PROPOSED CHANGES TO THE ELECTRICAL ENGINEERING DEGREE PROGRAM IN THE
COLLEGE OF ENGINEERING SECTION IN THE UNDERGRADUATE CATALOG 2014-2016

Type of Change Academic Change

1. IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST
CONSULT NEAL ARMSTRONG TO DETERMINE IF SACS-COC APPROVAL IS REQUIRED.
   - Is this a new degree program? No
   - Does the program offer courses that will be taught off campus? No
   - Will courses in this program be delivered electronically? No

2. EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH
INDIVIDUAL CHANGE (include page numbers in the catalog where changes will be made):

   No changes to the degree program. All changes are minor editing for clarification, corrections to course
   numbers to reflect recent changes, and corrections to the description of computing equipment needed for
   coursework.

   1. M 408K, L, M is equivalent in all ways to M 408C, D. This codifies a standard substitution that we always
      accept, and is especially useful for transfer students and students with AP credit.

   2. EE 364E and 464S represent an alternate acceptable pathway for the Senior Design Sequence course
      requirements -- EE 364D and 464K, R,... These are entrepreneurship courses especially established for that
      purpose.

   3. The "14 hour ..." description under the Academic Enrichment secondary core clarifies the language of the
      requirements. It does not change them, since that is what has been required of those students: we sometimes
      accept one lower division science course in departments very different from the ECE curriculum. The new
      language allows that.

   4. The new course number for Solar Energy Conversion is EE 339S. It has been previously submitted to the
      Course Inventory System, and will be routinely listed by the time this catalog goes into effect. We will
      continue to accept the previous course number for students who have taken the 379K course version.

3. SCOPE OF PROPOSED CHANGE
   a. Does this proposal impact other colleges/schools? No
   b. Will students in other degree programs be impacted (are the proposed changes to courses commonly
      taken by students in other colleges)? No
   c. Will students from your college take courses in other colleges? No
   d. Does this proposal involve changes to the core curriculum or other basic education requirements (42-
      hour core, signature courses, flags)? No
   e. Will this proposal change the number of hours required for degree completion? No

4. COLLEGE/SCHOOL APPROVAL PROCESS
   Department approval date: March 28, 2013
   College approval date: April 1, 2013
   Dean approval date: April 8, 2013

Impact statement #1 last modified March 25, 2013.
Bachelor of Science in Electrical Engineering

Students seeking the Bachelor of Science in Electrical Engineering pursue one of two curricula—electrical engineering or computer engineering. Both curricula contain the fundamentals of electrical engineering and computer engineering; they differ in their technical core requirements in order to suit different career objectives.

The curricula in electrical engineering and computer engineering are designed to educate students in the fundamentals of engineering, which are built upon a foundation of mathematics, science, communication, and the liberal arts. Graduates should be equipped to advance their knowledge while contributing professionally to a rapidly changing technology. Areas in which electrical and computer engineers contribute significantly are: communications, signal processing, networks and systems, electronics and integrated circuits, energy systems and renewable energy, fields, waves and electromagnetic systems, nanoelectronics and nanotechnology, computer architecture and embedded systems, and software engineering and design. Typical career paths of graduates include design, development, management, consulting, teaching, and research. Many graduates seek further education in law, medicine, business, or engineering.

The core requirements of the Bachelor of Science in Electrical Engineering provide a foundation of engineering fundamentals. Students then build on the core requirements by choosing a primary and a secondary technical core area; students also choose two advanced laboratory courses. Once the primary technical core area is chosen, the student is assigned a faculty adviser with expertise in that area to help the student select technical area core courses that are appropriate to his or her career and educational goals. The curriculum thus ensures breadth through the core courses and the choice of a technical elective; technical core area coursework provides additional depth.

Program Outcomes
[No changes to this section.]

Program Educational Objectives
[No changes to this section.]

Portable Computing devices

Students enrolled in a degree program in Electrical and Computer Engineering will be expected to own a portable computing device capable of compiling and running a program (i.e., a notebook computer, tablet, or slate) suitable for use in the classroom and on the University wireless network. Use of these devices in the classroom and as a general part of the learning experience within our programs is at the discretion of faculty and not all classes or courses of instruction will require the use of these devices. Once admitted, students will be informed by the Electrical and Computer Engineering Department office about specific device requirements.

