PROPOSED CHANGES TO THE BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING DEGREE PROGRAM IN THE COLLEGE/SCHOOL OF ENGINEERING CHAPTER IN THE *UNDERGRADUATE CATALOG 2018-2020* or *LAW SCHOOL CATALOG 2018-2020*

TYPE OF CHANGE:[1] ☒ Academic Change
☐ Degree Program Change (THECB[2] form required)

PROPOSED CLASSIFICATION:[3] ☒ Exclusive ☐ General ☐ Major

1. IF THE ANSWER TO ANY OF THE FOLLOWING QUESTIONS IS YES, THE COLLEGE MUST CONSULT LINDA DICKENS, DIRECTOR OF ACCREDITATION AND ASSESSMENT, TO DETERMINE IF SACSCOC APPROVAL IS REQUIRED.

- Is this a new degree program? Yes ☐ No ☒
- Is this program being deleted? Yes ☐ No ☒
- Does the program offer courses that will be taught off campus? Yes ☐ No ☒
- Will courses in this program be delivered electronically? Yes ☐ No ☒

2. EXPLAIN CHANGE TO DEGREE PROGRAM AND GIVE A DETAILED RATIONALE FOR EACH INDIVIDUAL CHANGE:

Item A: The requirements for the advanced portion of the degree are changing. In the existing requirements, students are required to select a primary area of specialization within the department and a secondary area of specialization within the department. Students can optionally choose the secondary area outside of the department using the "academic enrichment" specialization. In the new requirements, students will select only the primary area of specialization. The previous primary technical core and the primary technical electives are renamed to be the "advanced technical component" and "advanced technical component electives"; the actual requirements remain the same. The secondary technical component (comprising 14 SCH) is replaced entirely with a requirement of a set of free electives that meet some explicitly stated conditions of rigor, depth, and coverage of math and science (still comprising 14 SCH). These free electives can otherwise be chosen from courses within the department or elsewhere in the university. Finally, the "other requirement" of a "free elective" (3 SCH) is replaced with a requirement of an additional (in-department) advanced technical elective (3 SCH). The number of semester credit hours required for the degree remains the same.

The suggested arrangement of courses is actually the same for both the Electrical Engineering and the Computer Engineering degrees; the heading for Electrical Engineering has been revised to combine the two.

Item B: Added a new academic track title Data Science and Information Processing to provide an additional area of concentration under Computer Engineering.

3. THIS PROPOSAL INVOLVES: (Please check all that apply)

☐ Courses in other colleges	☐ Courses in proposer's college that are frequently taken by students in other colleges	☐ Flags
☐ Course in the core curriculum	☐ Change in course sequencing for an existing program	☐ Courses that have to be added to the inventory
☐ Change in admission requirements (external or internal)	☐ Requirements not explicit in the catalog language (e.g., lists of acceptable courses maintained by department office)	

4. SCOPE OF PROPOSED CHANGE:

a. Does this proposal impact other colleges/schools? Yes ☐ No ☒
If yes, then how would you do so?

b. Do you anticipate a net change in the number of students in your college? Yes ☐ No ☒
If yes, how many more (or fewer) students do you expect?

c. Do you anticipate a net increase (or decrease) in the number of students from outside of your college taking classes in your college? Yes ☐ No ☒
If yes, please indicate the number of students and/or class seats involved.

d. Do you anticipate a net increase (or decrease) in the number of students from your college taking courses in other colleges? Yes ☐ No ☒
If yes, please indicate the number of students and/or class seats involved.

If 4 a, b, c, or d was answered with yes, please answer the following questions:
If the proposal has potential budgetary impacts for another college/school, such as requiring new sections or a non-negligible increase in the number of seats offered, at least one contact must be at the college-level.

