

# ELECTRICAL ENGINEERING (CONTROLS & ROBOTICS) - BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

## Overview

The Electrical Engineering BS program is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs. This particular concentration in the BSEE program gives students the opportunity to explore more deeply the area of **controls and robotics**.

## Electrical Engineering Program Educational Objectives

Below are the program educational objectives (PEOs) that describe the expected accomplishments of graduate during their first few years after graduation.

1. Our graduates will obtain relevant, productive employment in the private sector, government and/or pursue an advanced degree.
2. Our graduates will be using their engineering foundation to innovate solutions to the problems of the real world.

## Transfer Credit Guidelines for Electrical Engineering Degrees

Credit earned at other institutions are generally accepted; however, the following restrictions apply to transfer credits:

- Engineering credit must be earned at an ABET accredited school.
- Physics coursework must be calculus based.
- If the NMSU required course includes a lab, the transfer credit must include a lab.
- A grade of C- or better, must have been earned for transfer coursework.
- E E Courses numbered 300/3000 or higher, Cornerstone and Capstone courses may not be transferred for credit.
- Transfer credits for courses above 300/3000 level are not accepted.

## Requirements (123-124 credits)

Students must complete all University degree requirements, which include: General Education requirements, Viewing a Wider World requirements, and elective credits to total at least 123 credits with 48 credits in courses numbered 300 or above. Developmental coursework will not count towards the degree requirements and/or elective credits, but may be needed in order to take the necessary English and Mathematics coursework.

BSEE students must earn a grade of C- or better in all engineering, technology, math and science courses (including associated prerequisite courses) required for the degree. A student may attempt any of these courses no more than three times to earn a passing grade of C- or better. Students who earn a grade less than a C- will be contacted by the department head or academic advising center and advised about this policy and resources to help in their academic success. If the student fails to pass any of these courses after three attempts, then the student will not be able to continue as an electrical engineering major and will be counseled on other degree options. Students may request an exception

to this policy through written appeal to the Associate Dean for Academics in the College of Engineering.

Prefix	Title	Credits
<b>General Education</b>		
<i>Area I: Communications</i>		
<i>English Composition - Level 1</i>		4
ENGL 1110G	Composition I	
or ENGL 1110H	Composition I Honors	
or ENGL 1110M	Composition I	
<i>English Composition - Level 2<sup>1</sup></i>		3
<i>Oral Communication<sup>1</sup></i>		3
<i>Area II: Mathematics</i>		
MATH 1511G	Calculus and Analytic Geometry I <sup>2</sup>	
or MATH 1511H	Calculus and Analytic Geometry I Honors	
<i>Area III: Laboratory Sciences</i>		
CHEM 1215G	General Chemistry I Lecture and Laboratory for STEM Majors	8
PHYS 1310G & PHYS 1310L	Calculus -Based Physics I and Calculus -Based Physics I Lab	
<i>Area IV: Social/Behavioral Sciences (3 credits)<sup>1</sup></i>		3
<i>Area V: Humanities<sup>1</sup></i>		3
<i>Area VI: Creative and Fine Arts<sup>1</sup></i>		3
<i>General Education Elective</i>		4
MATH 1521G	Calculus and Analytic Geometry II	
or MATH 1521H	Calculus and Analytic Geometry II Honors	
<b>Departmental/College Requirements</b>		
<i>Program Specific Requirements</i>		
<i>Mathematics and Natural Science</i>		18
MATH 3160	Introduction to Ordinary Differential Equations	
PHYS 1320G & PHYS 1320L	Calculus -Based Physics II and Calculus -Based Physics II Lab	
ENGR 190	Introduction to Engineering Mathematics	
E E 200	Linear Algebra, Probability and Statistics Applications	
E E 240	Multivariate and Vector Calculus Applications	
<i>STEM</i>		6
Choose two STEM Electives <sup>3</sup>		
<i>Electrical and Computer Engineering</i>		43
ENGR 120	DC Circuit Analysis	
ENGR 130	Digital Logic	
ENGR 140	Introduction to Programming and Embedded Systems	
ENGR 230	AC Circuit Analysis	
E E 300	Cornerstone Design	
E E 317	Semiconductor Devices and Electronics I	
E E 320	Signals and Systems I	
E E 325	Signals and Systems II	
E E 340	Fields and Waves	
E E 362	Introduction to Computer Organization	
ENGR 401	Engineering Capstone I <sup>4</sup>	
ENGR 402	Engineering Capstone II	
<i>E E Concentration Required Courses</i>		6
E E 407	Introduction to Control Systems <sup>5</sup>	
E E 475	Control Systems Synthesis <sup>5</sup>	
or E E 551	Control Systems Synthesis	
<i>E E Concentration Electives: Choose two courses from the following (one must be an E E course):<sup>6</sup></i>		6

