the field of computer engineering, through puzzle-like problems that represent a range of challenges facing computer engineers in their daily problem-solving efforts and at the frontiers of research.

2A. Circuits, Devices, and Systems
(3) YORK
Prerequisites: Mathematics 3A-B, and Mathematics 3C or 4A with a minimum grade of C; and, Mathematics 5A or 4B with a minimum grade of C (may be taken concurrently); Physics 3 or 23 (may be taken concurrently); open to electrical engineering, computer engineering, and pre-computer engineering majors only. Lecture, 3 hours; laboratory, 4 hours.
Introduction to basic circuit analysis. KCL, KVL, nodal analysis, superposition, independent and dependent sources; diodes and I-V characteristics; basic op-amp circuits; first-order transient analysis; AC analysis and phasors. Introduction to the use of test instruments.

2B. Circuits, Devices, and Systems
(5) YORK
Prerequisites: ECE 2A with a grade of C- or better; open to electrical engineering, computer engineering, and pre-computer engineering majors only. Lecture, 3 hours; laboratory, 4 hours.
Second order circuits. Laplace transform and solution of steady state and transient circuit problems in the s-domain; Bode plots; Fourier series and transforms; filters. Transistor as a switch; load lines; simple logic gates; latches and flip-flops.

10A. Foundations of Analog and Digital Circuits & Systems
(5) STAFF
Prerequisites: Mathematics 3A-B, and Mathematics 4A or 3C with a minimum grade of C; and, Math 4B or 5A with a minimum grade of C (may be taken concurrently); Physics 3 or 23 (may be taken concurrently); open to electrical engineering, computer engineering, and computer engineering majors. Lecture, 3 hours.
Not open for credit for those who have received a C- or higher in ECE 2A.
The objective of the course is to establish the foundations of analog and digital circuits. The course will introduce the student to the power of abstraction, resistive networks, network analysis, nonlinear analysis and the digital abstraction.

10AL. Foundations of Analog and Digital Circuits and Systems Lab
(2) STAFF
Prerequisite: ECE 10A (may be taken concurrently) with a C- or better grade. Laboratory: 4 hours.
Not open for credit for those who have received a C- or higher in ECE 2A.
The goal of 10AL is to provide the student with a hands-on application of the concepts discussed in ECE 10A. The lab will introduce the use of microcontrollers as a data acquisition system, network analysis, resistors, nonlinear analysis and digital abstraction.

10B. Foundations of Analog and Digital Circuits and Systems
(3) STAFF
Prerequisite: ECE 10A with a C- or better grade. Lecture: 1 hour.
Not open for credit for those who have received a C- or higher in ECE 2B.
The objective of the course is to introduce the MOSFET both as a simple digital switch and as controlled current source for analog design. The course will cover basic digital design, small-signal analysis, charge storage elements and operational amplifiers. (W)
10BL. Foundations of Analog and Digital Circuits and Systems Lab

(2) STAFF
Prerequisite: ECE 10B (may be taken concurrently) with C- or better grade. Laboratory: 4 hours
Not open for credit for those who have received a C- or higher in ECE 2B.

The goal of 10BL is to provide the student with a hands-on application of the concepts discussed in ECE 10B. The lab will utilize the microcontroller to introduce students to the understanding of datasheets for both digital and analog circuits, single-stage amplifier design and basic instrumentation.

10C. Foundations of Analog and Digital Circuits and Systems Lab

(3) STAFF
Prerequisite: ECE 10B with a C- or better grade. Lecture: 3 hours
Not open for credit for those who have received a C- or higher in ECE 2C.

The objective of the course is to introduce the student to the basics of transient analysis. The course will energy and power dissipation in digital circuits, first-order and second-order linear time invariant circuits, sinuousoidal steady state, impedance representation, feedback and resonance. (S)

10CL. Foundations of Analog and Digital Circuits and Systems Lab

(2) STAFF
Prerequisite: ECE 10C (may be taken concurrently) with C- or better grade. Laboratory: 4 hours
Not open for credit for those who have received a C- or higher in ECE 2C.

The goal of 10CL is to provide the student with a hands-on application of the concepts discussed in ECE 10C. The lab will utilize the microcontroller to introduce students to the understanding of propagation delay in digital circuits and the resulting power dissipation, first order linear networks, second order linear networks, sinuousoidal steady-state, impedance analysis and op-amp circuits.

15A. Fundamentals of Logic Design

(4) MAREK-SADOWSKA
Prerequisites: Open to electrical engineering, computer engineering, and pre-computer engineering majors only.
Not open for credit to students who have completed ECE 15. Lecture, 3 hours; discussion, 1 hour.