Curriculum

Course requirements are divided into three categories: basic sequence courses, major sequence courses, and other required courses. In addition, each student must complete the University’s Core Curriculum. In some cases, a course required as part of the basic sequence may also be counted toward the core curriculum; these courses are identified below. To ensure that courses used to fulfill the social and behavioral sciences and visual and performing arts requirements of the core curriculum also meet ABET criteria, students should follow the guidance given in ABET Criteria.

In the process of fulfilling engineering degree requirements, students must also complete coursework to satisfy the following flag requirements: one independent inquiry flag, one course with a quantitative reasoning flag, one ethics and leadership flag, one global cultures flag, one cultural diversity in the US flag, and two writing flags. The independent inquiry flag, the quantitative reasoning flag, the ethics and leadership flag, and one two writing flags are carried by courses specifically required for the degree; these courses are identified below. Students are advised to fulfill the second writing flag requirement with a course that meets another requirement of the core curriculum.
such as the first-year signature course. Courses that may be used to fulfill flag requirements are identified in the Course Schedule. More information about flags is given in Skills and Experiences Flags.

Enrollment in major sequence courses is restricted to students who have received credit for all of the basic sequence courses and have been admitted to the major sequence. Requirements for admission to a major sequence are given in Admission to a Major Sequence. Enrollment in other required courses is not restricted by completion of the basic sequence.

Pre-approved courses are used to fulfill technical core, advanced math and/or science and core technical electives; and other elective courses requirements must be approved by the electrical and computer engineering faculty before the student enrolls in them.

<table>
<thead>
<tr>
<th>Courses</th>
<th>Sem Hrs</th>
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<tbody>
<tr>
<td><strong>Basic Sequence Courses</strong></td>
<td></td>
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<tr>
<td>• Mathematics 408C, 408D, 427K, 340L (or Mathematics 408K, 408L, and 408M). (Mathematics 408C may be used to fulfill the mathematics requirement of the core curriculum; Mathematics 408C and 427K each carry a quantitative reasoning flag)</td>
<td>15</td>
</tr>
<tr>
<td>• Electrical Engineering 302, 306, 411, 312, 313, 319K (Electrical Engineering 302 may be used to fulfill the science and technology, part II, requirement of the core curriculum.)</td>
<td>19</td>
</tr>
<tr>
<td>• Physics 303K, 303L, 103M, 103N (Physics 303K and 303L may be used to fulfill the science and technology, part I, requirement of the core curriculum; both courses carry a quantitative reasoning flag.)</td>
<td>8</td>
</tr>
<tr>
<td>• Rhetoric and Writing 306 (may be counted toward the English composition requirement of the core curriculum.)</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>45</td>
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| **Major Sequence Courses** | |
| • Electrical Engineering 333T, 351K, 364D, or 364E, and one of the following senior design project courses: Electrical Engineering 464G, 464H, 464K, 464R, 464S. (Electrical Engineering 333T carries a writing flag; the design project courses carry independent inquiry flags) | 13 |
| • Primary technical core: Core courses (six hours), core laboratory course (four hours), advanced mathematics course (four hours) | 14 |
| • Primary core electives: Four courses (twelve to fourteen hours) | 12 |
| • Secondary technical core: Core courses (six hours), core laboratory course (four hours), advanced mathematics course (four hours) | 14 |
| **Total** | 53 |

| **Other Required Courses** | |
| • Approved elective | 3 |

| **Remaining Core Curriculum Courses** | |
| • English 316K (humanities) | 3 |
| • American and Texas government | 6 |
| • American history | 6 |
| • Visual and performing arts | 3 |
| • Social and behavior sciences | 3 |
| • Undergraduate Studies 302 or 303 (some sections carry a writing flag) | 3 |
| **Total** | 24 |

| Minimum Required | 125 |
Upper-division technical core areas

Both electrical engineering and computer engineering students must choose a primary and a secondary technical core area. Electrical engineering students must choose their primary technical core area from the electrical engineering technical core areas listed below; computer engineering students must choose their primary technical core area from the computer engineering core areas. For the secondary technical core area, students may choose any technical core area, including academic enrichment.