How many students do you expect to be impacted?
Impacted schools must be contacted and their response(s) included:
Person communicated with:
Date of communication:
Response:

e. Does this proposal involve changes to the core curriculum or other basic education requirements (42-hour core, signature courses, flags)? If yes, explain:
If yes, Undergraduate Studies must be informed of the proposed changes and their response included:
Person communicated with:
Date of communication:
Response:

f. Will this proposal change the number of hours required for degree completion? No
Note: THECB Semester Credit Hour Change Form required, download from URL:
http://www.thecb.state.tx.us/reports/DocFetch.cfm?DocID=2419&format=doc
If yes, explain:

5. COLLEGE/SCHOOL APPROVAL PROCESS

Department approval date:	April 23, 2017	Approved by whom: Electrical and Computer Engineering Faculty & Chair
College approval date:	May 24, 2017 (Item A)	Approved by whom: CSE Degrees & Courses Committee
	August 31, 2017 (Item B)	Approved by whom: CSE Degrees & Courses Committee
Dean approval date:	Sept. 18, 2017	Approved by whom: CSE Faculty; Sharon L. Wood, Dean

PROPOSED NEW CATALOG TEXT:[4]
See next page

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 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~~ an advanced technical component ~~core area~~ and a set of free electives from within or outside of the department~~; 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 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.

Student Outcomes

[Text unchanged]

Program Educational Objectives

[Text unchanged]

Portable Computing Devices

[Text unchanged]

Curriculum

[Introductory text unchanged]

Requirements		Hours
Electrical Engineering Courses		
E E 302	Introduction to Electrical Engineering (part II science and technology)	3
E E 306	Introduction to Computing	3
E E 411	Circuit Theory	4
E E 312	Software Design and Implementation I	3
or E E 312H	Software Design and Implementation I	
E E 313	Linear Systems and Signals	3
E E 319K	Introduction to Embedded Systems	3
E E 333T	Engineering Communication (writing flag)	3
E E 351K	Probability and Random Processes	3
E E 364D	Introduction to Engineering Design (writing flag)	3

or E E 364E	Interdisciplinary Entrepreneurship	
One of the following senior design project courses:		4
E E 464G	Multidisciplinary Senior Design Project (independent inquiry flag)	
E E 464H	Honors Senior Design Project (independent inquiry flag)	
E E 464K	Senior Design Project (independent inquiry flag)	
E E 464R	Research Senior Design Project (independent inquiry flag)	
E E 464S	Start-Up Senior Design Project	
~~Primary technical core: Core courses (six-seven hours), core laboratory course (four hours), advanced mathematics course (three-four hours)*~~		~~14~~
~~Primary core electives: Four courses (minimum 12 hours)~~		~~12~~
~~Secondary technical core: Core courses (six-seven hours), core laboratory course (three-four hours), advanced mathematics course (three-four hours)~~		~~14~~
Advanced technical component: Within an identified "core" : 2 core courses (six-seven hours), 1 core laboratory course (four hours), 1 advanced mathematics course (three-four hours) [14 hours total]		14
Advanced technical component electives: Within the same identified "core" : 4 courses (minimum 12 hours)		12
Advanced technical elective*: Within any core of Electrical Engineering : 1 upper division electrical engineering course (or EE316) (three-four hours)		3
Set of free electives: at least 14 hours of additional coursework taken for a letter grade, constrained by : must include at least 1 advanced mathematics or basic science course (3 hours); no more than 3 hours of lower-division coursework; all coursework must count for a major in the offering department; ~~no Credit by Exam, or dual credit coursework is allowed;~~ all coursework must be taken in residence, except that up to 3 credit hours can be transferred with approval; no course can duplicate a course the student has taken or is required to take as part of the other Electrical Engineering coursework requirements		14
Other Technical Courses		
Mathematics		
M 408C & M 408D	Differential and Integral Calculus and Sequences, Series, and Multivariable Calculus (mathematics; quantitative reasoning flag)	8
or		
M 408K & M 408L & M 408M	Differential Calculus and Integral Calculus and Multivariable Calculus	
M 427J	Differential Equations with Linear Algebra (quantitative reasoning flag)	4
or M 427K	Advanced Calculus for Applications I	
M 340L	Matrices and Matrix Calculations	3
Physics		
PHY 103M	Laboratory for Physics 303K	1
PHY 103N	Laboratory for Physics 303L	1
PHY 303K	Engineering Physics I (part I science and technology; quantitative reasoning flag)	3
PHY 303L	Engineering Physics II (part I science and technology; quantitative reasoning flag)	3
Rhetoric and Writing		
RHE 306	Rhetoric and Writing (English composition)	3
~~**Other Required Courses**~~		

