The BSEE Program
This curriculum is designed to provide the student with a broad background covering the basics of the major areas of Electrical Engineering practice. Additionally, by proper choice of upper-division technical electives and Senior Design Project, the student may specialize in the areas of Analog Electronics, Digital System Design, Networking, Communication, Digital Signal Processing, Integrated Circuit Design and Fabrication. The undergraduate curriculum is accredited by the Accreditation Board for Engineering and Technology (ABET).

Advising
Each semester you must see your Major Advisor to have your graduation plan approved so your registration hold is removed. You will receive an email when to come in for advising. To ensure your hold is removed in time, please see an advisor between the last day to drop and two weeks before the last day of class. Make sure your email address in MysJSU is current so as to not miss important communications. Appointments can be made on Appointments Plus. The EE designated advisors are:

Professor David Parent
Room: E355
Tel: (408) 924-3963
david.parent@sjsu.edu

Professor Sotoudeh Hamedi-Hagh
Room: 381
Tel: (408) 924-4041
sotoudeh.hamedi-hagh@sjsu.edu

Professor Robert Morelos-Zaragoza
Room: E373
Tel: (408) 924-3879
robert.morelos-zaragoza@sjsu.edu

Professor Ping Hsu
Room: 257
Tel: (408) 924-3902
ping.hsu@sjsu.edu
Up-to-date information is available on the bulletin board outside the EE Office (E349) as well as online at department website. All forms are also available online at http://ee.sjsu.edu/content/undergraduate-forms

Students who want a head start in the engineering practice may consider the Cooperative Education / Internship option, earning technical elective units for academically relevant industry assignments that are approved by the Co-op Coordinator. Interested students should contact the Co-op Coordinator (listed on EE department website at http://ee.sjsu.edu/content/advising) and check the university career center website at http://www.sjsu.edu/careercenter

Engr100W
Students must have received a grade of C or better in Engr100W prior to enrolling in EE198A. Note that Engr100W may not be waived based on Written Skills Test (WST) scores.

Major Form
Every student must see his/her advisor and submit a Major Form, delineating his/her objectives. Every student should meet with his/her designated Major Advisor at least one week before the deadline for the approval of the Major Form. The submission of the Major Form is also a prerequisite for enrolling in EE198A. Deadline for submission of Graduation Application and Major Form is shown on the Graduation Application form, which can be downloaded at: http://www.sjsu.edu/registrar/docs/grad_app.pdf. Please see the University catalog for other graduation requirements.

Drop Procedures
For course withdrawals after expiration of the deadline, students must first obtain the faculty member’s signature. The signature indicates that the student has been advised about the possible negative impact of the “W” on their transcript and, where appropriate, be encouraged to consult with the Student Resource Center. The instructor’s signature does not indicate or authorize approval of late course withdrawal. The University’s Director of Academic Services will evaluate late course and University withdrawal requests.

A student may petition to drop a course after the fourth through the thirteenth week of instruction only for “serious and compelling reasons” (poor performance in a class is not considered a serious and compelling reason for late drop).

Technical Elective Requirements
Students are required to take 12 units of technical electives. The EE department currently offers technical elective courses in those areas as shown below. With Major Form advisor’s approval, students can take electives from other departments. Graduate level courses can also be taken as electives for students with a GPA above 2.75. Samples of four-elective sets are shown at the end of this brochure.
Requirements for BSEE Degree

Semester Units:

30 units  General Education
Total University requirement is 51 units. Of the 51 units, up to 21 units may be satisfied by exemptions or courses taken in support of the major. See your EE Undergraduate Coordinator for details.