Boolean algebra, logic of propositions, minterm and maxterm expansions, Karnaugh maps, Quine-McCluskey methods, m-ell circuit, combinational circuit design and simulation, multiplexers, decoders, programmable logic devices.

92. Projects in Electrical and Computer Engineering

(4) STAFF
Prerequisite: Consent of instructor; for Electrical Engineering and Computer Engineering majors only.
Projects in electrical and computer engineering for advanced undergraduate students.

94AA-ZZ. Group Studies in Electrical and Computer Engineering

(1-4) STAFF
Prerequisite: consent of instructor.
Group studies intended for small number of advanced students who share an interest in a topic not included in the regular departmental curriculum.

96. Undergraduate Research

(2-4) STAFF
Prerequisite: Consent of instructor. Must have a 3.00 GPA. May be repeated for up to 12 units.
Research available for undergraduate students. Students will be expected to give regular oral presentations, actively participate in a weekly seminar, and prepare at least one written report on their research.

UPPER DIVISION

120A. Integrated Circuit Design and Fabrication

(4) BOWERS
Prerequisite: ECE 132 with a minimum grade of C-.
Lecture: 3 hours; Laboratory: 3 hours
Not open for credit for those who have taken ECE 124B.

Theory, fabrication, and characterization of solid state devices including P-N junctions, capacitors, bipolar and MOS devices. Devices are fabricated using modern VLSI processing techniques including lithography, oxidation, diffusion, and evaporation. Physics and performance of processing steps are discussed and analyzed.

120B. Integrated Circuit Design and Fabrication

(4) BOWERS
Prerequisite: ECE 2ABC and either ECE 124B or ECE 120A with a minimum grade of C- or better in each of the courses.
Lecture: 3 hours; Laboratory: 3 hours
Not open for credit to those who have taken ECE 124C.

Design, simulation, fabrication, and characterization of NMOS integrated circuits. Circuit design and layout is performed using commercial layout software. Circuits are fabricated using modern VLSI processing techniques. Circuit and discrete device electrical performance are analyzed.

121A. The Practice of Science

(3) HU, AWISCHALOM
Prerequisite: Consent of instructor.
Same course Plan B.

Provides experience in pursuing careers within science and engineering through discussions with researchers, lectures on ethics, funding, intellectual property, and commercial innovation. Students prepare a focused research proposal that is pursued in the second quarter of the course.

121B. The Practice of Science

(3) HU, AWISCHALOM
Prerequisite: ECE 121A or Physics 121A; consent of instructor.
Same course as Physics 121B.

Provides experience in pursuing careers within science and engineering through discussions with researchers, lectures on ethics, funding, intellectual property, and commercial innovation. Students prepare a focused research proposal that is pursued in the second quarter of the course.

122A. VLSI Principles

(4) BANERJEE
Prerequisite: ECE 152A with a minimum grade of C-.
Lecture: 3 hours; Laboratory: 3 hours
Not open for credit for those who have taken ECE 124A or ECE 123.

Introduction to CMOS digital VLSI design: CMOS devices and manufacturing technology; transistor level design of static and dynamic logic gates and components and interconnections; circuit characterization: delay, noise margins, and power dissipation; combinational and sequential circuits; arithmetic operations and memories.

122B. VLSI Architecture and Design

(4) BOWERS
Prerequisite: ECE 124A or ECE 123 or ECE 122A with a minimum grade of C-.
Lecture: 3 hours; Laboratory: 2 hours
Not open for credit for those who have taken ECE 124D.

Practical issues in VLSI circuit design, pad-pin limitations, clocking and interfacing standards, electrical packaging for high-speed and high-performance designs, cache and crosstalk, clock and power distribution, architectural and circuit design constraints, interconnection limits and transmission line effects.

123. High-Performance Digital Circuit Design

(4) THEGARAJAN
Prerequisite: ECE 2A-B-C with a minimum grade of C- in each of those courses; open to both electrical engineering and computer engineering majors only.
Not open for credit for those who have taken ECE 124A or ECE 122A.

Introduction to high-performance digital circuit design techniques. Basics of digital physics including deep submicron effects; device sizing and logical effort; Circuit design styles; clocking & timing issues; memory & datapath design; Low-power design; VLSI design flow; and associated EDA tools.
amplifiers and lasers, optical modulators, photo detectors, optical receivers, wavelength division multiplexing components, optical filters, basic transmission system analysis and design.

137A. Circuits and Electronics I
(4) RODWELL
Prerequisites: ECE 2A-B-C, 130A, and 132 with a minimum grade of C- in all; open to EE majors only. Lecture, 3 hours; laboratory, 3 hours.
Analysis and design of single stage and multistage transistor circuits including biasing, gain, impedances and input and output signal levels.

