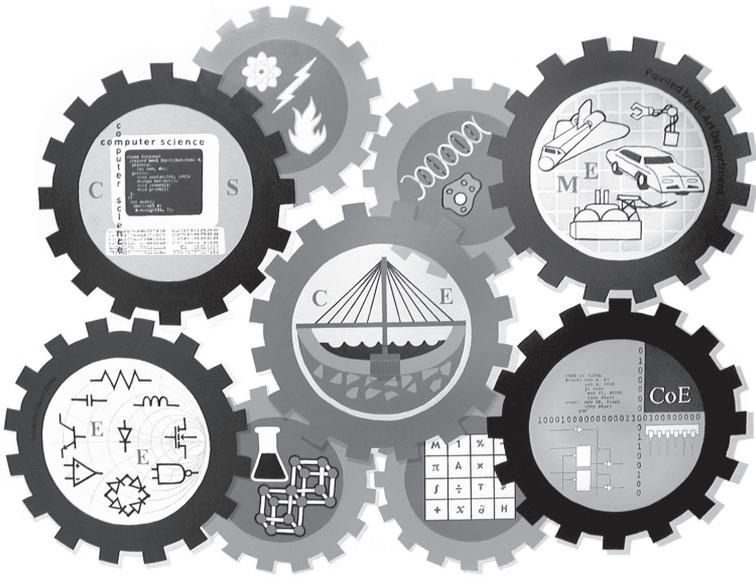


2022-2023



*ELECTRICAL ENGINEERING  
GUIDE BOOK*

**UE** University  
of Evansville

# ELECTRICAL ENGINEERING PROGRAM GUIDE BOOK 2022-2023

## Table of Contents

Program Objectives .....	2
Plan of Study – Standard.....	3
Areas of Specialization.....	4
Electives .....	6
Co-op Program .....	8
Harlaxton College Option.....	10
Plan of Study – Harlaxton Option .....	11
Honors Program.....	12
Undergraduate Research .....	13
Faculty and Staff .....	15
Electrical Engineering Courses.....	16
Frequently Asked Questions .....	18



The computer engineering program at the University of Evansville is accredited by the Engineering Accreditation Commission of ABET; [abet.org](http://abet.org).

*Revised October 2021*

# PROGRAM OBJECTIVES

The Electrical Engineering program has the following Educational Objectives and Student Outcomes:

**Objective 1:** *Graduates will be engaged in a professional career and continued or advanced study in their chosen field. This implies that graduates will recognize the value and necessity of lifelong learning.*

- **Outcome 1a.** Students will have an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (ABET EAC Outcome 1)
- **Outcome 1b.** Students will have an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (ABET EAC Outcome 7)

**Objective 2:** *Graduates will be engaged in applications of problem solving and communication skills for a wide variety of problems in engineering or computer science, either as individuals or in teams.*

- **Outcome 2a.** Students will have 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. (ABET EAC Outcome 5)
- **Outcome 2b.** Students will have 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. (ABET EAC Outcome 2)
- **Outcome 2c.** Students will have an ability to communicate effectively with a range of audiences. (ABET EAC Outcome 3)
- **Outcome 2d.** Students will have an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (ABET EAC Outcome 6)

**Objective 3:** *Graduates will be active participants in a local, national, or global engineering or computer science community.*

- **Outcome 3a.** Students will have 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. (ABET EAC Outcome 4)