~~Approved elective~~		~~3~~
Remaining Core Curriculum Courses		
E 316L	British Literature (humanities; ~~in E 316L, 316M, 316N, and 316P~~ some sections carry a global cultures or cultural diversity flag)	3
or E 316M	American Literature (humanities; some sections carry a global cultures or cultural diversity flag)	
or E 316N	World Literature (humanities; some sections carry a global cultures or cultural diversity flag)	
or E 316P	Masterworks of Literature (humanities; some sections carry a global cultures or cultural diversity flag)	
American and Texas government (some sections carry a cultural diversity flag)		6
American history (some sections carry a cultural diversity flag)		6
Visual and performing arts (some sections carry a global cultures and/or cultural diversity flag)		3
Social and behavioral science (some sections carry a global cultures and/or cultural diversity flag)		3
UGS 302	First-Year Signature Course (in UGS 302 all sections carry writing flag; ~~in UGS 303 some sections carry a writing flag~~)	3
or UGS 303	First-Year Signature Course (in UGS 303 some sections carry a writing flag)	
*EE Option: ~~Primary~~ Advanced Technical ~~Core~~ Component (mathematics) is four hours and one ~~Primary~~ Advanced Technical ~~Core~~ Component Requirement is three hours		
*CE Option: ~~Primary~~ Advanced Technical ~~Core~~ Component (mathematics) is three hours and one ~~Primary~~ Advanced Technical ~~Core~~ Component Elective is four hours		
Total Hours		125

Integrated BSEE/MSE program

The integrated degree program results in simultaneously awarding a Bachelor of Science in Electrical Engineering: Integrated Option (BSEE) degree, and a Master's of Science in Engineering (MSE) degree in any one of the ten graduate tracks offered by the graduate program in electrical and computer engineering (ECE).

There are two stages to admission, an informal non-binding department based stage and a second stage in which the student formally applies to the Graduate School within the integrated BSEE/MSE program and within one of the available ECE graduate tracks. At stage one, undergraduate students in the ECE department may apply to the integrated degree program after qualifying for admission to major sequence. The purpose of stage one is primarily to provide appropriate advising to students interested in and appropriate for the integrated program. Admission to the integrated program at stage one is based on the applicant's grade point average, letters of recommendation, a statement of purpose, and other relevant examples of academic ability and leadership. Students will be advised by the integrated program adviser about the appropriate courses to take and reserve for graduate credit in their senior year in order to complete the integrated program as efficiently as possible. As for admission to the regular standalone MSE program, all admissions decisions at stage two are made by the admissions committee in the respective graduate track, with admission requirements set by the graduate track, with the exception that Graduate Record Exam (GRE) test scores are not required of integrated program participants. While optimal, application and admission at stage one are not required for application and admission to the integrated program at stage two.

The integrated program requires 120 semester credit hours (SCH) for the BSEE portion of the integrated program, as opposed to the 125 SCH minimum required for the BSEE degree alone. Students in the integrated program begin taking graduate courses as seniors. Students admitted to the integrated program will normally take and reserve for graduate credit two graduate courses in place of approved electives from the ~~primary and secondary~~ advanced technical ~~cores~~ coursework that would *otherwise* be required in the regular/standalone BSEE program. However, precisely which BSEE electives are to be replaced by the graduate courses can be adjusted as approved by technical core faculty advisers.

Students in this program will receive the BSEE and MSE degrees simultaneously after successfully completing a minimum total of 150 semester credit hours, 30 of which must qualify for the MSE program of work in electrical and computer engineering. Students unable to successfully complete the integrated program may obtain a BSEE degree by satisfying all of the requirements for the standalone BSEE degree. Since the regular BSEE degree requirements are a subset of the Integrated BSEE/MSE Program degree requirements, an undergraduate student should still be on a trajectory to graduate with the regular BSEE degree in the

same timeframe that the student was on when applying to the Integrated BSEE/MSE Program. A student dismissed from the integrated program while a graduate student should already meet the degree requirements for the regular BSEE degree.

Information regarding the integrated program requirements and policies may be obtained from the ECE advising offices.

