

**Specialization Area Courses 2013-2014**

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](http://www.ece.rice.edu) for the latest information.

**Computer Engineering**

ELEC 323<sup>†</sup> Principles of Parallel Programming  
 ELEC 342 Analog Electronic Circuits  
 ELEC 345 Introduction to Computer Vision  
 ELEC 419 Innovation Lab for Mobile Health  
 ELEC 420<sup>†</sup> Design and Analysis of Algorithms  
 ELEC 421<sup>†</sup> Operating Systems and Concurrent Programs  
 ELEC 424 Mobile & Embedded System  
 ELEC 425 Computer Systems Architecture  
 ELEC 427 Adv Digital Design & Implement  
 ELEC 429<sup>†</sup> Introduction to Computer Networks  
 ELEC 446 Mobile Device Applications  
 COMP 221<sup>†</sup> Introduction to Computer Systems  
 COMP 430<sup>†</sup> 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/Neura Engr.  
 ELEC 482 Physiological Control Systems  
 ELEC 485 Fundamentals of Medical Imaging I  
 ELEC 486 Fundamentals of Medical Imaging II  
 ELEC 489 Theoretical Neuroscience II

**Photonics and Nanoengineering**

ELEC 262 Introduction to Waves and Photonics  
 ELEC 306 Applied Electromagnetics  
 ELEC 342 Analog Electronic Circuits  
 ELEC 361 Quantum Mechanics For Engineers  
 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 Under-Resourced Urban Communities  
 ELEC 439 Digital Image Processing  
 ELEC 446 Mobile Device Applications

<sup>†</sup>**Note:** -ELEC 323/COMP 322, ELEC 420/COMP 482, ELEC 421/COMP 421, ELEC 429/COMP 429, COMP 221 and COMP 430 are courses listed or crosslisted with Computer Science. Additional prerequisites have been added for 2012-2013.

-COMP 140 followed by COMP 211 or the sequence of COMP 182, COMP 215, COMP 221 are recommended in addition for the Computer Engineering Area  
 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 Laboratory requirement (ELEC 327, 332, or 364) is satisfied with the lab in their chosen Major Specialization-Area, then the student takes 3 of 6 courses in their chosen Major Specialization Area. However, if the Design Laboratory requirement is satisfied with the lab in their Minor Area, then it is recommended that the student takes 4 (four) of 6 courses in their chosen Major Specialization Area. It is important to consult a departmental advisor in this situation or if interested in taking a second Design Laboratory course.