30 units  Preparation for the Major
(Mathematics, Physics, and Chemistry)
Math30, 31, 32, 133A; Phys50, 51, 52; Chem1A

16 units  Engineering Common Area
Engr10, Engr100W\(^1\); EE30, EE97, EE98

45 units  Requirements for the Major
EE101, 102, 110, 112, 118, 120, 122, 124, 128, (132 or 134 or 160) 140, 198A, 198B and MatE153, ENGR195A, ENGR195B

12 units  Approved Upper Division Technical Electives

Total of 120 Units Required for BSEE Degree

Notes  ^1Also meets the General Education Upper Division Writing Requirement. Course may not be waived based on WST scores
Required Courses in Electrical Engineering

**EE30. Introduction to Programming Microcontrollers for Electrical Engineering**
Introduction to C language program development using an integrated development environment for a microcontroller is the subject of this course. Program development includes program design, development, debugging, testing and documentation. Electrical engineering application examples dealing with circuits, systems, data converters and signal processing concepts are used throughout the course. **Prerequisite:** Engr 10, Math 30

**EE97. Introductory Electrical Engineering Laboratory**
Basic instruments and experimental techniques in Electrical Engineering. Oscilloscopes, function generators, frequency counters, and multiple-use meters. Measurements of voltage, current, frequency response, transient response, and computer simulation of circuits. **Pre/Corequisite:** EE98. 1 unit.

**EE98. Introduction to Circuit Analysis**
Circuit laws and nomenclature, resistive circuits with D.C. sources, ideal operational amplifier, controlled sources, natural and complete response of first and second order circuits, steady-state sinusoidal analysis, and power calculations. **Prerequisite:** Engr10, Phys51 or 71. **Corequisite:** Math133A or Math 123. 3 units.

**EE101. Circuit Concepts and Problem Solving**
Development of skill and proficiency in solving electric circuit, calculus, and differential equation problems; techniques for analyzing DC circuits, AC circuits, and transients. Well prepared students should consider credit by examination for this course. Check the E.E. Department web site for schedule and place of the exams. Note that passing the challenge exam does not exempt the student from enrolling in EE101. **Prerequisite:** EE98 with a grade of “C” or better. 1 unit, credit / no credit.

**EE102. Probability and Statistics in Electrical Engineering**
Discrete probability theory. Theory of one and two random variables. Elementary statistics and hypothesis testing. EE Applications. **Prerequisite:** EE112 with a grade of C or better. 3 units.

**EE110. Network Analysis**

**EE112. Linear Systems**
Advanced study of linear discrete and continuous systems. Laplace transforms and Z transforms. Convolution. System functions and frequency response. Fourier series and Fourier transforms. Discrete and fast Fourier transforms. **Prerequisites:** EE98 with a grade of C or better, EE101, Math133A. 3 units.

**EE118. Digital Design I**
Boolean algebra and number systems. Combinational and sequential circuits. Realization of logic blocks with standard integrated circuit packages. Design of counters, dividers, registers, arithmetic logic units and algorithmic state machines. **Prerequisites:** EE98 with a grade of C or better, Math 133A, English 1A, Lecture 3 hours, laboratory 3 hours. 4 units.
EE120. Microprocessor-Based System Design
Advanced algorithmic processes using MSI and SSI integrated circuits. Organization and interface requirements for a microcomputer. Hardware-software tradeoffs in digital systems. Prerequisites: EE118 with a grade of C or better. EE120L (to be taken concurrently). Basic knowledge in computer programming and software development. Lecture 3 hours, laboratory 3 hours. 4 units.

EE122. Electronic Design I
Active device equivalent circuits with emphasis on transistors, elementary switching circuits, small-signal amplifier analysis and design, and operational amplifiers. Computer simulation. Prerequisites: EE97, EE110 with a grade of C or better. Lecture 3 hours, laboratory 3 hours. 4 units.

EE124. Electronic Design II
Integrated circuit amplifiers. Amplifiers with feedback. Frequency response. CAE and CAD. Prerequisites: Engr100W, EE122, and EE128 with grades of C or better; Submission of major form. Lecture 3 hours, laboratory 3 hours. Lab fee required. 4 units.

EE128. Physical Electronics
Review of semiconductor theory. Methods of device fabrication; p-n junctions; bipolar junction transistors; field-effect transistors (FETS); MOSFETs; and equivalent circuits. Prerequisite: MatE153 with a C or better. 3 units.