Upper-Division Technical ~~Core~~ Component Areas

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

For all technical ~~core~~ component 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 adviser 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 14 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 160, 260, 360, or 460, *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, which may include Electrical Engineering 155R, *Undergraduate Research Seminar* and 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. That is:~~

1. ~~If the senior design project consists of software only, then the electives include at least two of the following: Electrical Engineering 316, Electrical Engineering 445L, Electrical Engineering 445M.~~
2. ~~If the senior design project involves a significant hardware design component, then the electives must include at least one of the following: Electrical Engineering 316, Electrical Engineering 445L, Electrical Engineering 445M.~~

Electrical Engineering Advanced Technical ~~Cores~~ Component Areas

Communications, Signal Processing, Networks, and Systems

Communications, signal processing, networks, and systems broadly encompasses the principles underlying the design and implementation of systems for information transmission. The field considers how information is represented, compressed, and transmitted on wired and wireless links and how communication networks can be, and are, designed and operated. A student who chooses this technical ~~core~~ component area should recognize that communications and networking is a broad application domain where many engineering tools come into play: from circuit design for wireless phones to embedded network processors to system and application software for networked systems.

Students complete the following:

1. Electrical Engineering 325, *Electromagnetic Engineering*
2. Either Electrical Engineering 351M, *Digital Signal Processing* or Electrical Engineering 362K, *Introduction to Automatic Control*
3. Core laboratory course: Electrical Engineering 445S, *Real-Time Digital Signal Processing Laboratory*
4. Core mathematics course: Mathematics 427L, *Advanced Calculus for Applications II*
5. Four courses from the following list:
   Electrical Engineering 325K, *Antennas and Wireless Propagation*

Electrical Engineering 351M, *Digital Signal Processing*
Electrical Engineering 360C, *Algorithms*
Electrical Engineering 360K, *Introduction to Digital Communications*
Electrical Engineering 361M, *Introduction to Data Mining*
Electrical Engineering 362K, *Introduction to Automatic Control*
Electrical Engineering 363M, *Microwave and Radio Frequency Engineering*
Electrical Engineering 370K, *Computer Control Systems*
Electrical Engineering 370N, *Introduction to Robotics and Mechatronics*
Electrical Engineering 471C, *Wireless Communications Laboratory*
Electrical Engineering 371R, *Digital Image and Video Processing*
Electrical Engineering 372N, *Telecommunication Networks*
Mathematics 325K, *Discrete Mathematics*
Mathematics 362M, *Introduction to Stochastic Processes (*carries a quantitative reasoning flag*)*
Mathematics 365C, *Real Analysis I*

Electronics and Integrated Circuits

The electronics and integrated circuits technical ~~core~~ component 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~~ component 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 438K, *Analog Electronics*
   Electrical Engineering 338L, *Analog Integrated Circuit Design*
   Electrical Engineering 440, *Integrated Circuit Nanomanufacturing Techniques*
   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 360S, *Digital Integrated Circuit Design*
   Electrical Engineering 361R, *Radio-Frequency Electronics*
   Electrical Engineering 363M, *Microwave and Radio Frequency Engineering*
   Electrical Engineering 374K, *Biomedical Electronic Instrument Design*
   Electrical Engineering 374L, *Applications of Biomedical Engineering*

Energy Systems and Renewable Energy

This technical ~~core~~ component 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 339S, *Solar Energy Conversion 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~~ component 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*
5. Either Electrical Engineering 325K, *Antennas and Wireless Propagation* or Electrical Engineering 363M, *Microwave and Radio Frequency Engineering*
6. Three courses from the following list:
   Electrical Engineering 321K, *Mixed Signal and Circuits Laboratory*
   Electrical Engineering 325K, *Antennas and Wireless Propagation*
   Electrical Engineering 334K, *Quantum Theory of Engineering Electronic Materials*
   Electrical Engineering 341, *Electric Drives and Machines*
   Electrical Engineering 347, *Modern Optics*
   Electrical Engineering 348, *Laser and Optical Engineering*
   Electrical Engineering 361R, *Radio-Frequency Electronics*
   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~~ component 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*
3. Core laboratory course: Electrical Engineering 440, *Integrated Circuit Nanomanufacturing Techniques*
4. Core mathematics course: Mathematics 427L, *Advanced Calculus for Applications II*
5. Four courses from the following list:
   Electrical Engineering 334K, *Quantum Theory of Engineering Electronic Materials*

Electrical Engineering 438, *Fundamentals of Electronic Circuits I Laboratory*
Electrical Engineering 338L, *Analog Integrated Circuit Design*
Electrical Engineering 339S, *Solar Energy Conversion Devices*
Electrical Engineering 347, *Modern Optics*
Electrical Engineering 348, *Laser and Optical Engineering*
Electrical Engineering 360S, *Digital Integrated Circuit Design*
Electrical Engineering 438, *Fundamentals of Electronic Circuits I Laboratory*
Electrical Engineering 460R, *Introduction to VLSI Design*