# PLAN OF STUDY – STANDARD

## Bachelor of Science in Electrical Engineering

FALL		SPRING			
<b>FRESHMAN</b>					
CHEM 118	Principles of Chemistry	4	CS 210	Fundamentals of	3
ENGR 101	Introduction to Electrical Computer Engineering	3	MATH 222	Programing I	4
FYS 112	First-Year Seminar	3	PHYS 210	Calculus II	4
MATH 221	Calculus I	4		Calculus Physics I	4
	Foreign Language 111*	<u>3</u>		General Education	3
		17		Foreign Language 112*	<u>3</u>
					17
<b>SOPHOMORE</b>					
EE 210	Circuits	3	EE 215	Circuits II	3
ME 212	Statics	3	EE 254	Logic Design	3
MATH 324	Differential Equations	3	EE 342	Electronics I	3
PHYS 211	Calculus Physics II	4	ENGR 390	Engineering Mathematics	3
	General Education	<u>3</u>	MATH 323	Calculus III	<u>4</u>
		16			16
<b>JUNIOR</b>					
EE 310	Signals and Systems	3	EE 311	Digital Signal Processing	3
EE 330	Introduction to Power Systems	3	EE 360	Control Systems	3
			EE 380	Instrumentation Lab	3
EE 343	Electronics II	3	EE 454	Microcontroller	3
EE 354	Embedded Systems	3		Applications	
	General Education	<u>3</u>	EE 494	Senior Project Seminar	0
		15		General Education	<u>3</u>
					15
<b>SENIOR</b>					
EE 420	Electromagnetics	3	EE 497	Senior Project Phase II	3
EE 445	Industrial Electronics & Systems	3		Electrical Engineering	3
				Elective	
EE 495	Senior Project Phase 1	3		Math/Science Elective	3
	Electrical Engineering	3		General Education	3
	Elective			Free Elective	<u>3</u>
	General Education	3			15
	Health and Wellness	<u>1</u>			
		16			

**Figure 1** - A four-year degree plan for a BSEE degree.

\*Note: Only if necessary to meet University foreign language requirement.

# AREAS OF SPECIALIZATION

The electrical engineering program provides an introduction to nearly all areas of electrical engineering. The standard program is shown in Figure 1. In the senior year, the three Electrical Engineering electives provide the student with the opportunity to develop some depth in a particular area.

Technical electives are available in electronics, computers, electronics, power systems, and systems engineering. Students who have an interest in continuing on to graduate school may select electives in advanced mathematics or physics.

## Electronics Area

An understanding of the fundamentals of electronics is central to electrical engineering. All electrical engineers are required to take two courses in electronics during their junior year and one course in senior year.

## Computer Area

Students in electrical engineering who wish to learn more about the computer area have a wide array of courses which they may take as technical electives. These include the following courses:

Course	Title
CS 215	Fundamentals of Programming II
CS 320	Computer Architecture
CS 355	Computer Graphics
CS 430	Artificial Intelligence
CS 475	Networks

CS 215, CS 320, and CS 475 are recommended courses.

## Power Systems Area

There is one required power course in the electrical engineering curriculum, and some power concepts are presented in EE 215. In addition, students should take ENGR 213 - Dynamics as a technical elective. ME 362 - Thermodynamics is also useful.

## Systems Engineering Area

The systems engineering area electives at UE are concerned with either control systems or communication systems. EE 410 - Analog Circuit Synthesis and EE 465 - Digital Control Systems are particularly recommended for this area. All electrical engineers take EE 360 - Linear Control Systems and EE 470 - Communication Theory as part of their required course work

<b>Course</b>	<b>Title</b>
EE 410	Analog Circuit Synthesis
EE 440	Communication Electronics
EE 465	Digital Control Systems
MATH 341	Linear Algebra

### **Graduate School**

Electrical engineers who intend to go to graduate school for more specialization should take courses in advanced mathematics or in areas that provide a broad theoretical foundation in particular areas. The following courses may be useful for this purpose.

<b>Course</b>	<b>Title</b>
EE 410	Analog Circuit Synthesis
EE 415	Image Processing
EE 465	Digital Control Systems
MATH 365	Probability
MATH 420	Advanced Calculus
PHYS 305	Mathematical Physics
PHYS 471	Quantum Mechanics

### **Biomedical Option**

Electrical engineering majors may receive a bachelor's degree in electrical engineering with a biomedical option by substituting Biology 107, 112, 113, and a 3 hour biology elective for Electrical Engineering 430, 471, and Physics 213/214. Two of the electrical engineering technical electives may be chosen in the electrical engineering area or in the biology area with guidance and permission of the academic advisor. In addition, the senior project must be biomedically related.

# ELECTIVES

The electives in the electrical engineering program can be classified into four categories: math/science elective, mathematics elective, electrical engineering electives, and general education electives. There are restrictions on which courses can be taken in each category.

## Mathematics/Science Elective

The mathematics/science elective is normally taken in the spring semester of the sophomore year. It must be chosen from Physics 213 Introduction to Modern Physics (3 hours), Physics 305 Mathematical Physics (3 hours), Mathematics 341 Linear Algebra (3 hours), Mathematics 370 Combinatorics (3 hours), or Mathematics 425 Complex Variables (3 hours).

## Electrical Engineering Electives

There are three electrical engineering electives in the program, and these are taken during the senior year. It is important in choosing these electives that the student gain some depth in a particular area of electrical engineering and get some additional design experience.