137B. Circuits and Electronics II
(4) RODWELL
Prerequisites: ECE 2C and 137A with a minimum grade of C- in both; open to EE majors only. Lecture, 3 hours; laboratory, 3 hours.
Analysis and design of single stage and multistage transistor circuits at low and high frequencies. Transient response. Analysis and design of feedback circuits. Stability criteria.

139. Probability and Statistics
(4) ILTIS
Prerequisite: Open to Electrical Engineering, Computer Engineering and pre-Computer Engineering majors only. Lecture, 3 hours; discussion, 2 hours.
Fundamentals of probability, conditional probability, Bayes rule, random variables, functions of random variables, expectation and high-order moments, Markov chains, hypothesis testing.

141A. Introduction To Nanoelectromechanical and Microelectromechanical Systems (NEMS/MEMS)
(3) PENNATHUR, TURNER
Prerequisites: ME 16 & 17, ME 152A, ME 151A (may be concurrent); or, ECE 130A and 137A with a minimum grade of C- in both.
Introduction to nanoelectromechanics and microtechnology. Scaling laws and nanoscale physics are stressed. Individual subjects at the nanoscale including materials, mechanics, photonics, electronics, and fluidics will be described, with an emphasis on differences of behavior at the nanoscale and real-world examples.

141B. MEMS: Processing and Device Characterization
(4) PENNATHUR, TURNER
Prerequisites: ME 141A, ME 163 (may be concurrent); or ECE 141A.
Lectures and laboratory on semiconductor-based processing for MEMS. Description of key equipment and characterization tools used for MEMS and design, fabrication, characterization and testing of MEMS Emphasis on current MEMS devices including microoscillators, microfluids, micro-reactors and capacitor-actuators. (W)

142. Introduction to Power Electronics
(4) YORK
Prerequisite: ECE 132, ECE 134, and ECE 137A with a minimum grade of C- in all, open to EE majors only. Lecture, 3 hours; laboratory, 2 hours.
An introduction to modern switched-mode power electronics and associated devices. Covers modern converter/inverter topologies for the control and conversion of electrical power with high efficiency with applications in power supplies, renewable energy systems, lighting, electricity/hybrid vehicles, and motor drives.

144. Electromagnetic Fields and Waves
(4) YORK
Prerequisite: ECE 134 with a minimum grade of C-. Lecture, 3 hours; laboratory, 3 hours.
Wave on transmission lines, Maxwell’s equations, skin effect, propagation and reflection of electromagnetic waves, microwave integrated circuit principles, metal and dielectric waveguides, resonant cavities, antennas, microwave and optical device examples and experience with modern microwave and CAD software.

145A. Communication Electronics
(5) RODWELL
Prerequisites: ECE 137A-B with a minimum grade of C- in both. Lecture, 3 hours; laboratory, 6 hours.

145B. Communication Electronics II
(5) STAFF
Prerequisite: ECE 145A with a minimum grade of C-. EE majors only. Lecture, 3 hours; laboratory, 6 hours.

145C. Communication Electronics III
(5) YUE
Prerequisites: ECE 145B with a minimum grade of C-. Lecture, 4 hours.

146. Communication Systems
(5) MADOW
Prerequisite: ECE 130B-A with a minimum grade of C-, open to EE majors only. Lecture: 3 hours; Laboratory: 6 hours.
Communication signals and systems; channel modeling and transceiver signal processing in complex baseband; analog communication techniques, including amplitude and angle modulation, superheterodyne reception, and phase locked loops; digital modulation, including bandwidth-efficient linear modulation and orthogonal modulation.

146B. DIGITAL COMMUNICATION SYSTEM DESIGN
(5) MADOW
Prerequisites: ECE 130A-B and 146A with minimum grades of C- in each; open to EE majors only. Lecture: 3 hours; Laboratory: 6 hours.
Statistical modeling of signals and noise, including review of probability and random variables, and introduction to random processes; Optimal demodulation, including signal space geometry and performance estimates; communication over dispersive channels using singlecarrier and multicarrier modulation.

147A. Feedback Control Systems - Theory and Design
(5) TEEL, SMITH
Prerequisites: ECE 130A-B-C and 147A with a minimum grade of C- in each; open to EE and computer engineering majors only. Lecture, 3 hours; laboratory, 6 hours.
Feedback systems design, specifications in time and frequency domains. Analysis and synthesis of closed loop systems. Computer aided analysis and design.