Computer Engineering Advanced Technical ~~Core~~ Component Areas

Computer Architecture and Embedded Systems

Computer architecture involves understanding the operation and design of computers on many different levels. These levels include the instruction set, microarchitecture, and logic design. Embedded systems represent the combination of software and hardware that are designed to perform specific functions. These systems may be stand-alone items or an integral part of a larger system. Within this technical ~~core~~ component area, students are exposed to logic design, programming, computer architecture, systems design, and digital signal processing. The student studying computer architecture will be well positioned to join the microprocessor design industry as a logic designer or a circuit designer. After a good deal of experience on the job, the student would be well positioned to become the chief architect of a new design.

Jobs in embedded systems involve defining, designing, and fabricating application-specific processors and computers in areas such as automotive electronics, consumer devices, and telecommunications.

Students complete the following:

1. Electrical Engineering 316, *Digital Logic Design*
2. Electrical Engineering 460N, *Computer Architecture*
3. Core laboratory course: Electrical Engineering 445L, *Embedded Systems Design Laboratory*
4. Core mathematics course: Mathematics 325K, *Discrete Mathematics*
5. Electrical Engineering 360C, *Algorithms*
6. Three courses from the following list:
   Electrical Engineering 422C, *Software Design and Implementation II*
   Electrical Engineering 445M, *Embedded and Real-Time Systems Laboratory*
   Electrical Engineering 445S, *Real-Time Digital Signal Processing Laboratory*
   Electrical Engineering 460M, *Digital Systems Design Using HDL*
   Electrical Engineering 360P, *Concurrent and Distributed Systems*
   Electrical Engineering 460R, *Introduction to VLSI Design*
   Electrical Engineering 362K, *Introduction to Automatic Control*
   Computer Science 375, *Compilers*

Software Engineering and Design

Courses in this area cover the engineering life cycle of software systems, including requirement analysis and specification, design, construction/programming, testing, deployment, maintenance, and evolution. Area courses are intended to teach students theory, practical methods, and tools for designing, building, delivering, maintaining, and evolving software to meet stakeholder requirements. Every software engineer must understand how software systems operate and how they can be used to solve engineering problems and deliver solutions. The courses in this area are designed to educate students about a diverse and relevant set of technologies and about the ways that technology can be used to design and build software systems.

Students complete the following:

1. Electrical Engineering 422C, *Software Design and Implementation II*
2. Electrical Engineering 360C, *Algorithms*
3. Core laboratory course: Electrical Engineering 461L, *Software Engineering and Design Laboratory*
4. Core mathematics course: Mathematics 325K, *Discrete Mathematics*
5. Four courses from the following list:
   Electrical Engineering 316, *Digital Logic Design*
   Electrical Engineering 445L, *Embedded Systems Design Laboratory*
   Electrical Engineering 445M, *Embedded and Real-Time Systems Laboratory*
   Electrical Engineering 360F, *Introduction to Software Engineering*
   Electrical Engineering 460N, *Computer Architecture*

Electrical Engineering 360P, *Concurrent and Distributed Systems*
Electrical Engineering 361Q, *Requirements Engineering*
Electrical Engineering 372N, *Telecommunication Networks*
Electrical Engineering 360T, *Software Testing*
Electrical Engineering 361M, *Introduction to Data Mining*

Data Science and Information Processing

This technical core trains students in information and signal processing, data mining as well as decision and control algorithms. Applications include data analytics, machine learning, sound and image processing as well as knowledge extraction and actuation.

Students complete the following:

1. Electrical Engineering 461P, *Data Science Principles*
2. Electrical Engineering 360C, *Algorithms*
3. Core laboratory course: Electrical Engineering 479K, *Data Science Laboratory*
4. Core mathematics course: Mathematics 325K, *Discrete Mathematics*
5. Electrical Engineering 351M, *Digital Signal Processing*
6. Three courses from the following list:

Electrical Engineering 422C, *Software Design and Implementation II*
Electrical Engineering 445S, *Real-Time Digital Signal Processing Laboratory*
Electrical Engineering 360P, *Concurrent and Distributed Systems*
Electrical Engineering 361C, *Multicore Computing*
Electrical Engineering 461L, *Software Engineering and Design Laboratory*
Electrical Engineering 362K, *Introduction to Automatic Control*
Electrical Engineering 471C, *Wireless Communications Laboratory*
Electrical Engineering 371R, *Digital Image and Video Processing*
Electrical Engineering 379K, *Architecture for Big Data Science*