## Free Elective

The free elective may be taken as any 3 (or more) credit course at the University with a few exceptions. 100 level Chemistry, Mathematics, or Physics courses are not counted as free electives, nor are English Language courses or Computer Science 101 and 205.

## General Education Electives

The general education program has the following outcomes:

1. Critical reading and thinking – 3 hours
2. Engagement with imaginative expressions of the human condition – 3 hours
3. Knowledge of human history and the historical context of knowledge – 3 hours
4. Engagement with fundamental beliefs about human identity, core values, and humankind's place in the world – 3 hours
5. Understanding of human aesthetic creation and artistic creativity – 3 hours
6. Linguistic and cultural competence in a language other than one's own – 3 hours
7. Quantitative literacy – 3 hours
8. Scientific literacy – 7 hours
9. Understanding of core concepts of society, human behavior and civic knowledge – 6 hours
10. Knowledge and responsibility in relation to health and wellness – 1 hour
11. Ability to think critically and communicate effectively, orally and in writing/capstone – 3 hours

Outcome 1, critical reading and thinking, is met by taking First-year Seminar 112. Students who do not meet the writing entrance requirements must take First-year Seminar 111 as a prerequisite to First-year Seminar 112.

Outcome 6, linguistic and cultural competence in a language other than one's own, may be met with a foreign language competency test. Students who have successfully completed two years of foreign language their final two years in high school can, in general, meet this requirement by passing the competency test.

Outcome 7, quantitative literacy, and outcome 8, scientific literacy, are met automatically by the math and science requirement for a degree in engineering or computer science.

Outcome 11, ability to think critically and communicate effectively, orally and in writing/capstone, is met by taking Electrical Engineering 495, the electrical and computer engineering senior design project.

In addition to taking courses to meet the outcomes above, students must complete the writing overlay requirement, which consists of four courses. In electrical engineering these are FYS 112, EE 495, EE 497, and one additional writing course that may also satisfy one of the outcomes. Outcomes 2, 3, and 5 have courses that satisfy the writing overlay requirement. Students should meet with an advisor and carefully choose courses in these outcomes to meet the writing overlay.

A complete list of courses that meet the general education and writing overlay requirements is available online at [evansville.edu/registrar](http://evansville.edu/registrar).

## **Engineering Management Minor**

A minor in engineering management is offered by the School of Engineering and Computer Science in cooperation with the Schroeder School of Business. For electrical and computer engineering students, the engineering management minor can be earned by taking the following courses.

### **Engineering Management Minor (18 hours)**

ECON 101 Principles of Macroeconomics  
(General Education Outcome 9)

or

ECON 102 Principles of Microeconomics

ENGR 390 Applied Engineering Mathematics (Required)

ENGR 409 Engineering Economy and Decision Making

COMM 380\* Intercultural Communication  
(General Education Outcome 9 and Overlay A)

or

BUS 100 Introduction to Business

- MGT 331      International Business Strategy  
           or  
 MGT 377      Organizational Behavior  
 LSCM 315     Introduction to Logistics and Supply Chain Management

All electrical engineering students pursuing this minor should see an advisor to carefully choose courses which also meet general education requirements. With careful curriculum planning, electrical engineering students can earn an engineering management minor by taking just three additional courses.

### **Mathematics Minor**

To obtain a minor in mathematics from the College of Arts and Sciences students must take MATH 221, MATH 222 and four mathematics courses numbered 300 or above (including ENGR 390 and PHYS 305). Students who satisfy the Electrical Engineering degree requirements only need to take one additional mathematics course numbered 300 or above to satisfy the mathematics minor requirements. By taking either PHYS 305 or a 300- level or higher math course to satisfy the Math/Science elective, electrical engineers can satisfy the mathematics minor requirement without taking any additional courses.

### **Computer Science Minor**

A minor in computer science is offered by the School of Engineering and Computer Science. Electrical and computer engineering students can earn a computer science minor by taking the following courses:

- ENGR 123     Programming for Engineers  
 or  
 CS210        Fundamentals of Programming I  
 CS220        Logic Design and Machine Organization  
 or  
 EE 254        Logic Design  
 CS 215        Fundamentals of Programming II  
 CS 290        Object Oriented Design

Plus 9 hours of 300 or 400 level CS courses

## **CO-OP PROGRAM**

Electrical engineering majors are encouraged to participate in cooperative education (co-op program). In this program, a student completes the BSEE degree requirements in five years, but at the end of that time, the student has a BSEE plus four terms of industrial experience as an electrical engineer.