EE132. Theory of Automatic Controls
Theory of linear feedback control systems. Transfer functions and block diagrams; root-locus techniques; frequency analysis techniques; compensation; transducers and servo-system elements. Students are required to take EE132 or EE160. For students who choose to take both EE132 and EE160, one of them can be counted as an elective. Prerequisites: EE112 with a grade of C or better; Submission of major form. 3 units.

EE134. Power Systems
Introduction to power systems including: complex power, power factor correction, power quality, power flow analysis, grid steady state and transient stability, fault analysis, integration of renewable energy, theory and modeling of transformers, transmission lines, and synchronous generators. Prerequisites: EE1120 and EE112 with a grade of C or better.

EE140. Principles of Electromagnetic Fields
Static electric and magnetic fields using vector calculus methods. Development of Maxwell’s Equations. Prerequisites: Phys72 (or 52), EE98 with a grade of C or better, Math 133A, English 1A. 3 units.

EE160. Principles of Communication Systems
Introduction to communication systems. Harmonics for analysis of amplifiers and amplitude modulators. Sampling and its application to frequency shifting. Communication receiver architectures: Direct-conversion and heterodyne. Amplitude modulators and demodulators. Basic binary modulation techniques. Lecture 2 hours, Laboratory 3 hours Prerequisites: EE112, with a grade of “C” or better. 3 units.

EE198A. Senior Design Project I
Team design project proposal, business plan, oral design review presentations of the initial phases of the design project, a written and oral defense of the proposed design project. Individual written reports on professional development plans. Prerequisites: Approved Major form on file, Engr100W, EE120, EE122, EE128 and a senior in good standing with a grade of “C” or better and instructor’s consent. Laboratory 3 hours. 1 unit.
EE198B. Senior Design Project II
Implementation of group design projects initiated in EE198A. Oral and written reports. **Prerequisite:** EE198A with a grade of “C” or better. Laboratory 9 hours. 3 units.

---

**Technical Elective Courses in Electrical Engineering**

**EE106/ME106. Fundamentals of Mechatronics Engineering**
Foundational concepts in mechatronics including analog and digital electronics, sensors, actuators, microprocessors and microprocessor interfacing to electromechanical systems. Hands-on laboratory experiments with components and measurement equipment used in the design of mechatronic products. EE students must get Major Advisor’s approval before taking this course. **See ME 106 for Prerequisites.** 3 Units.

**EE125. Analog CMOS Integrated Circuits**
Analysis and design of analog CMOS integrated circuits. Voltage references, noise analysis, amplifiers and comparators, sample-and-hold circuits, switched capacitor circuits and converters. **Prerequisite:** EE124. 3 Units.

**EE127. Electronics for Bioengineering Applications**
Study of the fundamental concepts of electrical circuits relevant to the use and design of biomedical instruments and devices currently used for patient care using several examples. **Prerequisites:** EE98. Lecture. 3 units.

**EE129/MatE129. Introduction to Integrated Circuits Processing and Design**
Basic processes involved in fabrication of integrated circuits; material preparation; oxidation; diffusion; photolithographic and chemical processes; photo resist; thin-film evaporation. Layout of transistors and passive devices; evaluation of device parameters. EE students must get Major Advisor’s approval before taking this course. **Prerequisite:** MatE25 or MatE153. **Corequisite:** EE128. Lecture 2 hours, laboratory 3 hours. 3 units.

**EE130. Electromechanics**
Magnetic circuits, force calculations, transformers, voice-coil motors, D.C. motors and generators, step motors and brushless D.C. motors. **Prerequisites:** EE110, EE140; Submission of major form. 3 units.

**EE134. Introduction to Power Systems**
Introduction to basic concepts in power systems including: complex power, power factor correction, power flow analysis, and optimal power flow dispatch. These concepts are built on phasor analysis and linear differential equation.

**EE136. Semiconductor Power Electronics**
Study of power electronic circuits and applications including switch-mode regulators, AC-DC, DC-DC and DC-AC conversion, uninterruptable power supplies, variable speed drives, active filtering and harmonic cancellation; laboratory demonstrations. Applications include electric vehicle propulsion and spacecraft power systems. **Prerequisite:** EE124. 3 units.

