The computer engineering program at the University of Evansville is accredited by the Engineering Accreditation Commission of ABET; www.abet.org.

Revised May 2018
WHAT IS COMPUTER ENGINEERING?
An Essay by D. K. Blandford, PhD

Computer engineering is a relatively new field in academic terms. Until the early seventies, computer engineering functions were done by electrical engineers who used switching circuits to construct dedicated real-time machines for automation and control functions. Some interfacing to larger computer systems was necessary, but computers at that time were too large, too expensive, and generally not fast enough to be effective real-time controllers. When Intel introduced the first microprocessor (the Intel 4004 in 1971) all of that changed. The microprocessor made it economically feasible to move the complexity of a real-time control function from a maze of circuits and hardware to a program in software. Thus, electrical engineers building real-time controllers had to master not only the hardware but much of the software as well. Sometime in the 1970s the undergraduate computer engineering degree was born and a number of universities began to make it available. Today the computer engineering degree remains closely tied to the electrical engineering program but it incorporates a substantial portion of software; in particular, it stresses the relationship of hardware (the circuits) to the software (the programs). If you view a continuum going from circuit design and electrical engineering to developing algorithms and writing programs in computer science, then computer engineering sits somewhere in the middle.

Computer engineers differ from electrical engineers in that they receive a substantial amount of algorithm and program development in their curriculum. They take foundation courses such as data structures and algorithms from the computer science program, and they are competent at solving problems in software. Computer engineers differ from computer scientists in that they take considerably more hardware courses than the computer science major. Computer engineers typically take the basic circuit courses and labs as well as courses in microcontrollers, digital electronics, linear systems, and controls. In terms of job function, computer engineers are involved in the industrial automation problem. They are adept at solving problems using embedded computers such as engine and body controllers for automobiles, appliance controllers (VCR, microwave oven, etc.), and in industrial automation including robots. In these applications, the engineer must understand not only how the hardware and the software work, but also an understanding of how the hardware and software work together is critical.

Thus, computer engineering is a cross between electrical engineering and computer science that stresses the use of computers in dedicated real-time applications.
DEPARTMENT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE OBJECTIVES

All programs in the Department of Electrical Engineering and Computer Science share the following objectives:

These objectives apply to our graduates in the three to five years after graduation

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.

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.

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

ELECTIVES

The electives in the computer engineering program can be classified into two categories: computer engineering electives and general education courses. There are some restrictions on which courses can be taken in each of these categories and these are discussed below.

Computer Engineering Electives

There are four computer engineering electives in the program taken during the senior year. These four electives must be chosen from the following courses in consultation with a computer engineering advisor. In addition, at least one of the following courses must be included in the four electives chosen: CS 380, EE 311, EE 343.

Electrical Engineering Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 311</td>
<td>3</td>
<td>Linear Systems and DSP II</td>
</tr>
<tr>
<td>EE 343</td>
<td>3</td>
<td>Electronics II</td>
</tr>
<tr>
<td>EE 410</td>
<td>3</td>
<td>Analog Circuit Synthesis</td>
</tr>
<tr>
<td>EE 456</td>
<td>3</td>
<td>Small Computer System Design</td>
</tr>
<tr>
<td>EE 458</td>
<td>3</td>
<td>Embedded Systems and Real-Time Programming</td>
</tr>
<tr>
<td>EE 465</td>
<td>3</td>
<td>Digital Control Systems</td>
</tr>
</tbody>
</table>
### Computer Science Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 350</td>
<td>3</td>
<td>Computer/Human Interaction</td>
</tr>
<tr>
<td>CS 355</td>
<td>3</td>
<td>Computer Graphics</td>
</tr>
<tr>
<td>CS 375</td>
<td>3</td>
<td>UNIX System Programming</td>
</tr>
<tr>
<td>CS 380</td>
<td>3</td>
<td>Programming Languages</td>
</tr>
<tr>
<td>CS 381</td>
<td>3</td>
<td>Formal Languages</td>
</tr>
<tr>
<td>CS 430</td>
<td>3</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>CS 472</td>
<td>3</td>
<td>Concurrent and Parallel Programming</td>
</tr>
<tr>
<td>CS 473</td>
<td>3</td>
<td>Mobile Application Development</td>
</tr>
</tbody>
</table>

It is important in choosing these three electives that the student gain additional depth in an area of computer engineering and get some additional design experience. The electives can be grouped into the following areas of specialization:

#### Hardware Systems
- EE 311 Linear Systems and DSP II
- EE 343 Electronics II or EE 410 Analog Circuit Synthesis
- EE 465 Digital Control Systems

#### Software Topics
- CS 375 UNIX System Programming
- CS 480 Compilers

#### Advanced Computer Science Topics
- CS 350 Computer/Human Interaction
- CS 355 Computer Graphics
- CS 430 Artificial Intelligence

#### Small Real-Time Systems
- EE 343 Electronics II
- EE 456 Small Computer System Design

#### If you are going to graduate school
- EE 311 Linear Systems and DSP II
- CS 381 Formal Languages
- CS 473 Mobile Application Development

Students who wish to take an elective outside the areas of specialization must do so in consultation with their computer engineering advisor.
**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

In addition to taking courses to meet the outcomes above, students must complete the writing overlay requirement, which consists of four courses. In computer 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 some courses that also satisfy the writing overlay requirement. Students should meet with an advisor and carefully choose courses in these outcomes to meet the writing overlay.