Alternate Mathematics Courses

For students who choose ~~both primary and secondary~~ an advanced technical ~~core~~ component area~~s~~ in computer engineering:

Mathematics 427L, *Advanced Calculus for Applications II*
Mathematics 328K, *Introduction to Number Theory*
Mathematics 343K, *Introduction to Algebraic Structures*
Mathematics 344K, *Intermediate Symbolic Logic*
Mathematics 348, *Scientific Computation in Numerical Analysis (*carries a quantitative reasoning flag*)*
Mathematics 358K, *Applied Statistics (*carries a quantitative reasoning flag*)*
Mathematics 374M, *Mathematical Modeling in Science and Engineering*
Computer Science 341, *Automata Theory*
Computer Science 346, *Cryptography*

For students who choose ~~both primary and secondary~~ an advanced technical ~~core~~ component area~~s~~ in electrical engineering:

Mathematics 325K, *Discrete Mathematics*
Mathematics 328K, *Introduction to Number Theory*
Mathematics 346, *Applied Linear Algebra*
Mathematics 348, *Scientific Computation in Numerical Analysis (*carries a quantitative reasoning flag*)*
Mathematics 358K, *Applied Statistics (*carries a quantitative reasoning flag*)*
Mathematics 361, *Theory of Functions of a Complex Variable*
Mathematics 362M, *Introduction to Stochastic Processes*
Mathematics 372K, *Partial Differential Equations and Applications*
Mathematics 374, *Fourier and Laplace Transforms*
Mathematics 374M, *Mathematical Modeling in Science and Engineering*

SUGGESTED ARRANGEMENT OF COURSES: ELECTRICAL ENGINEERING AND COMPUTER ENGINEERING

Electrical and Computer Engineering Curriculum - Advanced Technical Component: ~~Electrical Engineering~~

First Year

First Term	Hours	**Second Term**	Hours
E E 302	3	E E 319K	3
E E 306	3	M 408D	4
M 408C	4	PHY 303K	3
RHE 306	3	PHY 103M	1
UGS 302 or 303	3	Visual and performing arts or social and behavioral sciences	3
	16		14

Second Year

First Term	Hours	**Second Term**	Hours
E E 411	4	E 316L, 316M, 316N, or 316P	3
M 427J or 427K	4	E E 312	3
PHY 303L	3	E E 313	3
PHY 103N	1	GOV 310L	3
Visual and performing arts or social and behavioral sciences	3	M 340L	3
	15		15

Third Year

First Term	Hours	**Second Term**	Hours
E E 333T	3	~~Secondary technical core (mathematics)~~ Advanced technical elective	3
E E 351K	3	~~Secondary technical core laboratory~~ Free elective (mathematics or basic science)	4
~~Primary~~ Advanced technical ~~core~~ component (mathematics)*	3 or 4	~~Secondary technical core requirement~~ Free elective (satisfying constraints)	4
~~Primary~~ Advanced technical ~~core~~ component laboratory	4	~~Primary~~ Advanced technical ~~core~~ component requirement*	3 or 4
Advanced technical ~~core~~ component requirement	3	~~Primary~~ Advanced technical ~~core~~ component elective	3
	17		17

Fourth Year

First Term	Hours	**Second Term**	Hours
E E 364D	3	E E 464C, 464G, 464H, 464K, or 464R	4
American history	3	GOV 312L	3

~~Secondary technical core requirement~~ Free elective (satisfying constraints)	3	American history	3
Advanced ~~Primary~~ technical ~~core~~ component electives	6	~~Primary~~ Advanced technical ~~core~~ component elective	3
		~~Approved elective~~ Free elective (satisfying constraints)	3
	15		16

Total credit hours: 125

*EE Option: ~~Primary~~ Advanced Technical ~~Core~~ Component ~~(~~mathematics~~)~~ is 4 hours and one ~~Primary~~ Advanced Technical ~~Core Requirement~~ Component elective is 3 hours.

