

# ELECTRICAL AND COMPUTER ENGINEERING MAJOR, BACHELOR OF SCIENCE (BS)

This degree combines studies in selected areas of engineering, physics, mathematics, and science to prepare students to solve real-world problems in electrical and computer engineering. The EWU Bachelor of Science in Electrical Engineering Degree is accredited by the Engineering Accreditation Commission of ABET (<https://www.abet.org/>).

The first two years of the curriculum allow students to establish a solid foundation in mathematics and sciences. The third-year curriculum introduces students to a broad spectrum of electrical and computer engineering coursework, followed by specialization courses and a capstone design experience in the fourth year. The senior year capstone course allows students to consolidate their education experience with the solution of real-world, practical engineering problems often provided by industry.

The primary objective of the electrical and computer engineering program is to prepare students to enter and progress in electrical and computer engineering positions in business, industry, and government. Graduates are generally expected to work in the research and development of ideas, products, and processes by applying engineering principles to the solution of practical problems in the electrical and computer engineering field. The number of majors and graduates for Electrical and Computer Engineering are available on the program website (<https://www.ewu.edu/cstem/csee/electrical-computer-engineering-bs/>).

**Note:** incoming freshmen are expected to start both the Calculus and Physics series in their first year in order to finish the degree in four years.

In order to ensure all EWU Electrical and Computer Engineering graduates meet EWU ABET accreditation requirements, all Electrical and Computer Engineering students are required to take EENG 320, EENG 330, EENG 360, EENG 401 and EENG 490A/EENG 490B from EWU. Exceptions to this policy will be reviewed on a case by case basis by the Electrical and Computer Engineering curriculum review (ECECR) committee to ensure the student has successfully met the EWU ABET performance indicators required for each course.

**Note:** *Not all engineering software runs on Mac OS.* If you are planning on studying Electrical and Computer Engineering, we recommend a machine that will run electrical and computer engineering software—contact the department for suggestions.

**Grade Requirements:** In order to graduate, students majoring in the department must earn a GPA  $\geq 2.5$  for all departmental coursework taken from EWU. Specifically: approved transfer courses may be used to meet degree requirements, but those transfer courses will be excluded in the calculation of departmental GPA.

## Required Courses Outside Department

CHEM 171 & 171L	GENERAL CHEMISTRY I and GENERAL CHEMISTRY LABORATORY I	5
MATH/HONS 161	CALCULUS I	5
MATH 162	CALCULUS II	5
MATH 163	CALCULUS III	5
MATH 231	LINEAR ALGEBRA	5

MATH 241	CALCULUS IV	5
MATH 347	INTRODUCTORY DIFFERENTIAL EQUATIONS	4
PHYS 151	GENERAL PHYSICS I	4
PHYS 152	GENERAL PHYSICS II	4
PHYS 153	GENERAL PHYSICS III	4
PHYS 161	MECHANICS LABORATORY	1
PHYS 162	HEAT AND OPTICS LABORATORY	1
PHYS 163	ELECTRONICS LABORATORY I	1

## Required Departmental Courses

EENG 160	DIGITAL CIRCUITS	5
EENG 163	INTRODUCTION TO EMBEDDED SYSTEMS AND ELECTRICAL ENGINEERING	5
EENG 209	CIRCUIT THEORY I	5
EENG 210	CIRCUIT THEORY II	5
EENG 255	INTRODUCTION TO C FOR EMBEDDED SYSTEMS	5
EENG 260	MICROCONTROLLER SYSTEMS	4
EENG 320	SIGNALS AND SYSTEMS I	5
EENG 321	SIGNALS AND SYSTEMS II	5
EENG 330	MICROELECTRONICS I	5
EENG 331	MICROELECTRONICS II	5
EENG 350	ENERGY SYSTEMS	5
EENG 360	HARDWARE DESCRIPTION LANGUAGES	5
EENG 383	APPLIED STOCHASTIC PROCESSES	4
EENG 388	STOCHASTIC PROCESSES LAB	1
EENG 401	ENGINEERING APPLIED ELECTROMAGNETICS	5

**Electives Electrical and Computer Engineering—students are required 25 to complete three courses from a single concentration, with each of those courses taken at EWU. Additionally, a minimum of 20 credits must be taken within Electrical and Computer Engineering, excluding EENG 495 and EENG 499. As an option, students may select EENG 495, EENG 499, or a 400 level technical elective from outside Electrical and Computer Engineering for the remaining five elective credits, where the latter requires ECECR committee approval prior to enrolling in the course.**