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.

A complete list of courses that meet the general education requirements is available online at www.evansville.edu/registrar/calendars.cfm.
Bachelor of Science in Computer Engineering

<table>
<thead>
<tr>
<th>FALL</th>
<th>SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FRESHMAN</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 118 Principles of Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ENGR 101 Introduction to Engineering</td>
<td>3</td>
</tr>
<tr>
<td>FYS 112 First-Year Seminar</td>
<td>3</td>
</tr>
<tr>
<td>MATH 221 Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>Foreign Language 111*</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td>17</td>
</tr>
</tbody>
</table>

| **SOPHOMORE** |          |
| CS 215 Fundamentals of Programming II | 3 | CS 290 Object Oriented Design | 3 |
| EE 210 Circuits | 3 | EE 215 Circuits and Systems | 3 |
| MATH 324 Differential Equations | 3 | EE 254 Logic Design | 3 |
| PHYS 211 Calculus Physics II | 4 | EE 342 Electronics I | 4 |
| General Education | 3 | MATH 323 Calculus III | 4 |
| **Total:** | 16 | **Total:** | 16 |

| **JUNIOR** |          |
| EE 310 Linear Systems and DSP I | 3 | EE 360 Linear Control Systems | 3 |
| EE 354 Digital Systems | 3 | EE 380 Intermediate Electrical Projects Lab | 3 |
| EE 356 Small Computer Software | 3 | EE 454 Microcontroller Applications | 3 |
| MATH 370 Discrete and Combinatorial Mathematics | 3 | EE 494 Senior Project Seminar | 0 |
| General Education | 3 | **Total:** | 0 |
| **Total:** | 18 | **Total:** | 17 |

| **SENIOR** |          |
| CS 475 Networks | 3 | CS 470 Operating Systems | 3 |
| EE/CS 495 Senior Project Phase 1 | 3 | EE/CS 497 Senior Project Phase 2 | 3 |
| Computer Engineering Elective | 3 | Computer Engineering Elective | 3 |
| Computer Engineering Elective | 3 | General Education | 3 |
| General Education | 3 | Computer Engineering Elective | 3 |
| Health and Wellness | 1 | General Education | 3 |
| **Total:** | 16 | **Total:** | 18 |

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

**Figure 1** - A four-year degree plan for a BSCoE degree.
ENGINEERING MANAGEMENT MINOR

A minor in engineering management is offered by the College of Engineering and Computer Science in cooperation with the Schroeder Family School of Business Administration. 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 Elective)
  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
  - ID 150 The American Corporation (General Education Elective Overlay C and E)
- MGT 310 Production/Operations Management
- MGT 331 International Business Strategy
  or
  - MGT 377 Organizational Behavior

With careful curriculum planning, electrical and computer engineering students can earn an engineering management minor by taking just three additional courses.
MATHEMATICS MINOR
A minor in mathematics is offered by the College of Arts and Sciences. Electrical and computer engineering majors can earn a mathematics minor by taking the following courses.

Mathematics Minor (20 hours)
MATH 221 Calculus I
MATH 222 Calculus II
MATH 323 Calculus III
MATH 324 Differential Equations
ENGR 390 Engineering Mathematics
or
MATH 365 Probability
one of
MATH 341 Linear Algebra (Technical Elective)
MATH 370 Combinatorics

For computer engineering majors the courses required for the minor in mathematics are also required for the major. Electrical engineering students must take one additional course for the minor in mathematics.

COMPUTER SCIENCE MINOR
A minor in computer science is offered by the College 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
CS 210 Fundamentals of Programming I
CS 220 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

For computer engineering majors, all requirements for the CS minor are satisfied by the major.
**CO-OP PROGRAM**

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

The typical computer 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.

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>School 1</td>
<td>School 2</td>
<td>Work option</td>
</tr>
<tr>
<td>2</td>
<td>School 3</td>
<td>School 4</td>
<td>Work 1</td>
</tr>
<tr>
<td>3</td>
<td>School 5</td>
<td>Work 2</td>
<td>School/Work option</td>
</tr>
<tr>
<td>4</td>
<td>Work 3</td>
<td>School 6</td>
<td>Work 4</td>
</tr>
<tr>
<td>5</td>
<td>School 7</td>
<td>School 8</td>
<td></td>
</tr>
</tbody>
</table>

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 computer 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 at various places throughout the country. The companies listed below are some of the companies that have employed computer 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 has to provide a computer engineering opportunity for a prospective engineer that is relevant to the student’s education and chosen profession.