The typical electrical engineering co-op student goes to school the first two years just as a non-co-op student does. At the end of the sophomore year, the co-op student goes to work and works through the summer. The student is back in school in the fall and out to work in the spring. Thereafter, the student alternates between work and school.

<b>CO-OP CALENDAR</b>			
<b>Year</b>	<b>Fall</b>	<b>Spring</b>	<b>Summer</b>
1	School 1	School 2	Work option
2	School 3	School 4	Work 1
3	School 5	Work 2	School/Work option
4	Work 3	School 6	Work 4
5	School 7	School 8	

Some students who are exceptionally well-prepared to enter the work force may begin their co-op period in the summer after the freshman year. This is unusual, and most students begin after the sophomore year. The summer after the junior year may be either school or work as needed. Many students work through this summer, thereby completing a full calendar year on the job.

To enter the co-op program, students should enroll in Experiential Education 90. This is a noncredit course which should be taken during the fall of the sophomore year. This course covers such topics as résumé writing, interviewing, and what is expected on the job. During the spring of the sophomore year, the typical co-op student interviews with prospective employers. The career placement office takes care of contacting employers and arranging interviews for students. Actual placement in a co-op position is dependent on the outcome of the interview process.

Co-op students in electrical engineering have a wide range of employers to choose from. Employers are located in the immediate Evansville area, in the surrounding region of Indiana, Kentucky, and Illinois, and in various places throughout the country. The companies listed below are some of the companies that have employed electrical engineering co-op students in the past. If a student wants to work for a company with which we do not presently have a co-op program, the Center for Career Development will contact that company and attempt to establish a program. The requirement to qualify as a legitimate co-op employer is that the company provides an electrical engineering opportunity for a prospective engineer that is relevant to the student's education and chosen profession.

Intel Corporation

Whirlpool Corporation

Vectren Energy Delivery

Boeing

Toyota

General Electric

NWSC Crane

Alcoa

Wright-Patterson AFB

The real value of the co-op program is in the experience that it provides the student. A co-op job can be a financial benefit, but one term at work does not typically cover the cost of one term of education. The co-op program gives employers a chance to look at a student as a prospective employee without making a commitment to long-term employment. Likewise, the co-op program gives the student a chance to look at a company and gain some experience before entering the work force as a working professional.

Co-op students normally get a higher salary offer upon graduation than do non-co-op students. In many cases the co-op employer provides a long-term employment opportunity for the co-op student upon graduation. About 25 percent of electrical engineering students participate in the co-op program.

## **HARLAXTON COLLEGE OPTION**

The University of Evansville's Harlaxton College is located just outside of Grantham, England, in the rolling English countryside. Harlaxton is about a one-hour ride by train from London. Engineering students who choose to spend a semester studying at Harlaxton have easy access to England's culture, history, and entertainment.

Harlaxton is housed in a large Victorian manor house where about 300 students and faculty members live and hold classes. The manor house has a state dining room, a library, and a number of historic state rooms where classes are held. A soccer field, sports hall, student lounges, bistro, and tennis courts are also available on the grounds.

Engineering students who wish to study one semester in England are encouraged to do so during the first semester of their sophomore year. At Harlaxton, engineering students typically take calculus, British studies, and general education classes. Harlaxton is on the semester system and all classes earn credit at UE in the same way they would if they were taken in Evansville. Since the engineering program requires a number of general education classes, all classes taken at Harlaxton count as required courses toward the engineering degree. Tuition at Harlaxton is the same as tuition at the UE Evansville campus, and all scholarships and loans may be applied to Harlaxton costs.

Students at Harlaxton College are encouraged to travel on weekends. The college arranges eight to 10 weekend field trips to locations such as Stonehenge, Nottingham, London, and Scotland. During some semesters, less frequent but longer trips are arranged to Ireland and the continent.

Harlaxton College has its own resident British faculty as well as visiting faculty from the home campus and other selected universities in the United States. Likewise, students at Harlaxton come from the Evansville campus, England, and various other campuses around the United States.