E E 495	Introduction to Digital Signal Processing
E E 403	Geometric Algebra
or E E 576	Geometric Algebra
E E 408	Noncooperative Game Theory
or E E 553	Noncooperative Game Theory
E E 444	Advanced Image Processing
or E E 588	Advanced Image Processing
E E 446	Digital Image Processing
or E E 596	Digital Image Processing
E E 460	Space System Mission Design and Analysis
E E 465	Machine Learning I
or E E 565	Machine Learning I
E E 496	Introduction to Communication Systems
ENGR 234	Engineering Mechanics II
M E 452	Control System Design
M E 486	Introduction to Robotics
M E 487	Mechatronics
CSCI 4405	Artificial Intelligence I
CSCI 4520	Python Programming I
CSCI 4245	Computer Networks I
MATH 4230	Applied Linear Algebra
MATH 4350	Advanced Linear Algebra
MATH 4360	Introduction to Real Analysis I
STAT 4210	Probability: Theory and Applications

**Non-Departmental Requirements (in addition to Gen.Ed)**

Viewing a Wider World Electives <sup>7</sup> 6

*Programming Elective*

Select one course from the following: 3-4

CSCI 1240	C++ Programming I <sup>8</sup>
or CSCI 4510	C++ Programming
CSCI 1210	Java Programming <sup>8</sup>
or CSCI 4505	Java Programming
CSCI 1220	Computer Programming Fundamentals: Python <sup>8</sup>
or CSCI 4520	Python Programming I
CSCI 1225	Python Programming II <sup>8</sup>
or CSCI 4525	Python Programming II
CSCI 1720	Computer Science I
CSCI 2210	Object-Oriented Programming

**Second Language: (not required)**

**Electives, to bring the total credits to 123** 0

**Total Credits** 123-124

<sup>1</sup> See the General Education (<https://catalogs.nmsu.edu/nmsu/general-education-viewing-wider-world/>) section of the catalog for a full list of courses.

<sup>2</sup> MATH 1511G Calculus and Analytic Geometry I is required for the degree but students may need to take any prerequisites needed to enter MATH 1511G Calculus and Analytic Geometry I first.

<sup>3</sup> STEM Elective: Course at the 300/3000 level or above from E E that is not used to satisfy any other E E program requirement or courses at the 300/3000 level or above from A E, C E, CHME, I E, M E, ASTR, BIOL, CHEM, CSCI, MATH, PHYS and STAT. Excluded courses include VWW courses and those which are substantially equivalent to an E E course. Click to view a list of excluded STEM Electives (<https://ece.nmsu.edu/undergrad-study/BSEE-STEM-electives.html>).

<sup>4</sup> The prerequisite for ENGR 401 Engineering Capstone I for BSEE students is E E 300 Cornerstone Design.

<sup>5</sup> Students must take both E E 407 Introduction to Control Systems which is currently offered in the Fall semester and (E E 475 Control Systems Synthesis or E E 551 Control Systems Synthesis ) which is currently offered in the Spring semester. Note also that E E 407 Introduction to Control Systems is a prerequisite for E E 475 Control Systems Synthesis/E E 551 Control Systems Synthesis .

<sup>6</sup> Some of these elective courses may have additional prerequisites.

<sup>7</sup> See the Viewing a Wider World (<https://catalogs.nmsu.edu/nmsu/general-education-viewing-wider-world/#viewingawiderworldtext>) section of the catalog for a full list of courses.

<sup>8</sup> Only one of the 1000-level or the 4000-level course may be taken to satisfy degree requirements. Students may not take the 1000-level of a course to satisfy the programming elective requirement and the 4000-level of the same course to satisfy other degree requirements. Students may count CSCI 4520 Python Programming I toward their Programming Elective or toward their E E Concentration Electives, but may not use the course to count toward both.

## A Suggested Plan of Study for Students

This roadmap assumes student placement in MATH 1511G Intermediate Algebra and ENGL 1110G Rhetoric and Composition. The contents and order of this roadmap may vary depending on initial student placement in mathematics and English. It is only a suggested plan of study for students and is not intended as a contract. Course availability may vary from fall to spring semester and may be subject to modification or change.