**EE138. Introduction to Embedded Control System Design**
Embedded system design challenge and metrics. Processor and IC technologies. Software and hardware architectures for ESD. Design flow and tools. The design of standard peripherals, microcontrollers, single-purpose and general-purpose processors. Basic concepts of interfacing and communication protocols in ESD. **Prerequisite:** EE120. 3 Units
EE153. Introduction to Digital Signal Processing
Digital signal processing fundamentals, discrete system theory, convolution, DFT, and design of IIR and FIR filters. MATLAB based lab exercises are used for verification of DSP principles, signal analysis, and design of filters for audio signals. **Prerequisite:** EE112. 3 units.

EE161. Digital Communication Systems
Introduction to communication systems and noise. Binary communication systems. Pulse amplitude modulation. Digital modulation of amplitude, phase and frequency of a carrier signal. Modulation and signaling for wireless communication channels. Digital wireless communication using multiple antennas. **Prerequisite:** EE 102 and EE112. Lecture 3 hours. 3 units.

EE165/MatE165. Photovoltaic Fabrication/Testing Lab
Laboratory course covering photovoltaic (solar cell) design, fabrication, and testing. TCAD simulation tools will be used in design. Fabrication processes will include cleaning, surface texturing, deposition, diffusion, metallization, photolithography, etching, and electrical testing. **Prerequisites:** MATE 025 or MATE 153 or **corequisite** of MATE 129. Lab 3 hours, 1 unit.

EE166. Design of CMOS Digital Integrated Circuits
Analysis and design of MOS based combinational sequential digital integrated circuits. Industry standard CAD tools (Cadence) will be used extensively in homework and a group final project. **Prerequisite:** EE128. 3 units.

EE168/ME168. Microfluidics Fabrication and Design
Hands-on design, fabrication, and testing of microfluidic devices. Processes including photolithography, soft lithography, and plasma bonding. Design problems for microfluidic devices. Introduction to microfluidics simulation. **Prerequisite:** MATE 025 or MATE 153 or MATE/EE 129. 1 unit

EE169/ME169. Microelectromechanical Systems Fabrication and Design
Hands-on design, fabrication, and testing of micro electro-mechanical systems (MEMS). Processes including oxidation, photolithography, etching, wet processing, and metal deposition applied to MEMS. Design problems for MEMS transducer components such as cantilever beam actuators, membrane deflection sensors, and micro fluidic flow channels. EE students must get Major Advisor's approval before taking this course. **Prerequisites:** CE112 or MatE25 or EE098. Lecture 2 hours, laboratory 3 hours. 3 units.

EE172. Microwaves
Introduction to microwave engineering and techniques. Transmission lines and waveguides, microwave network analysis. Impedance matching and timing. Resistors, dividers, couplers. **Prerequisite:** EE142. 3 units.

EE174. Analog Peripheral for Embedded Systems
Introduction to analog peripherals for embedded systems such as ADC/DAC, DC-DC Converters. Energy harvesting and solar cells, near field communication, RF-IDs, phase lock loops, clock generators, displays and touch screens. Industry based projects and applications are integral to the course. **Prerequisite:** EE110 and EE112 with a grade C or better. 3 units.

EE178. Digital Design with FPGA's
This course covers advanced digital design technologies as they relate to synchronous digital systems. The course requires student to design projects that deal with the use of CAD tools for the design, simulation, and implementation of systems with FPGA’s. **Prerequisite:** EE118. 3 Units.
EE180. Individual Studies
Individual work on special topics arranged by the student and faculty mentor. Enrollment is handled by the EE department office. A completed and approved application is required. Prerequisite: BS in Electrical Engineering Senior in good standing. Repeatable for credit, 1-3 units

EE181. Fundamentals of Networking
Data communication concepts, protocols, algorithms; 7-layer OSI reference model, implementations of the OSI model; physical media (fiber, wire); LAN architectures and components, Ethernet, FDDI, TCP/IP, and related standards. Prerequisites: EE118. 3 units.

EE189. Special Topics in Electrical Engineering
Advanced topics in Electrical Engineering. Content varies from semester to semester. Prerequisite: Instructor consent/senior standing.