# PLAN OF STUDY – HARLAXTON OPTION

## Bachelor of Science in Electrical Engineering

FALL		SPRING			
<b>FRESHMAN</b>					
CHEM 118	Principles of Chemistry	4	CS 210	Fundamentals of	3
ENGR 101	Introduction to	3		Programming I	
	Engineering		EE 210	Circuits	3
FYS 112	First-Year Seminar	3	MATH 222	Calculus II	4
MATH 221	Calculus I	4	PHYS 210	Calculus Physics I	4
	Foreign Language 111*	<u>3</u>		Foreign Language 112*	3
		17			<u>17</u>
<b>SOPHOMORE</b>					
ID H282/H283	The British Experience	6	EE 215	Circuits II	3
MATH 324	Differential Equations	3	EE 254	Logic Design	3
	General Education	3	EE 342	Electronics I	3
	General Education	<u>3</u>	ENGR 390	Engineering	3
		15		Mathematics	
			MATH 323	Calculus III	<u>4</u>
					<u>16</u>
<b>JUNIOR</b>					
EE 310	Signals and Systems	3	EE 311	Digital Signal	3
EE 343	Electronics II	3		Processing	
EE 354	Embedded Systems	3	EE 360	Control Systems	3
EE 331	Energy Conversion	3	EE 380	Instrumentation Lab	3
	Systems		EE 454	Microcontroller	3
	General Education	<u>3</u>		Applications	
		15	EE 494	Senior Project Seminar	0
				General Education	<u>3</u>
					<u>15</u>
<b>SENIOR</b>					
EE 420	Electromagnetics	3	EE 497	Senior Project Phase II	3
EE 470	Communication Theory	3	ME 212	Statics	3
EE 495	Senior Project Phase 1	3		Electrical Engineering	3
PHYS 211	Calculus Physics II	4		Elective	
	Electrical Engineering	3		Math/Science Elective	3
	Elective	<u>—</u>		Free Elective	3
		16		Health and Wellness	<u>1</u>
					<u>16</u>

**Figure 2** - Four-year Degree Plan for a BSEE Degree - Harlaxton.

\*Note: Only if necessary to meet University foreign language requirement.

Figure 2 shows a typical four-year degree plan in which an electrical engineering student can take the fall semester of the sophomore year at Harlaxton College.

### **Harlaxton College Costs**

While the tuition at Harlaxton is the same as on the UE Evansville campus and all scholarships apply to Harlaxton, there are additional costs, namely those of travel. The typical airplane round-trip is about \$1,500, and the typical student at Harlaxton College will spend an additional \$4,000 on weekend trips, souvenirs, and other miscellaneous expenses.

## **HONORS PROGRAM**

The Honors Program is open to selected students. Typically students apply when admitted to the University, but also may apply during the first year of study. Admittance to the Honors Program is determined by the University Honors Committee on the basis of standardized test scores, high school grade point average, extracurricular activities, and an essay. The Honors Program provides participants with the opportunity to interact with other Honors Program students both socially and academically. Special honors courses and other academic events are available for honors students. Honors students are able to register early, live in the honors residence hall, and receive a University Honors designation on official transcript.

To successfully complete the Honors Program, a student must fulfill the following requirements.

- Achieve a GPA of 3.5 or above by the time of graduation
- Complete 15 credit hours of honors courses
- Complete an honors project
- Earn 4 honors participation points per semester

Honors courses are designated as such by the registrar. In addition, a limited number of courses may be contracted formally as honors courses, generally requiring additional or alternative course work. A sufficiently complex computer science senior project can be approved as an honors project. Often these projects are more research-oriented than the typical senior project.

Honors participation points are earned by attending Honors Program activities. Each semester a major event is held that is worth 3 honors participation points. Currently the fall event is a formal banquet and the spring event is a Nerd Wars Trivia night. In addition, 6-8 smaller events are organized that are worth 1 honors participation point each. These events include group attendance at athletic events, theatre and music performances, other academic or social events, and Honors Project presentations. Students studying at Harlaxton College or other study abroad programs are granted the

4 honors participation points for that semester automatically in recognition of the study abroad experience.

### **Alternative Courses** (points vary)

Alternative honors courses include courses taken for independent study and contract courses. A contract course is a non-honors course in which a contract is written requiring additional or alternative course work. The contract must be preapproved by the instructor, the department chair, and the honors director.