## Computer Engineering

EENG 460	COMPUTING SYSTEMS: ORGANIZATION AND DESIGN	
EENG 461	EMBEDDED SYSTEMS DESIGN	
EENG 462	REAL TIME EMBEDDED SYSTEMS	

## Power Systems

EENG 450	POWER SYSTEMS ANALYSIS	
EENG 452	PROTECTIVE RELAYS	
EENG 470	CONTROL SYSTEMS	

## Communications, Controls, or Machine Learning

EENG 420	DIGITAL SIGNAL PROCESSING	
EENG 470	CONTROL SYSTEMS	

## Select one of the following

EENG 427	INTRODUCTION TO DEEP NEURAL NETWORKS	
EENG 440	DIGITAL COMMUNICATION SYSTEMS	
EENG 471	DIGITAL CONTROL SYSTEMS	

## Other Courses

EENG 415	INTRODUCTION TO COMPUTER COMMUNICATION NETWORKS	
EENG 425	PRINCIPLES OF DIGITAL IMAGE PROCESSING	

EENG 442	MOBILE COMMUNICATIONS	
EENG 495	INTERNSHIP	
EENG 499	DIRECTED STUDY	

**Required Senior Capstone**

EENG 490A & EENG 490B	SR CAPSTONE: DESIGN LAB I and SR CAPSTONE: DESIGN LAB II	5
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**Total Credits 148**

Courses needed to be completed to declare into the Pre-Major: MATH 141 (<https://catalog.ewu.edu/search/?P=MATH%20141>), MATH 142 (<https://catalog.ewu.edu/search/?P=MATH%20142>).

**Pre-Major–Pre-Electrical and Computer Engineering**

The following courses must be completed as part of the pre-major before you will be allowed to declare as an Electrical and Computer Engineering major. Note: most require ≥C to progress into the major.

Once you declare as a pre-major, you will have access to important Electrical and Computer Engineering major-related information via our Canvas page.

Declaring into the Electrical and Computer Engineering major is required for students to enroll in some of the 300 level and all of the 400 level Electrical and Computer Engineering courses.

MATH 161 & MATH 162 & MATH 163	CALCULUS I and CALCULUS II and CALCULUS III	15
PHYS 151 & PHYS 152 & PHYS 153	GENERAL PHYSICS I and GENERAL PHYSICS II and GENERAL PHYSICS III (these have required labs)	12
EENG 160 & EENG 163	DIGITAL CIRCUITS and INTRODUCTION TO EMBEDDED SYSTEMS AND ELECTRICAL ENGINEERING	10

**Total Credits 37**

**Plan of Study**

The following plan of study is for a student with zero credits. Individual students may have different factors such as: credit through transfer work, Advanced Placement, Running Start, or any other type of college-level coursework that requires an individual plan.

Courses could be offered in different terms, checking the academic schedule is paramount in keeping an individual plan current. **Students should connect with an advisor to ensure they are on track to graduate.**

All Undergraduate students are required to meet the Undergraduate Degree Requirements (<http://catalog.ewu.edu/undergraduate-degree/>).

**First Year**

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
ENGL 201	5	EENG 160	5	EENG 163	5
MATH 161	5	MATH 162	5	MATH 163	5
PHYS 151 & PHYS 161 (Natural Science BACR 1)	5	PHYS 152 & PHYS 162 (Natural Science BACR 2)	5	PHYS 153 & PHYS 163	5
	15		15		15

**Second Year**

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
CHEM 171 & 171L	5	EENG 209	5	EENG 210	5
MATH 241	5	EENG 255	5	EENG 260	4

Humanities & Arts BACR 1 <sup>1</sup>	5	Diversity - graduation requirement <sup>1</sup>	5	MATH 347	4
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			Humanities & Arts BACR 2 <sup>1</sup>	5
	15		15	18

**Third Year**

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
EENG 350	5	EENG 320	5	EENG 321	5
EENG 383	4	EENG 330	5	EENG 331	5
EENG 388	1	Social Science BACR 1 <sup>1</sup>	5	EENG 360	5
MATH 231	5				
	15		15		15

**Fourth Year**

Fall Quarter	Credits	Winter Quarter	Credits	Spring Quarter	Credits
EENG 401	5	EENG 490A (Senior Capstone - graduation requirement)	2	EENG 490B (Senior Capstone - graduation requirement)	3
Electrical and Computer Engineering Elective <sup>2</sup>	5	Electrical and Computer Engineering Elective <sup>2</sup>	5	Electrical and Computer Engineering Elective <sup>2</sup>	5
Electrical and Computer Engineering Elective <sup>2</sup>	5	Electrical and Computer Engineering Elective <sup>2</sup>	5	Global Studies - graduation requirement <sup>1</sup>	5
		Social Science BACR 2 <sup>1</sup>	5		
	15		17		13

**Total Credits 183**

<sup>1</sup> University Graduation Requirements (UGR) and Breadth Area Course Requirements (BACR) courses may be less than 5 credits and additional credits may be required to reach the required 180 total credits needed to graduate. Students should connect with an advisor to ensure they are on track to graduate.