EE197/ENGR197. Cooperative Education Project
Part or full-time on-site paid work experience based on a pre-approved project assignment in area of student’s career objective. Oral presentations, written final report and evaluation by project supervisor. Approved technical elective. Prerequisite: Instructor consent. 3 units.
## Electrical Engineering 4 year plan:

### FRESHMAN YEAR

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Units</th>
<th>Semester 2</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 30, Calculus 1</td>
<td>3</td>
<td>Math 31, Calculus 2</td>
<td>4</td>
</tr>
<tr>
<td>Chem 1A, General Chemistry</td>
<td>5</td>
<td>Phys 50, Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>Engr 10, Intro. to Engineering (GE Area E)</td>
<td>3</td>
<td>Comm 20 (GE Area A1)</td>
<td>3</td>
</tr>
<tr>
<td>English 1A, composition (GE Area A2)</td>
<td>3</td>
<td>English 1B, composition (GE Area C3)</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

### SOPHOMORE YEAR

<table>
<thead>
<tr>
<th>Semester 3</th>
<th>Units</th>
<th>Semester 4</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 32, Calculus 3</td>
<td>3</td>
<td>Math 133A, Differential equations</td>
<td>3</td>
</tr>
<tr>
<td>Phys 51, Electricity and Magnetism</td>
<td>4</td>
<td>EE 98, Circuit Analysis</td>
<td>3</td>
</tr>
<tr>
<td>AMS 1A (GE Area C1,2; D2,3; F1,2,3)</td>
<td>6</td>
<td>EE 97, Introduction to EE laboratory</td>
<td>1</td>
</tr>
<tr>
<td>EE 30, Intro. to Programming for EE</td>
<td>3</td>
<td>Phys 52, Atomic Heat and Light</td>
<td>4</td>
</tr>
<tr>
<td>AMS 1B (GE Area C1,2; D2,3; F1,2,3)</td>
<td>6</td>
<td>Total</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>

### JUNIOR YEAR

<table>
<thead>
<tr>
<th>Semester 5</th>
<th>Units</th>
<th>Semester 6</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 101, Circuit Problem Solving *</td>
<td>1</td>
<td>EE 120, Microprocessor System Design</td>
<td>4</td>
</tr>
<tr>
<td>EE 110, Circuits and Systems</td>
<td>3</td>
<td>EE 122, Electronic Design I</td>
<td>4</td>
</tr>
<tr>
<td>EE 118, Digital Design</td>
<td>4</td>
<td>EE 128, Physical Electronics</td>
<td>3</td>
</tr>
<tr>
<td>MatE 153, Elec. Opt. and Mag. of Mat.</td>
<td>3</td>
<td>ENGR 100W</td>
<td>3</td>
</tr>
<tr>
<td>EE 112, Intro. to Signal Processing</td>
<td>3</td>
<td>Total</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>Total</td>
<td>14</td>
</tr>
</tbody>
</table>

### SENIOR YEAR

<table>
<thead>
<tr>
<th>Semester 7</th>
<th>Units</th>
<th>Semester 8</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 198A, Senior Design Project I</td>
<td>1</td>
<td>EE 198B, Senior Design Project II</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 195A (GE AreaS&amp;V)</td>
<td>1</td>
<td>ENGR 195B (GE AreaS&amp;V)</td>
<td>1</td>
</tr>
<tr>
<td>EE 102, Prob. and Stats. in EE</td>
<td>3</td>
<td>EE 132/134/160</td>
<td>Control/Power/Communications</td>
</tr>
<tr>
<td>EE 140, Prin. of E&amp;M</td>
<td>3</td>
<td>Technical Elective 2</td>
<td>3</td>
</tr>
<tr>
<td>EE 124, Electronic Design II</td>
<td>4</td>
<td>Technical Elective 3</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective 1</td>
<td>3</td>
<td>Technical Elective 4</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>Total</td>
<td>16</td>
</tr>
</tbody>
</table>

**Notes:**
Courses listed in red * are on the **critical path** to graduation.

* Visit the EE101 [FAQs](#) to find the answer to many of your questions.