EXECUTIVE COMMITTEE
BOURNS COLLEGE OF ENGINEERING

REPORT TO THE RIVERSIDE DIVISION
MAY 23, 2017

To be adopted:

Proposed Changes to Electrical and Computer Engineering Major

PRESENT:	**PROPOSED:**
Undergraduate Program Focus Areas	**Undergraduate Program Focus Areas**
The electrical engineering undergraduate program offers the following focus areas:	[no change]
1.Communications, Signal Processing and Networking Fundamental and state-of-the-art theory and applications of ~~communications, networking of devices, and related signal processing, involving information sources in the form of audio, video, image and text messages and transmission media of wire, wireless (radio frequency), fiber optics, etc.~~	1. Communications, Signal Processing and Networking: Fundamental and state-of-the-art theory and applications of acquisition, processing, and transmission of digital signals and images over wire, wireless (radio frequency), fiber optics, etc. Example applications include speech processing and recognition, mobile communication using smartphones, fiber optical communication, image enhancement and compression.
2.Control and Robotics ~~Theory and design of control of systems and robots.~~ Example applications include control systems in automotive, satellite, aircraft, computer hard drive, robotic manufacturing, autonomous robots, cell phone signal tracking~~, among others.~~	2. Control, Robotics and Machine Intelligence: Theory and design of control of systems and robots, and systems capable of intelligent decisions. Example applications include control systems in automotive, satellite, aircraft, computer hard drive, robotic manufacturing, autonomous robots, cell phone signal tracking, computer vision and intelligent transportation systems.
~~3.Intelligent Systems Theory, design and development of systems capable of intelligent decisions. Example applications include video surveillance systems, medical imaging devices, intelligent transportation systems, and manufacturing automation.~~	3. Embedded Systems and VLSI: Theory, design and methodologies of embedded system using microcontrollers, very large scale, nanometer integrated circuits. Example applications include smart home appliances, Internet of Things, microprocessors, analog and mixed signal circuits, RF circuits for cell phones and wireless networks, system-on-chip and wireless networks, system-on-chip.
4.Nanotechnology, Advanced Materials and Devices Synthesis and characterization of advanced materials at nanometer scale, theory, design and fabrication of electronic	4. [no change]

and optoelectronic devices. Example applications include creation of ultra-fast low-power transistors, efficient solar cells for energy generation, high-density memory for smart phones and mobile services, and tiny devices for medical applications.	
5.Power Engineering Power electronics, AC and DC power and their conversion, electro-mechanical energy conversion, electric motors, large-scale power generation and transmission systems, long-distance transmission and distribution of electric power, design of motion control drive circuits for robotic and industrial automation systems, and other related topics.	5. [no change]
~~6.VLSI Design and Systems Theory, design and methodologies of very large scale, nanometer integrated circuits. Example applications include microprocessors, analog and mixed signal circuits, RF circuits for cell phones New (SOC), application specific integrated circuits (ASIC).~~	
All undergraduates in the College of Engineering must see an advisor at least annually. For details, visit student.engr.ucr.edu.	[no change]
University Requirements See Undergraduate Studies section.	[no change]
College Requirements See The Marlan and Rosemary Bourns College of Engineering, Colleges and Programs section. The Electrical Engineering major uses the following major requirements to satisfy the college's Natural Sciences and Mathematics breadth requirement.	[no change]
1.One course in the biological sciences chosen from an approved list	
2.CHEM 001A, CHEM 01LA	
3.MATH 008B or MATH 009A	
4.PHYS 040A, PHYS 040B	
Major Requirements	
1.Lower-division requirements (73 units)	[no change]

a) One course in the biological sciences chosen from an approved list
b) CHEM 001A, CHEM 01LA
c) CS 010, CS 013, CS 061
d) EE 001A, EE 01LA, EE 001B, EE 010, EE 020
e) MATH 008B or MATH 009A, MATH 009B, MATH 009C, MATH 010A, MATH 010B, MATH 046
f) PHYS 040A, PHYS 040B, PHYS 040C