*CE Option: ~~Primary~~ Advanced Technical ~~Core~~ Component ~~(~~mathematics~~)~~ is 3 hours and one ~~Primary~~ Advanced Technical ~~Core~~ Component ~~E~~elective is 4 hours.

~~SUGGESTED ARRANGEMENT OF COURSES: COMPUTER ENGINEERING~~

~~Electrical and Computer Engineering Curriculum – Primary Technical Core: Computer Engineering~~

~~First Year~~

~~First Term~~	~~Hours~~	**~~Second Term~~**	~~Hours~~
~~E E 302~~	~~3~~	~~E E 319K~~	~~3~~
~~E E 306~~	~~3~~	~~M 408D~~	~~4~~
~~M 408C~~	~~4~~	~~PHY 303K~~	~~3~~
~~RHE 306~~	~~3~~	~~PHY 103M~~	~~1~~
~~UGS 302 or 303~~	~~3~~	~~Visual and performing arts or social and behavioral sciences~~	~~3~~
	~~16~~		~~14~~

~~Second Year~~

~~First Term~~	~~Hours~~	**~~Second Term~~**	~~Hours~~
~~E E 411~~	~~4~~	~~E 316L, 316M, 316N, or 316P~~	~~3~~
~~M 427J or 427K~~	~~4~~	~~E E 312~~	~~3~~
~~PHY 303L~~	~~3~~	~~E E 313~~	~~3~~
~~PHY 103N~~	~~1~~	~~GOV 310L~~	~~3~~
~~Visual and performing arts or social and behavioral sciences~~	~~3~~	~~M 340L~~	~~3~~
	~~15~~		~~15~~

~~Third Year~~

~~First Term~~	~~Hours~~	**~~Second Term~~**	~~Hours~~
~~E E 333T~~	~~3~~	~~Secondary technical core (mathematics)~~	~~3-4~~
~~E E 351K~~	~~3~~	~~Secondary technical core laboratory~~	~~4~~
~~Primary technical core (mathematics)~~	~~3~~	~~Secondary technical core requirement~~	~~3~~
~~Primary technical core laboratory~~	~~4~~	~~Primary technical core requirement~~	~~3~~
~~Primary technical core requirement~~	~~4~~	~~Primary technical core (elective)~~	~~3~~
	~~17~~		~~16-17~~

~~Fourth Year~~

~~First Term~~	~~Hours~~	**~~Second Term~~**	~~Hours~~
~~E E 364D~~	~~3~~	~~E E 464C, 464G, 464H, 464K, or 464R~~	~~4~~
~~American history~~	~~3~~	~~GOV 312L~~	~~3~~
~~Secondary technical core requirement*~~	~~4~~	~~American history~~	~~3~~
~~Primary technical core electives~~	~~6~~	~~Primary technical core elective~~	~~3~~
		~~Approved elective~~	~~3~~
	~~16~~		~~16~~

~~Total credit hours: 125-126~~

~~* 3 credit hours needed if choosing a secondary electrical engineering technical core.~~

~~EE Option: Primary Technical Core (mathematics) is 4 hours and one Primary Technical Core Requirement is 3 hours~~

~~CE Option: Primary Technical Core (mathematics) is 3 hours and one Primary Technical Core Elective is 4 hours~~

[1] See https://facultycouncil.utexas.edu/degree-program-changes for detailed explanations.
[2] Submit required Texas Higher Education Coordinating Board forms to the provost's office (lydia.cornell@austin.utexas.edu); downloadable from URL https://facultycouncil.utexas.edu/thecb-forms
[3] **EXCLUSIVE**: of *exclusive* application and of primary interest only to a single college or school ("no protest" period is *seven calendar days*); **GENERAL**: of *general* interest to more than one college or school (but not for submission to the General Faculty) ("no protest" period is *fourteen calendar days); major* legislation must be submitted to the General Faculty for adoption ("no protest" period is *fourteen calendar days)*.
[4] The proposed text should be based on the text of the current catalog available at: http://catalog.utexas.edu/undergraduate/
Strike through and replace (with underlines) only the specific language to be changed. Do NOT use track changes, and do not include hyperlinks in the catalog copy. Submit form electronically to the Office of the General Faculty and Faculty Council at fc@austin.utexas.edu. For questions on completing this section, please contact Victoria Cervantes, fc@austin.utexas.edu, 471-5934 or Brenda Schumann, brenda.schumann@austin.utexas.edu, 475-7654.