For all technical core areas, the student must complete all courses in the core area on the letter-grade basis. A course may not be counted toward more than one technical core area.

In cases where a single electrical engineering course appears on both the primary and secondary technical core area list, the student must replace the secondary technical core area course with an elective from the same secondary technical core area list or obtain approval from a faculty advisor for course substitution. In the case of a duplicate mathematics course, the student must choose an approved mathematics or science course to replace it.

Academic Enrichment Technical Core Area

A student may choose the academic enrichment technical core area, but only as his or her secondary technical core area. For this core area, the student selects a minimum of fourteen hours of elective coursework to support his or her personal or career goals, which must include an upper-division course in either mathematics or science. Before registering for these courses, the student must prepare a career plan statement and a list of relevant electives; this plan must be approved by the undergraduate adviser.

These electives may include traditional upper-division technical courses in electrical engineering and other engineering fields; courses in other fields at the University that satisfy degree requirements, such as business, economics, communication, music, and philosophy; or research done with a faculty member in Electrical Engineering 3360, Special Problems in Electrical and Computer Engineering. The courses must be completed in residence; courses in an approved study abroad program require the approval of the undergraduate adviser. A minimum of 14 semester credit hours is required. The fourteen elective course hours must include at least eleven hours of upper division coursework, which may include Electrical Engineering 155R, Undergraduate Research Seminar, and Electrical Engineering 325L, Cooperative Engineering, or up to three hours in Electrical Engineering 125S, Internship in Electrical and Computer Engineering, but not both. Students selecting software engineering and design as their primary technical core and academic enrichment as their secondary technical core must also ensure that their program of work includes adequate hardware coursework. [No further changes to this section.]

Electrical Engineering Technical Cores

Communications, Signal Processing, Networks, and Systems
[No changes to this section.]

Electronics and Integrated Circuits
The electronics and integrated circuits technical core area involves the design and analysis of the circuits that provide the functionality of a system. The types of circuits that students encounter include analog and digital integrated circuits, radio frequency circuits, mixed signal (combination of analog and digital) circuits, power electronics, and biomedical electronics. The design and implementation of integrated circuits and systems using analog and digital building blocks are included in this core area. A student should choose this technical core area if he or she is interested in designing chips for applications, such as computing, telecommunications, and signal processing.
Students complete the following:

1. Electrical Engineering 325, Electromagnetic Engineering
2. Electrical Engineering 339, Solid-State Electronic Devices
3. Core laboratory course: Electrical Engineering 438, Fundamentals of Electronic Circuits I Laboratory
4. Core mathematics course: Mathematics 427L, Advanced Calculus for Applications II
5. Electrical Engineering 316, Digital Logic Design
6. Three courses from the following list:
   Electrical Engineering 321K, Mixed Signal and Circuits Laboratory
   Electrical Engineering 338K, Analog Electronics
   Electrical Engineering 338L, Analog Integrated Circuit Design
   Electrical Engineering 440, Integrated Circuit Nanomanufacturing Techniques Microwave Techniques Laboratory
   Electrical Engineering 445L, Embedded Systems Design Laboratory
   Electrical Engineering 445S, Real-Time Digital Signal Processing Laboratory
   Electrical Engineering 460M, Digital Systems Design Using HDL
   Electrical Engineering 460N, Computer Architecture
   Electrical Engineering 460R, Introduction to VLSI Design
   Electrical Engineering 362Q, Power Quality and Harmonics
   Electrical Engineering 362R, Renewable Energy and Power Systems
   Electrical Engineering 362S, Development of a Solar-Powered Vehicle
   Electrical Engineering 368L, Power Systems Apparatus and Laboratory
   Electrical Engineering 369, Power Systems Engineering
   Electrical Engineering 374K, Biomedical Electronic Instrument Design
   Electrical Engineering 374L, Applications of Biomedical Engineering

Energy Systems and Renewable Energy
This technical core area provides the foundation for a career in electric power systems, generation, grid operation, motors and drives, and renewable energy sources. This core area involves the study and design of reliable and economic electric power systems, including both traditional and renewable resources. Energy conversion involves conversion to and from electrical energy, including the study and design of electrical machines.