<sup>2</sup> Electives Electrical and Computer Engineering—students are required to complete three courses from a single concentration, with each of those courses taken at EWU. Additionally, a minimum of 20 credits must be taken within Electrical and Computer Engineering, excluding EENG 495 and EENG 499. As an option, students may select EENG 495, EENG 499, or a 400 level technical elective from outside Electrical and Computer Engineering for the remaining five elective credits, where the latter requires ECECR committee approval prior to enrolling in the course.

**University Competencies and Proficiencies**

- English (<http://catalog.ewu.edu/undergraduate-degree/#newitemtext>)
- Quantitative and Symbolic Reasoning (<http://catalog.ewu.edu/undergraduate-degree/#mathcompproficienciestext>)
- Placement and Clearance (<http://catalog.ewu.edu/placement/>)
- Prior Learning/Sources of Credit AP, CLEP, IB (<http://catalog.ewu.edu/prior-learning/>)

**General Education Requirements (<http://catalog.ewu.edu/undergraduate-degree/#generaleducationrequirementsstext>) (GER)**

- Minimum Credits—180 cumulative credit hours
  - 60 upper-division credits (300 level or above)
  - 45 credits in residence (attendance) at Eastern, with at least 15 upper-division credits in major in residence at Eastern
- Minimum Cumulative GPA ≥2.0

**Breadth Area Core Requirements (BACR)**

Humanities and Arts (<http://catalog.ewu.edu/undergraduate-degree/#humanitiesandfineartsgcrtxt>)  
 Natural Sciences (<http://catalog.ewu.edu/undergraduate-degree/#naturalsciencesgcrtxt>)  
 Social Sciences (<http://catalog.ewu.edu/undergraduate-degree/#socialsciencesgcrtxt>)

The most current Program Educational Objectives (PEOs) and Program Learning Outcomes (PLOs) are available on the website (<https://www.ewu.edu/cstem/engineering/electrical-engineering-bs/>). The number of majors, premajors and graduates for Electrical and Computer Engineering are available on the program website (<https://www.ewu.edu/cstem/csee/electrical-computer-engineering-bs/>).

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**University Graduation Requirements (<http://catalog.ewu.edu/undergraduate-degree/#universitygraduationrequirementstxt>) (UGR)**

Diversity Course List (<http://catalog.ewu.edu/undergraduate-degree/#cultureandgenderdiversityintheulistxt>)  
 World Language (<http://catalog.ewu.edu/undergraduate-degree/#worldlanguagetxt>) (for Bachelor of Arts)  
 Global Studies Course List (<http://catalog.ewu.edu/undergraduate-degree/#internationalstudiesrequirementstxt>)  
 Minor or Certificate (<http://catalog.ewu.edu/undergraduate-degree/#majorminororcertificateugrtxt>)  
 Senior Capstone Course List (<http://catalog.ewu.edu/undergraduate-degree/#capstonecourselisttxt>)

Application for Graduation (use EagleNET (<https://inside.ewu.edu/eaglenet/>)) must be made at least two terms in advance of the term you expect to graduate (undergraduate and post-baccalaureate).

Use the Catalog Archives (<http://catalog.ewu.edu/archives/>) to determine *two important catalog years*.

Requirements in Degree Works (<https://inside.ewu.edu/records-and-registration/degree-works/>) are based on these two catalog years:

- a. The catalog *in effect at the student's first term* of current matriculation is used to determine **BACR** (Breadth Area Credit Requirements) **and** **UGR** (Undergraduate Graduation Requirements).
- b. The catalog *in effect at the time the student declares a major or minor* is used to determine the program requirements.

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**Students who earn a BS in Electrical and Computer Engineering from EWU should be able to:**

- identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics;
- 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;
- communicate effectively with a range of audiences;
- 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;
- function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives;
- develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions;
- acquire and apply new knowledge as needed, using appropriate learning strategies.