### First Year

Fall		Credits
ENGR 190	Introduction to Engineering Mathematics	4
ENGL 1110G	Composition I	4
or ENGL 1110H	or Composition I Honors	
or ENGL 1110M	or Composition I	
CHEM 1215G	General Chemistry I Lecture and Laboratory for STEM Majors	4
ENGR 120	DC Circuit Analysis	4
<b>Credits</b>		<b>16</b>

### Spring

MATH 1511G	Calculus and Analytic Geometry I <sup>1</sup>	4
or MATH 1511H	or Calculus and Analytic Geometry I Honors	
General Education Course <sup>2</sup>		3
ENGR 130	Digital Logic	4
ENGR 140	Introduction to Programming and Embedded Systems	4
<b>Credits</b>		<b>15</b>

### Second Year

Fall		Credits
MATH 1521G	Calculus and Analytic Geometry II	4
or MATH 1521H	or Calculus and Analytic Geometry II Honors	
PHYS 1310G & PHYS 1310L	Calculus -Based Physics I and Calculus -Based Physics I Lab	4
E E 200	Linear Algebra, Probability and Statistics Applications	4
ENGR 230	AC Circuit Analysis	4
<b>Credits</b>		<b>16</b>

### Spring

MATH 3160	Introduction to Ordinary Differential Equations	3
PHYS 1320G & PHYS 1320L	Calculus -Based Physics II and Calculus -Based Physics II Lab	4

E E 240	Multivariate and Vector Calculus Applications	3
Choose one Programming course from the following:		3-4
CSCI 1240 or CSCI 4510	C++ Programming I or C++ Programming	
CSCI 1210 or CSCI 4505	Java Programming or Java Programming	
CSCI 1220 or CSCI 4520	Computer Programming Fundamentals: Python or Python Programming I	
CSCI 1225 or CSCI 4525	Python Programming II or Python Programming II	
CSCI 1720	Computer Science I	
CSCI 2210	Object-Oriented Programming	
General Education Requirement (Area I, IV, V, VI or VWW) <sup>2</sup>		3
<b>Credits</b>		<b>16-17</b>
<b>Third Year</b>		
<b>Fall</b>		
E E 300	Cornerstone Design	2
E E 320	Signals and Systems I	3
E E 340	Fields and Waves	4
General Education Requirement (Area I, IV, V, VI or VWW) <sup>2</sup>		3
General Education Requirement (Area I, IV, V, VI or VWW) <sup>2</sup>		3
<b>Credits</b>		<b>15</b>
<b>Spring</b>		
E E 317	Semiconductor Devices and Electronics I	4
E E 325	Signals and Systems II	4
E E 362	Introduction to Computer Organization	4
General Education Requirement (Area I, IV, V, VI or VWW) <sup>2</sup>		3
<b>Credits</b>		<b>15</b>
<b>Fourth Year</b>		
<b>Fall</b>		
ENGR 401	Engineering Capstone I	3
E E 407	Introduction to Control Systems <sup>3</sup>	3
Controls & Robotics Elective <sup>5,6</sup>		3
STEM Elective <sup>4,5</sup>		3
General Education Requirement (Area I, IV, V, VI or VWW) <sup>2</sup>		3
<b>Credits</b>		<b>15</b>
<b>Spring</b>		
ENGR 402	Engineering Capstone II	3
E E 475 or E E 551	Control Systems Synthesis or Control Systems Synthesis	3
Controls & Robotics Elective <sup>5,6</sup>		3
STEM Elective <sup>4,5</sup>		3
General Education Requirement (Area I, IV, V, VI or VWW) <sup>2</sup>		3
<b>Credits</b>		<b>15</b>
<b>Total Credits</b>		<b>123-124</b>

Introduction to Control Systems is a prerequisite for E E 475 Control Systems Synthesis.

<sup>4</sup> STEM Elective: Course at the 300 level or above from E E that is not used to satisfy any other E E program requirement or courses at the 300 level or above from A E, C E, CHME, I E, M E, ASTR, BIOL, CHEM, CSCI, MATH, PHYS and STAT. Excluded courses include VWW courses and those which are substantially equivalent to an E E course. Click to view a list of excluded STEM Electives (<https://ece.nmsu.edu/undergrad-study/BSEE-STEM-electives.html>).

<sup>5</sup> Depending on availability of specific courses in the fall or spring semester, students may need to reorganize the ECE Electives, STEM electives, and/or Gen Ed electives in their final year. Students are strongly advised to consult with their ECE Faculty Mentor for assistance in planning their final year.

<sup>6</sup> At least one Controls & Robotics Elective Course must be from the E E prefix. See E E Concentration Electives in the Degree Requirements section above.

<sup>1</sup> MATH 1511G Calculus and Analytic Geometry I is required for the degree but students may need to take any prerequisites needed to enter MATH 1511G Calculus and Analytic Geometry I first.

<sup>2</sup> See the General Education (<https://catalogs.nmsu.edu/nmsu/general-education-viewing-wider-world/>) section of the catalog for a full list of courses.

<sup>3</sup> Students must take both E E 407 Introduction to Control Systems which is currently offered in the Fall semester and (E E 475 Control Systems Synthesis or E E 551 Control Systems Synthesis ) which is currently offered in the Spring semester. Note also that E E 407