### **Honors Activities** (points vary)

Students may receive honors program points for activities other than traditional course work. These might include a summer research experience for undergraduates (REU) program, an internal research project, a paper or poster presentation, a summer internship, completion of the co-op program, participation in an IEEE or ACM sponsored contest, participation in community projects, or a leadership role in a student professional organization.

## **UNDERGRADUATE RESEARCH**

There are numerous opportunities to conduct undergraduate research. All students are encouraged to participate in at least one undergraduate research project at some point during their four years at UE. Students who have an interest in graduate school are strongly encouraged to participate in multiple programs. Some of the undergraduate research opportunities available to students studying electrical or computer engineering or computer science are described below.

### **NSF Sponsored Research Experience for Undergraduates (REU)**

This program is sponsored by the National Science Foundation. It allows undergraduates to participate in research projects at major research institutions across the country. Participating students typically have a B+ or better grade point average and have achieved junior status. Most REUs provide a stipend (about \$2,000 to \$3,000 for 10 weeks) and some provide a housing or moving allowance. All REUs take place during the summer. For more information see the website at [nsf.gov/crssprgm/reu/index.jsp](http://nsf.gov/crssprgm/reu/index.jsp).

### **UE Sponsored Undergraduate Research**

The University of Evansville also sponsors summer research projects which typically provide a housing allowance or a stipend (about \$2,000). Almost all academic areas participate in these projects which are awarded to students on a competitive basis. All result in a student publication or presentation at a national or regional conference.

### **Special Topics and Independent Study**

Many professors are willing to sponsor research projects during the school year. Students typically register for Electrical Engineering 498 or Computer Science 498 and receive 1 to 3 hours of credit for such study.

### **National Competition Projects**

The electrical engineering students participate in several regional and national competitions, and all students (including freshmen) are eligible to participate in these projects. The southeast region of the Institute of Electrical and Electronics Engineers sponsors a robot competition each year. This is a team project and is usually completed as part of the senior design. Trinity University in Connecticut sponsors a national firefighting robot competition in which a robot must find its way through a maze, locate a candle, and extinguish it.

# FACULTY AND STAFF

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Computer Science Lab	KC 265	812-488-2784
School of Engineering and Computer Science Fax Line	KC 250	812-488-2780

# ELECTRICAL ENGINEERING COURSES

**EE 210 Circuits** (3) Prerequisite: Mathematics 222. Recommended corequisite: Mathematics 323. Fall, spring.

**EE 215 Circuits and Systems** (4) Prerequisites: Electrical Engineering 210, Mathematics 323. Recommended corequisite: Mathematics 324. Spring, summer.

**EE 254 Logic Design** (3) Prerequisites: None. Spring.

**EE 310 Signals and Systems** (3) Prerequisites: Electrical Engineering 215, Mathematics 324. Fall.

**EE 311 Digital Signal Processing** (3) Prerequisite: Electrical Engineering 310. Spring.

**EE 330 Introduction to Power Systems** (3) Prerequisite: Electrical Engineering 215.

**EE 331 Energy Conversion Systems** (3) Prerequisite: Electrical Engineering 210, Mathematics 222.

**EE 342 Electronics I** (3) Prerequisite: Electrical Engineering 210. Corequisite: Electrical Engineering 254. Fall.

**EE 343 Electronics II** (3) Prerequisites: Electrical Engineering 215, Electrical Engineering 342. Spring.

**EE 354 Embedded Systems** (3) Prerequisite: Electrical Engineering 254, working knowledge of C or C++. Fall.

**EE 360 Control Systems** (3) Prerequisite: Electrical Engineering 310. Spring.

**EE 380 Instrumentation Lab** (2) Prerequisite: Electrical Engineering 215, 12 hours of 300-level electrical engineering courses. Spring.

**EE 420 Electromagnetics** (3) Prerequisite: Electrical Engineering 210 or permission of instructor, Mathematics 324. Recommended: Physics 2111. Fall.

**EE 445 Industrial Electronics and Controls** (3) Prerequisite: Electrical Engineering 342.

**EE 454 Microcontroller Applications** (3) Prerequisite: Electrical Engineering 354. Spring.

**EE 494 Senior Project Seminar** (0) Prerequisite: 12 hours of 300-level electrical engineering courses. Spring.

**EE 495 Senior Project Phase 1** (3) Prerequisites: Electrical Engineering 380, Electrical Engineering 494, GPA of at least 2.0. Fall, spring.

