

# BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING, BIOMEDICAL TRACK

Through the Electrical Engineering program at Youngstown State University, you'll develop competency in all aspects of electrical engineering and its related fields. You'll take coursework anchored in engineering, math, and physics that will allow you to solve complex problems and design intricate systems. Along the way, you'll also refine your communication skills and learn how to ethically and responsibly deploy your engineering skills.

Electrical engineers have homes in a large assortment of industries, from power generation and automotive manufacturing to biomedical development and consumer product design. You may even find yourself using your engineering expertise to serve your country in the military.

With your bachelor's degree in hand, you'll be the person advancing the products and systems that advance society.

## MAJOR

Design projects, computer simulation and hands-on laboratory sessions are the pillars of the Electrical Engineering major at YSU. Students enrolled in the program may choose from three options that prepare graduates for a large variety of professional positions or advanced studies:

- Traditional Option (<https://ysu.edu/academics/science-technology-engineering-mathematics/electrical-engineering-major/#panel0>)
- Computer/Digital Option (<https://ysu.edu/academics/science-technology-engineering-mathematics/electrical-engineering-major/#panel1>)
- Biomedical Option (<https://ysu.edu/academics/science-technology-engineering-mathematics/electrical-engineering-major/#panel2>)

## Summary for Biomedical Track

COURSE	TITLE	S.H.
Elec & Comp Engin		42
Engineering <sup>1</sup>		11
Mathematics/CSIS <sup>1</sup>		22
Science <sup>1</sup>		32
Writing and Speech <sup>1</sup>		9
General Education Courses <sup>1</sup>		18
First Year Student Success		1
<b>Total Semester Hours</b>		<b>135</b>

<sup>1</sup> See Curriculum section for courses in these areas that are common to the three options.

COURSE	TITLE	S.H.
FIRST YEAR REQUIREMENT -STUDENT SUCCESS		
YSU 1500	Success Seminar	1-2
or SS 1500	Strong Start Success Seminar	
or HONR 1500	Intro to Honors	
General Education Requirement		
ENGL 1550	Writing 1	3-4
or ENGL 1549	Writing 1 with Support	
ENGL 1551	Writing 2	3
CMST 1545	Communication Foundations	3
Gen Ed Math Met in Major		
Natural Science Gen Ed (8 s.h.)		
CHEM 1515	General Chemistry 1	3

CHEM 1515L	General Chemistry 1 Laboratory	1
CHEM 1516	General Chemistry 2	3
CHEM 1516L	General Chemistry 2 Laboratory	1
Arts and Humanities (6 s.h.)		
Arts and Humanities (select 1 course)		
PHIL 2626	Engineering Ethics	3
Social Science (6 s.h.)		
Social Science (select 1 course)		
ECON 2610	Principles 1: Microeconomics	3
Social and Personal Awareness (6 s.h.)		
<b>Major Requirements</b>		
ECEN 1521	Digital Circuits	3
ECEN 1521L	Digital Circuits Laboratory	1
ECEN 2611	Instrumentation and Computation Lab 1	1
ECEN 2612	Instrumentation and Computation Lab 2	1
ECEN 2632	Basic Circuit Theory 1	3
ECEN 2633	Basic Circuit Theory 2	3
ECEN 3711	Intermediate Laboratory 1	1
ECEN 3712	Intermediate Laboratory 2	1
Select one of the following:		
ECEN 3710	Signals and Systems	3
ECEN 3734	Computer Design	
ECEN 3772	Digital and Analog Circuits 2	
ECEN 3733	Digital Circuit Design	3
ECEN 3741	Electromagnetic Fields 1	3
ECEN 3742	Electromagnetic Fields 2	3
ECEN 3771	Digital and Analog Circuits 1	3
ECEN 4803 & 4803L	Linear Control Systems and Linear Control Systems Laboratory	4
ECEN 4811	Senior Laboratory	1
ECEN 4844	Electromagnetic Energy Conversion	3
ECEN 4899	Senior Design Project	3
ECEN 4899L	Senior Design Project Lab	1
<b>Engineering</b>		
ENGR 1500	Engineering Orientation	1
ENGR 1550	Engineering Concepts	2
ENGR 1560	Engineering Computing	2
MECH 2620	Statics and Dynamics	3
ISEN 2610	Engineering Statistics	3
<b>Science</b>		
CHEM 3719	Organic Chemistry 1	3
CHEM 3719L	Organic Chemistry 1 Laboratory	1
CHEM 3720	Organic Chemistry 2	3
CHEM 3720L	Organic Chemistry 2 Laboratory	1
BIOL 2601	General Biology 1: Molecules and Cells	3
BIOL 2601L	General Biology I: Molecules and Cells Laboratory	1
BIOL 2602	General Biology 2: Organisms and Ecology	3
BIOL 2602L	General Biology: Organisms and Ecology Laboratory	1
PHYS 2610	General Physics 1	4
PHYS 2610L	General Physics Laboratory 1	1
PHYS 3705	Thermodynamics and Classical Statistical Dynamics	3
CSIS 2610	Programming and Problem-Solving	3
CSIS 2610L	Programming and Problem-Solving Lab	1
<b>Mathematics Minor -one course counts toward Gen Ed</b>		
MATH 1571	Calculus 1	4
MATH 1572	Calculus 2	4
MATH 2673	Calculus 3	4

