Specialization Area Courses 2014-2015

ECE undergraduate degrees are organized around a core of required courses and a selection of elective courses from four Specialization Areas: Computer Engineering, Neuroengineering, Photonics and Nanoengineering, and Systems: Control, Communication, Networks and Signal Processing. The Computer Engineering area provides a broad background in computer systems engineering, including computer architecture, digital hardware engineering, software engineering, and computer systems performance analysis. Neural engineering is an emerging discipline that exploits engineering techniques to understand, repair, manipulate, or treat the diseases of human neural systems and networks. The Photonics and Nanoengineering area encompasses studies of electronic materials, including nanomaterials, semiconductor and optoelectronic devices, lasers and their applications. The Systems area focuses on wireless communication systems, digital signal processing, image processing and networking. The specialization electives provide the flexibility to create a focus that crosses traditional areas.

The BSEE requires six specialization courses from at least two areas, (in addition to the Design Lab choice of ELEC 327, 332, or 364), including at least three courses in one area. The BA program requires four courses, including at least two courses in one area, and courses from at least two areas.

The department may add or delete courses from the areas. In addition, ELEC graduate courses in the 500-level series and equivalent courses from other departments may be used to satisfy specialization area requirements with permission. Consult departmental advisors and the ECE website: www.ece.rice.edu for the latest information.

### Computer Engineering
- ELEC 323† Principles of Parallel Programming
- ELEC 342 Analog Electronic Circuits
- ELEC 345 Introduction to Computer Vision
- ELEC 419 Innovation Lab for Mobile Health
- ELEC 420† Design and Analysis of Algorithms
- ELEC 421† Operating Systems and Concurrent Programs
- ELEC 424 Mobile & Embedded System
- ELEC 425 Computer Systems Architecture
- ELEC 427 Adv. Digital Design & Implement
- ELEC 429† Introduction to Computer Networks
- ELEC 446 Mobile Device Applications
- COMP 321† Introduction to Computer Systems
- COMP 430† Introduction to Database Systems

### Neuroengineering
- ELEC 342 Analog Electronic Circuits
- ELEC 345 Introduction to Computer Vision
- ELEC 381 Fundamentals of Electrophysiology
- ELEC 431 Digital Signal Processing
- ELEC 480 Introduction to Neuroengineering
- ELEC 481 Comp/Neuroscience/Neural Engr.
- ELEC 482 Physiological Control Systems
- ELEC 485 Fundamentals of Medical Imaging I
- ELEC 486 Fundamentals of Medical Imaging II
- ELEC 488 Theoretical Neuroscience I
- ELEC 489 Theoretical Neuroscience II

### Photonics, Electronics and Nano-devices
- ELEC 262 Introduction to Waves and Photonics
- ELEC 306 Applied Electromagnetics
- ELEC 342 Analog Electronic Circuits
- ELEC 361 Quantum Mechanics For Engineers
- ELEC 365 Nanomaterials for Energy
- ELEC 462 Optoelectronic Devices
- PHYS 302 Intermediate Electrodynamics
- PHYS 311 Introduction to Quantum Physics I

### Systems: Communications, Control, Networks and Signal Processing
- ELEC 302 Introduction to Systems
- ELEC 306 Applied Electromagnetics
- ELEC 345 Introduction to Computer Vision
- ELEC 430 Digital Communication
- ELEC 431 Digital Signal Processing
- ELEC 433 Architecture for Wireless Communications
- ELEC 434 Digital Signal Processing Lab
- ELEC 435 Electromechanical Devices and Systems
- ELEC 436 Fundamentals of Control Systems
- ELEC 437 Intro to Communication Network
- ELEC 438 Wireless Networking for Urban Communities
- ELEC 439 Digital Image Processing
- ELEC 498 Introduction to Robotics

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1 Note: The courses marked above with a plus (+), ELEC 323/COMP 322, ELEC 420/COMP 482, ELEC 421/COMP 421, ELEC 429/COMP 429, ELEC 488/CAAM 415, ELEC 489/CAAM 416, COMP 221 and COMP 430 are courses listed or cross-listed with Computer Science. The sequence of COMP 140, COMP 182, and COMP 215 is recommended in addition for the Computer Engineering Area, as these are prerequisites for the cross-listed Computer Science courses.

Note: ELEC 301 is a required course for the BSEE degree; however, ELEC 301 can count as a specialization course for the BA degree. If the Design Lab requirement (ELEC 327, 332, or 364) is satisfied with the lab in the student’s chosen Major Specialization Area, then the student takes 3 of the 6 courses in the chosen Major Area; however, if the Design Lab requirement is satisfied with the lab in the student’s Minor Area, then it is recommended that he/she take 4 of the 6 courses in his/her chosen Major Area. It is important to consult a departmental advisor in this situation or if interested in taking a second Design Lab course.