**EE 497 Senior Project Phase 2** (3) Prerequisite: Electrical Engineering 495. Fall, spring.

**EE 499 Special Topics in Electrical Engineering** (1-3) Prerequisites will be announced when scheduled.

# FREQUENTLY ASKED QUESTIONS

## ***I am undecided between computer engineering, electrical engineering, and computer science. How soon do I have to choose my major?***

All three majors share a common freshman year. At the beginning of the sophomore year, electrical engineering and computer engineering majors take the electrical engineering circuits courses that are not taken by the computer science majors. You should decide between electrical engineering, computer engineering and computer science by the end of the freshman year.

## ***Is a personal computer required in electrical engineering, computer engineering, or computer science?***

Yes, all students are expected to have their own computer. Faculty assume that students have access to a computer at home or in the residence hall for homework and projects. Laptops are preferred over desktops for their convenience, but are not required.

Several courses require that the student use a computer during the lecture or laboratory section of the course. University computers are available in the classroom/lab in that case, but students typically prefer to use their own laptops.

A lot of the software used will run on all three major operating systems (Windows, Mac, and Linux) and much of the software that is used is available for free to students. Students have 24-hour access to university computers that are required to specialized software. Virtual-machine software and/or dual-boot technology makes it relatively easy for students to run other operating systems regardless of whether they are using Windows, Macs or Linux.

The majority of engineering students have Windows computers while Computer Science students are more evenly divided in their preference between Windows and Macs. The computers dual-boot Windows and Linux and Mac computers are available in the Computer Science lab. Chromebook computers are not recommended for engineering students.

## ***Can I study abroad and still complete the program in four years?***

Yes. UE's Harlaxton College is located in Grantham, England, about one hour northeast of London. Electrical engineering, computer science, and computer engineering majors can spend one semester at our British campus and still graduate in four years. Tuition, room and board, and financial aid are the same as they are on the Evansville campus. Engineering students typically go to Harlaxton during the fall term of their sophomore year. At Harlaxton they take calculus and general education classes. Often, technical sophomore level classes are taught at Harlaxton by visiting faculty members from the engineering college.

### ***How does the co-op program work?***

Students attend two regular school years, then go to work during the summer after their sophomore year. They are back in school during the fall and out to work during the spring. After the sophomore year students alternate work and school between summer, fall, and spring. It is a five-year program. After five years, students obtain a bachelor's degree and have about two years work experience. About 25 percent of students choose the co-op program.

Interested students attend Experiential Education 90, a noncredit course during the first term of the sophomore year. In this class students learn about employment opportunities and résumé writing and also attend a job interview. UE arranges interviews, but the final job placement is made between the student and the employer. Most employers are in the local region, but there are choices nationwide. The Center for Career Development is very good at working with employers to establish co-op programs when students wish to work for employers with whom we do not already have an agreement in place.

### ***What do I do if I want to go to graduate school after earning my degree?***

It is common for students who receive an undergraduate degree in engineering or computer science to attend graduate school at a different university. At UE, about 20 percent of electrical and computer engineering and computer science majors go on to graduate school after completing their undergraduate degree. For students who have a 3.5 grade point average or better and who do relatively well on the Graduate Record Examination (GRE), graduate school is usually paid for by a fellowship or an assistantship. These typically cover 100 percent of tuition and provide modest living expenses. Over the past five years, UE graduates in electrical engineering, computer engineering, and computer science have gone on to attend graduate school at universities such as Cornell, Tufts, University of Illinois, University of Wisconsin, University of Missouri, Indiana University, Georgia Tech, Rensselaer Polytechnic, Iowa State, Duke, Vanderbilt University, and others.

### ***How should I prepare for graduate school?***

Good grades are very important. This is particularly true of courses in your major. Typically students who continue on to graduate school have a 3.5 grade point average or better. Most graduate schools also consider your grades on the Graduate Record Examination (GRE). Undergraduates who intend to go on to graduate school are encouraged to get some research experience as an undergraduate student. This can be done at UE or by participating in the summer research programs for undergraduates sponsored by the National Science Foundation.

Graduate school applications are typically due in December of the year in which you graduate with the expectation that you will enter graduate school in the following fall.

### ***What is the GRE?***

The Graduate Record Examination is given in two parts: a general test and a test in a specific area called a subject test. The general test measures verbal, quantitative, and analytical skills that have been developed over a long period of time and are not necessarily related to any particular field of study. The subject test is given in different areas such as mathematics. The subject test is designed to measure the qualifications of a student in a particular field of study and is used to compare students from different universities and different backgrounds. Most graduate schools require only the general test.