MATH 3705	Differential Equations	3
MATH 3718	Linear Algebra and Discrete Mathematics for Engineers	3

**Internships (Optional)**

The following internship courses are recommended, but not required

STEM 3790	STEM Internship Experience	
STEM 4890	STEM Internship	

The following two science courses are recommended for students to prepare for the MCAT test, but are not part of the degree requirements:

CHEM 3785	Biochemistry 1	
BIOL 3702	Microbiology	

**Total Semester Hours** **134-136**

**Year 1****Fall** **S.H.**

YSU 1500	Success Seminar	1-2
or SS 1500	or Strong Start Success Seminar	
or HONR 1500	or Intro to Honors	

ENGR 1500	Engineering Orientation	1
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ENGR 1550	Engineering Concepts	2
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CHEM 1515 & 1515L	General Chemistry 1 and General Chemistry 1 Laboratory	4
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ENGL 1550	Writing 1	3-4
or ENGL 1549	or Writing 1 with Support	

MATH 1571	Calculus 1	4
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**Semester Hours** **15-17**

**Spring**

MATH 1572	Calculus 2	4
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ENGR 1560	Engineering Computing	2
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CHEM 1516 & 1516L	General Chemistry 2 and General Chemistry 2 Laboratory	4
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ENGL 1551	Writing 2	3
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ECEN 1521 & 1521L	Digital Circuits and Digital Circuits Laboratory	4
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**Semester Hours** **17**

**Year 2****Fall**

MATH 2673	Calculus 3	4
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ECEN 2632	Basic Circuit Theory 1	3
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ECEN 2611	Instrumentation and Computation Lab 1	1
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PHYS 2610 & 2610L	General Physics 1 and General Physics Laboratory 1	5
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PHIL 2626	Engineering Ethics	3
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**Semester Hours** **16**

**Spring**

MATH 3705	Differential Equations	3
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MATH 3718	Linear Algebra and Discrete Mathematics for Engineers	3
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ECEN 2633	Basic Circuit Theory 2	3
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ECEN 2612	Instrumentation and Computation Lab 2	1
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MECH 2620	Statics and Dynamics	3
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CMST 1545	Communication Foundations	3
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**Semester Hours** **16**

**Year 3****Fall**

ECEN 3711	Intermediate Laboratory 1	1
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ECEN 3733	Digital Circuit Design	3
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ECEN 3741	Electromagnetic Fields 1	3
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ECEN 3771	Digital and Analog Circuits 1	3
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BIOL 2601 & 2601L	General Biology 1: Molecules and Cells and General Biology I: Molecules and Cells Laboratory	4
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ISEN 2610	Engineering Statistics	3
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**Semester Hours** **17**

**Spring**

ECEN 3712	Intermediate Laboratory 2	1
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ECEN 3734	Computer Design	3
or ECEN 3772	or Digital and Analog Circuits 2	
or ECEN 3710	or Signals and Systems	

ECEN 3742	Electromagnetic Fields 2	3
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ECEN 4844	Electromagnetic Energy Conversion	3
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BIOL 2602 & 2602L	General Biology 2: Organisms and Ecology and General Biology: Organisms and Ecology Laboratory	4
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CSIS 2610	Programming and Problem-Solving	3
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CSIS 2610L	Programming and Problem-Solving Lab	1
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**Semester Hours** **18**

**Year 4****Fall**

ECEN 4803 & 4803L	Linear Control Systems and Linear Control Systems Laboratory	4
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ECEN 4811	Senior Laboratory	1
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PHYS 3705	Thermodynamics and Classical Statistical Dynamics	3
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CHEM 3719 & 3719L	Organic Chemistry 1 and Organic Chemistry 1 Laboratory	4
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ECON 2610	Principles 1: Microeconomics	3
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General Education Requirement		3
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**Semester Hours** **18**

**Spring**

ECEN 4899	Senior Design Project	3
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ECEN 4899L	Senior Design Project Lab	1
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CHEM 3720 & 3720L	Organic Chemistry 2 and Organic Chemistry 2 Laboratory	4
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General Education Requirement		3
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General Education Requirement		3
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General Education Requirement		3
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**Semester Hours** **17**

**Total Semester Hours** **134-136**

## Student Outcomes

The following (1 through 7) Student Outcomes support the program educational objectives. Attainment of these outcomes by students by the time of their graduation prepares graduating students to enter the professional practice of engineering.

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.