2.Upper-division requirements (~~82~~ units)
a) EE 100A, EE 100B, EE 105, EE 110A, EE110B, EE 114, ~~EE 115,~~ EE 116, EE 132, EE 141, EE 175A, EE 175B

b) ~~CS 120A/EE 120A, CS 120B/EE 120B~~
c) ENGR ~~180W~~
d) ~~Twenty (20)~~ units of technical electives ~~(chosen with the approval of a faculty advisor)~~ from ~~CS 122A, CS 130,~~ CS 161, CS 168/EE 168; EE 117, EE 123, EE 128, ~~EE 133~~, ~~EE 134,~~ EE 135, EE 136, EE 137, EE 138, EE 139, ~~EE 140,~~ EE 144, EE 145/ME 145, EE 146, EE 150, EE 151, EE 152, EE 153, EE 155, ~~EE 160,~~ EE 162, EE 165, ENGR 160

The choice of technical electives ~~must ensure that the upper division requirements include~~ at least one coherent sequence of at least three (3) electrical engineering courses ~~to ensure depth in one area of electrical engineering.~~

2.Upper-division requirements (81 units)
a) EE 100A, EE 100B, EE 105, EE 110A, EE110B, EE 114, EE 116, CS 120A/EE 120A, CS 120B/EE 120B, EE 132, EE 133, EE 141, EE 175A, EE 175B
b) One of EE 128 or EE 155
c) ENGR 181W
d) Sixteen (16) units of technical electives chosen from CS 161, CS 168/EE 168; EE 115, EE 117, EE 123, EE 128 (if not chosen as a required course in b) above), EE 135, EE 136, EE 137, EE 138, EE 139, EE 144, EE 145/ME 145, EE 146, EE 150, EE 151, EE 152, EE 153, EE 155 (if not chosen as a required course in b) above), EE 162, EE 165, ENGR 160

To ensure depth, the choice of technical electives must include at least one coherent sequence of at least three (3) electrical engineering courses (lead course plus two additional) in one focus area of electrical engineering, as defined below.

- Communications, Signal Processing and Networking. Lead Course: EE 141. Sequence Courses: EE 115, EE 117, EE 128, EE 146, EE 150, EE 152, ENGR 160
- Control, Robotics and Machine Intelligence. Lead Course: EE 132. Sequence Courses: EE 128, EE 144, EE 145/ME 145, EE 146, EE 151, EE 152, ENGR 160
- Embedded Systems and VLSI. Lead Course: EE 128. Sequence Courses: EE 135, EE 165, CS 168/EE 168, CS 161, ENGR 160
- Nanotechnology, Advanced Materials and Devices. Lead Course: EE 133. Sequence Courses: EE 117, EE 134, EE 135, EE 136,

EE 137, EE 138, EE 139, EE 162, EE 165, CS 168/EE 168, ENGR 160

- Power Engineering. Lead Course: EE 155. Sequence Courses: EE 123, EE 128, EE 153, ENGR 160

Justification:
Prompted by the UC system's request to review upper-division curriculum and the department's Board of Industrial Advisors, the ECE department completed a review of its UG curriculum. When the ECE department was first established, all faculty members were in the system's area—there were no faculty member in nanotechnology, VLSI design, and power systems. The department has expanded into these new areas with growth in faculty and new technology trends. However, the upper-division required courses and tech electives have remained the same and are outdated. The required courses focus exclusively on systems so the proposed changes better meet the educational objectives of the program; ensures both depth and breadth in the 5 identified research and education areas within ECE department; and are easier for students to understand and follow. The total-upper division units remain the same, but the proposed course changes meet the ABET outcome objectives and student needs much better.

1. EE 134 is deleted because it has been incorporated within the curriculum of EE/CS 168.
2. EE160 does not exist as a course.
3. CS 122A substantially duplicates the content in EE 128, it is thus removed as a tech elective.
4. Total upper-division unit value was previously incorrect.
5. EE 140 was already voted upon and has been submitted in CRAMS to be removed.
6. ENGR 181W change has already been voted on and is already in progress.

Approvals:

Approved by the faculty of the Department of Electrical & Computer Engineering:	November 2, 2016
Approved by the Executive Committee of the College of Engineering:	January 11, 2017
Approved by the Committee on Educational Policy:	April 24, 2017