147B. Digital Control Systems - Theory and Design
(5) TEEL, SMITH
Prerequisite: ECE 147A with a minimum grade of C-; open to EE and computer engineering majors only. Lecture, 3 hours; laboratory, 6 hours.
Analysis of sampled data feedback systems; state space description of linear systems. Observability, controllability, pole assignment, state feedback, observers. Design of digital control systems. (W)

147C. Control System Design Project
(5) HISPANIA
Prerequisite: ECE 147A or ME 155B or ME 173 with a minimum grade of C-. Lecture, 3 hours; laboratory, 6 hours.

Students are required to design, implement, and document a significant control systems project. The project is implemented in hardware or in high-fidelity numerical simulators. Lectures and laboratories cover special topics related to the practical implementation of control systems.

148. Applications of Signal Analysis and Processing
(4) LEE
Prerequisite: ECE 130A and 130B with a minimum grade of C- in both. Lecture: 3 hours; Discussion: 2 hours
Recommended Preparation: concurrent enrollment in ECE 130C. A sequence of engineering applications of signal analysis and processing techniques; in communications, image processing, analog and digital filter design, signal detection and parameter estimation, holography and tomography, Fourier optics, and microwave and acoustic sensing.

150. Mobile Embedded Systems
(4) CHENG
Prerequisite: Proficiency in JAVA programming. Architectures of modern smartphones and their key hardware components including mobile application processors, communications chips, display, touchscreen, graphics, camera, battery, GPS and various sensors; the OS and software development platform of smartphones; smartphone applications; low power design techniques.

151. Distributed Systems
(4) MELLAR-SMITH
Prerequisite: Computer Science 170 with a minimum grade of C-.
Not open for credit to students who have completed Computer Science 171. Lecture, 3 hours; discussion, 1 hour.
Distributed systems architecture, distributed programming techniques, message passing, remote procedure calls, group communication and membership, naming, asynchrony, causality, consistency, fault-tolerance and recovery, resource management, scheduling, monitoring, testing and debugging.

152A. Digital Design Principles
(5) RODOPFU
Prerequisite: ECE 15A and 2A, or Computer Science 30 or 64 with a minimum grade of C- in each course; open to electrical engineering, computer engineering, and computer science majors only. Lecture: 3 hours; Laboratory: 6 hours.
Design of synchronous digital systems: timing diagrams, propagation delay, latches and flip-flops, shift registers and counters, Mealy/Moore finite state machines, Verilog, 2-phase clocking, timing analysis. CMOS implementation, S- RAM, RAM-based designs, ASM charts, state minimization.

153A. Hardware/Software Interface
(4) BRENNER, KINTZ
Prerequisite: Upper division standing in Computer Engineering, Computer Science or Electrical Engineering.
Same course as Computer Science 153A. Issues in interfacing computing systems and software to practical I/O interfaces. Rapid response, real-time events and management of tasks, threads, and scheduling required for efficient design of embedded software and systems is discussed. Techniques for highly constrained systems.

153B. Sensor and Peripheral Interface Design
(4) STAFF
Prerequisite: ECE 152A with a minimum grade of C-. Lecture: 3 hours; Laboratory: 3 hours
Hardware description languages; field-programmable logic and ASIC design techniques. Mixed-signal techniques, A/D and D/A converter interfaces; video and audio signal acquisition, processing and generation, communication and network interfaces.
154A. Introduction to Computer Architecture (4) PARMAMB
Prerequisite: ECE 152A with a minimum grade of C-; open to EE and CMPEN majors only. Lecture: 3 hours; Discussion: 1 hour.
Not open for credit to students who have completed Computer Science 154. ECE 154A is the formerly numbered ECE 154. Students who have taken ECE 154 and have received a grade of C- or lower may take ECE 154A for a better grade.
Students who have taken ECE 154 and have received a grade of C- or lower may take ECE 154A for a better grade.
Instruction-set architecture (ISA) and computer performance; Machine instructions, assembly, addressing modes; Memory map, arrays, pointers; Procedure calls; Number formats; Simple ALUs; Data path, control, microprogram; Buses, I/O programming, interrupts; Pipelined data paths and control schemes.

154B. Advanced Computer Architecture (4) STRUKOV
Prerequisite: ECE 154A with a C- grade or better. Open to EE, CMPEN, and majors only. Lecture: 3 hours; Laboratory: 4 hours.
Not open for credit to those who have taken Computer Science 154.
ISA variations; Pipeline data and control hazards; Fast ALU design; Instruction-level parallelism, multithreading, VLIW; Vector and array processing, multi/multi-core chips; Cache and virtual memory; Disk arrays; Shared- and distributed-memory systems, supercomputers; Reconfigurable and application-specific circuits.