Students who plan to take the GRE should register for the exam very early in their senior year. The general test is most often computer based. Students register for a time slot, go to a testing center to take the exam, and get their scores immediately upon completion. The website [gre.org](http://gre.org) has useful information about the GRE, including a free test practice book.

### ***Tell me about a professional engineering license in electrical engineering, computer engineering, and computer science.***

Professional engineering licenses are granted by individual states. Procedures for getting a license vary from state to state, but licensure is generally a two-step process. A candidate must have four years of engineering experience and pass the Fundamentals of Engineering (FE) exam. Most states count a four-year engineering degree as four years of experience; thus many graduating seniors in engineering take the FE exam. In step two of the two-step process, a candidate must have additional engineering experience and pass the Professional Engineering (PE) exam in a particular area such as electrical engineering.

Engineering licensure is not required in order to practice engineering unless you practice in an area that involves public health and safety. Such areas might include engineering consultants who advertise themselves as “engineers,” engineers who work for public utilities, or engineers who work in or for the government. Most electrical and computer engineers find that a professional engineering license is not required by their employer nor by their job assignment. According to the ASEE, only 4 percent of electrical engineers are registered professional engineers.

At UE, the Fundamentals of Engineering exam is not required of those graduating in electrical engineering, computer engineering, or computer science. However, a review course for the exam is available and students who wish to take the exam may do so in the semester that they graduate.

Refer to the web site [nces.org](http://nces.org) for additional information on the FE and PE exams.

***How does the electrical engineering degree differ from the computer engineering degree?***

Some see a computer engineering degree as a specialized electrical engineering degree in which the specialty is computers. While computer engineers take a number of electrical engineering courses, they also learn much more about software than do the electrical engineers. They typically do not take as many courses on electronics, system analysis, electromagnetics, electro-optics, or power systems. Computer engineering shares courses in circuit analysis, electronics and linear systems, logic design, and computer hardware with electrical engineering.

Some electrical engineering degrees offer a “track” or specialty area in computers. These specialized electrical engineering degrees tend to lean toward computer hardware and lack the software depth that is typical of most computer engineering programs.

Computer engineering evolved out of the electrical engineering program in the 1970s and 1980s and remains closely tied to the electrical engineering degree. In most cases, the electrical engineering degree and computer engineering degree are offered out of the same department and share faculty and resources.

***What are some examples of senior design projects in electrical engineering?***

A few senior project titles from the past several years include: “A Self-Playing Guitar,” “Elevator Simulation – Three Elevators, 21 Stories,” “Pulsed Power Generator,” “The Fire Fighting Robot,” “Autonomous Mail Delivery Robot,” etc. Senior projects often are centered on intercollegiate hardware contests. The program students regularly compete in the Fire Fighting Robot Contest at Trinity College in Connecticut, the IEEE Hardware Competition at SouthEastcon, and the robotic football competition at Notre Dame.

***What are the areas of specialty in electrical engineering?***

Electrical engineering majors at UE have six hours (two courses) of technical electives and no free electives. Areas of specialty include electronics, computer hardware, linear systems and Communication 352, controls, and power systems.

***How much mathematics is required in the electrical engineering program?***

Electrical engineering majors at UE are required to take three semesters of calculus, one semester of differential equations, and a mathematics elective.

***Is the UE electrical engineering program accredited by ABET?***

The electrical engineering program at UE is accredited by the Accreditation Board for Engineering and Technology (ABET). The first accreditation was in 1972.

***How does the electrical engineering degree program differ from the electrical engineering technology program?***

The electrical engineering degree program emphasizes design and invention, whereas the electrical engineering technology program emphasizes maintenance and repair.

Course titles are often similar in the two programs, but course content differs considerably. Since the BSEE program emphasizes design and invention, it requires considerably more in-depth understanding at a more fundamental level. This implies that the BSEE program contains more science and mathematics and uses that science and mathematics in the engineering course work. The BSET program has a different emphasis that requires more hands-on activity and lab work.

As an example, if you wanted your television repaired, you would ask a technician to do that since that is what he is trained to do. On the other hand, if you were designing new televisions or were putting them into production, you would ask an engineer to do that because she has the fundamentals and background necessary for design.



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