

ELECTRICAL ENGINEERING - ROBOTICS AND CONTROLS CONCENTRATION

Department: Electrical and Computer Engineering (<https://catalog.bradley.edu/undergraduate/engineering-technology/electrical-computer-engineering/>)

The baccalaureate program in electrical engineering is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org> (<https://www.abet.org/>).

Department Mission and Educational Objectives

Department Mission: the mission of the Electrical and Computer Engineering Department is to educate the next generation of electrical and computer engineers to meet the challenges of the future, and empower electrical engineering graduates for immediate and sustained success in their professional practice.

Program Educational Objectives: The ECE faculty recognize that there are a number of common elements inherent to the success in the profession, which include the following: ability to acquire, generate, and use new knowledge; ability to complete complex electrical engineering projects; critical thinking, experience, knowledge, skills, and capabilities relevant to profession. These elements required for success in the profession translate into these educational objectives of the program. It is the expectation of the ECE faculty that graduates of the EE program will attain the following goals within a few years of graduation,

1. Are applying their education to their professional work in the public or private sectors or obtaining an advanced degree in electrical engineering or related areas;
2. Are engaging in lifelong learning using their education as a foundation.
3. Are productive while demonstrating professional growth and assuming positions of increasing responsibility.

Student Outcomes

In order to meet these program educational objectives, students graduating from Bradley's electrical engineering program will attain the following outcomes.

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

The goal of the ECE department is to provide the intellectual and physical learning environment in which students achieve these outcomes. The intellectual component of this environment is supplied by the ECE faculty members, in their roles as mentors, advisors, and engineering professionals, as well as by the curriculum they establish for the programs. The physical component consists of quality facilities equipped with state-of-art instrumentation, equipment, computers, and professional software.

Students must complete all requirements for the Electrical Engineering Major (<https://catalog.bradley.edu/undergraduate/programs/electrical-engineering-major/>).

ECE Robotics and Controls Electives

The Robotics and Controls concentration provides ECE students with essential knowledge and skills in the practice of sensory feedback, geometric control, optimal control, cooperative control, planning and information processing for robotics. Completing this concentration will help students acquire the fundamentals and practical skills in autonomous robotics and prepare them for a career in intelligent robotics and/or for pursuing advanced degrees in robots.

Five elective courses for Robotics and Controls electives

Code	Title	Hours
1. Required project-based Robotics and Controls electives		
ECE 444	Autonomous Robotics	3.0
2. Take any two of these Robotics and Controls electives courses that emphasize dynamics, mechatronics, robotics and control:		
Select two of the following:		6.0
ECE 440	Electromechanical Systems	
ECE 441	Feedback Control of Dynamic Systems	
ECE 442	Advanced Data-Driven Control and Applications	
ECE 443	Distributed Learning Control of Dynamic Systems	
ECE 467	Mobile Robotics Laboratory	
ECE 468	Mechatronics	
ECE 474	Mobile Robot Navigation and Mapping	
3. Take any two of these Robotics and Controls electives courses that emphasize artificial intelligence, information processing and programming :		
Select two of the following:		6.0
ECE 460	Digital Signal Processing	
ECE 462	Digital Image Processing	
ECE 465	Engineering Applications of Machine Learning	
ECE 470	Embedded Data Structures and Object Oriented Programming	
ECE 471	Real-time Operating Systems	
ECE 472	Embedded Microcontroller Linux	
ECE 475	Security for Industrial Automation	
ECE 481	Digital Systems: Design and Synthesis	

4. Students in robotics and controls concentration are recommended to complete a senior capstone project in the area of Robotics and Controls. The senior capstone project courses include:

ECE 497	Capstone Project System Level Design
ECE 498	Senior Capstone Project I
ECE 499	Senior Capstone Project II

Total Hours	15
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Special topic courses may be offered as ECE Robotics and Controls electives. See advisor for updated list of Robotics and Control electives.

Introductory Course Exception

Students who do not earn credit for ECE 100 Introduction to Electrical and Computer Engineering may be required to take an extra ECE elective to replace those credit hours.