155A. Introduction to Computer Networks (4) MOSER
Prerequisite: Upper-division standing in Electrical Engineering, Computer Engineering and Computer Science; and CMPSC 24 with a minimum grade of C-.
Lecture: 3 hours; Discussion 1 hour.
Not open for credit to students who have completed Computer Science 176, 176A, or ECE 155.
Topics in this course include network architectures, protocols, wired and wireless networks, transmission media, multiplexing, switching, framing, error detection and correction, flow control, routing, congestion control, TCP/IP, DNS, email, and network security, socket programming in C/C++.

155B. Network Computing (4) MOSER
Prerequisite: ECE 155A or CMPSC 176A with a minimum grade of C-; and CMPSC 32 with a minimum grade of C-; and experience in Java programming or consent of instructor. Lecture: 3 hours; Discussion 1 hour.
Not open for credit to students who have completed Computer Science 176B or ECE 194W.
Topics in this course include client/server computing, threads, Java applets, Java sockets, Java RMI, Java servlets, Java server Pages, Java Database Connectivity, Enterprise Java Beans, Hypertext Markup Language, eXtensible Markup Language, Web Services, programming networked applications in Java.

156A. Digital Design with VHDL and Synthesis (4) WANG
Prerequisite: ECE 152A with a minimum grade of C-.
Lecture: 3 hours; laboratory: 3 hours.
Introduction to VHDL basic elements. VHDL simulation concepts. VHDL concurrent statements with examples and applications. VHDL subprograms, packages, libraries and design units. Writing VHDL for synthesis. Writing VHDL for finite state machines. Design case study.

156B. Computer-Aided Design of VLSI Circuits (4) WANG
Prerequisite: ECE 156A with a minimum grade of C-.
Lecture: 3 hours; laboratory: 3 hours.
Introduction to computer-aided simulation and synthesis tools for VLSI. VHDL system design flow, role of CAD tools, layout synthesis, circuit simulation, logic simulation, logic synthesis, behavior synthesis and test synthesis.

158. Digital Signal Processing (4) GIBSON
Prerequisite: ECE 130A-B with a minimum grade of C- in both; open to EE majors only.
Lecture: 3 hours; laboratory: 3 hours.
Discrete signals and systems, convolution, z-transforms, discrete Fourier transforms, digital filters.

160. Multimedia Systems (4) MELLIIAR-Smith
Prerequisite: Upper-division standing; open to electrical engineering, computer engineering, computer science, and creative studies majors only.
Lecture: 3 hours; Laboratory: 3 hours.
Not open for credit to students who have completed CMPSC 182.
Introduction to multimedia and applications, including WWW, image/video databases and video streaming. Covers media content analysis, media data organization and indexing (image/video databases), and media data distribution and interaction (video-on-demand and interactive TV).

162A. The Quantum Description of Electronic Materials (4) STAFF
Prerequisite: ECE 130A-B and 134 with a minimum grade of C- in all; open to EE and materials majors only.
Same course as Materials 162A.
Lecture: 4 hours.
Electrons as particles and waves, Schrödinger’s equation and illustrative solutions, Tunneling, Quantum structure, the exclusion principle and the periodic table. Bonds. Free electrons in metals, periodic potentials and energy bands.

162B. Fundamentals of the Solid State (4) Coldren
Prerequisite: ECE 162A with a minimum grade of C-; open to EE and materials majors only.
Same course as Materials 162B.
Lecture: 3 hours; Discussion 1 hour.

162C. Optoelectronic Materials and Devices (4) Coldren
Prerequisite: ECE 162A-B with a minimum grade of C-; open to electrical engineering and materials majors only.
Same course as Materials 162C.
Lecture: 3 hours; Discussion 1 hour.

178. Introduction to Digital Image and Video Processing (4) Manjunath
Prerequisite: open to EE, computer engineering, and computer science majors with upper-division standing. Lecture: 3 hours; discussion, 1 hour.
Basic concepts in image and video processing. Topics include image formation and sampling, image transforms, image enhancement, and image and video compression including JPEG and MPEG coding standards.

179. Introduction to Robotics: Dynamics and Control (4) Byl
Prerequisite: ECE 130A or ME 155A (may be taken concurrently).
Same course as ME 179D.
Dynamic modeling and control methods for robotic systems. LaGrangian method for deriving equations of motion, introduction to the Jacobian, and modeling and control of forces and contact dynamics at a robotic end effector. Laboratories encourage a problem-solving approach to control.
Graduate Courses

Graduate courses for this major can be found in the UCSB General Catalog.