Students complete the following:

1. Electrical Engineering 325, Electromagnetic Engineering
2. Electrical Engineering 368L, Power Systems Apparatus and Laboratory or Electrical Engineering 369, Power Systems Engineering
3. Core laboratory course: Electrical Engineering 462L, Power Electronics Laboratory
4. Core mathematics course: Mathematics 427L, Advanced Calculus for Applications II
5. Electrical Engineering 362K, Introduction to Automatic Control
6. Three courses from the following list:
   Electrical Engineering 339, Solid-State Electronic Devices
   Electrical Engineering 341, Electric Drives and Machines
   Electrical Engineering 362Q, Power Quality and Harmonics
   Electrical Engineering 362R, Renewable Energy and Power Systems
   Electrical Engineering 362S, Development of a Solar-Powered Vehicle
   Electrical Engineering 368L, Power Systems Apparatus and Laboratory
   Electrical Engineering 369, Power Systems Engineering
   Mechanical Engineering 337C, Introduction to Nuclear Power Systems

Fields, Waves, and Electromagnetic Systems
Students in this technical core area study different aspects of applied electromagnetics, including antennas, radio wave propagation, microwave and radio frequency circuits and transmission structures, optical components and lasers, and engineering acoustics. A student should choose the electromagnetic engineering core area if he or she is interested in engineering that involves the physical layer in modern communication and radar systems. Graduates are well positioned for jobs in antenna design and testing, propagation channel characterization, microwave and radio frequency circuit design, electromagnetic emission testing from electronic devices and systems, radar system
design and development, optical telecommunication, optical information and signal processing systems, and component design and development.

Students complete the following:
1. Electrical Engineering 325, *Electromagnetic Engineering*
2. Electrical Engineering 339, *Solid-State Electronic Devices*
3. Core laboratory course: Electrical Engineering 438, *Fundamentals of Electronic Circuits I Laboratory* or Electrical Engineering 462L, *Power Electronics Laboratory*
4. Core mathematics course: Mathematics 427L, *Advanced Calculus for Applications II*
6. Three courses from the following list:
   - Electrical Engineering 321K, *Mixed Signal and Circuits Laboratory*
   - Electrical Engineering 325K, *Antennas and Wireless Propagation*
   - Electrical Engineering 341, *Electric Drives and Machines*
   - Electrical Engineering 347, *Modern Optics*
   - Electrical Engineering 348, *Laser and Optical Engineering*
   - Electrical Engineering 363M, *Microwave and Radio Frequency Engineering*
   - Electrical Engineering 363N, *Engineering Acoustics*
   - Electrical Engineering 369, *Power Systems Engineering*
   - Electrical Engineering 374K, *Biomedical Electronic Instrument Design*
   - Electrical Engineering 374L, *Applications of Biomedical Engineering*

*Nanoelectronics and Nanotechnology*
Students in this technical core area learn about the materials and devices used in modern electronic and optoelectronic systems. Through required and electives courses, students learn about the fundamentals of charge transport and interactions with light in semiconductors. They learn about devices beginning with diodes and transistors, the building blocks of integrated circuits, and extending to photodiodes, semiconductor lasers, photodetectors and photovoltaic devices. They learn about microelectronics fabrication techniques. And they are introduced to quantum mechanics, particularly as it applies to electronic and optoelectronic materials and devices. Students may also explore device applications through digital and analog circuit design. With exposure to the topics in this area, students are well positioned to work in a wide variety of fields that rely on semiconductor devices, such as computers, telecommunications, the automotive industry, and consumer electronics.

Students complete the following:
1. Electrical Engineering 325, *Electromagnetic Engineering*
2. Electrical Engineering 339, *Solid-State Electronic Devices*
4. Core mathematics course: Mathematics 427L, *Advanced Calculus for Applications II*
5. Four courses from the following list:
   - Electrical Engineering 334K, *Quantum Theory of Electronic Materials*
   - Electrical Engineering 438, *Fundamentals of Electronic Circuits*
   - Electrical Engineering 338L, *Analog Integrated Circuit Design*
   - Electrical Engineering 347, *Modern Optics*
   - Electrical Engineering 348, *Laser and Optical Engineering*
   - Electrical Engineering 360S, *Digital Integrated Circuit Design*
   - Electrical Engineering 339K or 379K, *Topic 4: Solar Energy Conversion Devices*

[No further changes.]