Intel Corporation  General Electric  Boeing
Whirlpool Corporation  NWSC Crane  Wright-Patterson AFB
Vectren Energy Delivery  Alcoa  Delco Corporation

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 computer engineering students participate in the co-op program.
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, 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.

Computer 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 College, computer 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 computer engineering program requires a number of general education classes, all classes taken at Harlaxton College count as required courses toward the computer engineering degree. Tuition at Harlaxton College is the same as tuition at UE’s 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 8 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.

**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 $4000 on weekend trips, souvenirs, and other miscellaneous expenses.

Figure 2 shows a four-year degree plan for a Bachelor of Science degree in computer engineering in which the fall semester of the sophomore year is taken at Harlaxton College.
## Computer Engineering Harlaxton College Plan

### FALL

<table>
<thead>
<tr>
<th>FRESHMAN</th>
<th>SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 118 Principles of Chemistry</td>
<td>CS 210 Fundamentals of Programming I</td>
</tr>
<tr>
<td>ENGR 101 Introduction to Engineering</td>
<td>EE 210 Circuits</td>
</tr>
<tr>
<td>FYS 112 First-Year Seminar</td>
<td>General Education</td>
</tr>
<tr>
<td>MATH 221 Calculus I</td>
<td>MATH 222 Calculus II</td>
</tr>
<tr>
<td>Foreign Language 111*</td>
<td>Foreign Language 112*</td>
</tr>
<tr>
<td><strong>17</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>

### SOPHOMORE

| ID H282/283 The British Experience | CS 215 Fundamentals of Programming II |
| MATH 324 Differential Equations | General Education |
| | EE 342 Electronics I |
| | General Education |
| | EE 215 Circuits and Systems |
| Health and Wellness | EE 254 Logic Design |
| **16** | **17** |

### JUNIOR

| CS 290 Object Oriented Design | CS 315 Algorithms and Data Structures |
| EE 310 Linear Systems and DSP I | Computer Architecture |
| EE 354 Digital Systems | Linear Control Systems |
| EE 356 Small Computer Software | Microcontroller Applications |
| MATH 370 Discrete and Combinatorial Mathematics | Intermediate Electrical Projects Lab |
| Health and Wellness | EE/CS 494 Senior Project Seminar |
| **18** | **18** |

### SENIOR

| CS 475 Networks | CS 470 Operating Systems |
| EE/CS 495 Senior Project Phase 1 | EE 458 Embedded Systems and Real-Time Programming |
| ENGR 390 Applied Engineering Mathematics | |
| PHYS 211 Calculus Physics II | Computer Engineering Elective |
| Computer Engineering Elective | EE/CS 497 Senior Project Phase 2 |
| **16** | **18** |

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

**Figure 2** - A four-year degree plan for a BSCoE degree in which the fall semester of the sophomore year is at Harlaxton College.
HONORS PROGRAM

The Honors Program is open to selected students on entrance to the University. Admittance to the Honors Program is determined by the University Honors Committee on the basis of standardized test scores, an essay, and other student work completed in high school. The Honors Program provides participants with the opportunity to interact with other honors students both socially and academically. Special honors courses and other academic events are available for honors students both in general education and in the major. Honors students are able to register early, have access to an honors lounge, and receive a University Honors designation on their official transcripts.

1. Honors students must maintain a cumulative grade point average of 3.5 or better to remain in the program.

2. To complete the program, honors students must acquire a total of at least 21 points in the Honors Program made up of the following:

A minimum of 15 points from
Honors Courses (generally three points each) Honors courses offered on a regular basis include various courses that fulfill the general education requirements, and honors courses in other departments that are not part of the general education requirements.

Honors Colloquia (generally one point each) Honors colloquia are offered on a variety of topics and include small group discussion of a book, a research topic, or a topic of current interest.

Major Courses (generally three points each) These are courses within the major which are given the H section designation.

Contract Courses (points vary) See Alternative Courses below.

A minimum of three points from
Senior Honors Project In computer engineering this requirement is satisfied by the Electrical Engineering 494/495/497 senior project sequence. This is a year-long sequence in which computer engineering students write a proposal, complete a design, and construct a project. Honors projects in computer engineering are typically more challenging and are often research oriented.

Harlaxton College
Students who spend one semester in a study abroad program get two points for the Honors Program.
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 written contract is written requiring additional or alternative course work. The contract must be pre-approved 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 www.nsf.gov/crssprgm/reu/index.jsp.

**UE Sponsored Undergraduate Research**

The University of Evansville also sponsors summer research projects that typically provide a housing allowance or a stipend (about $2,000). Almost all academic areas participate in these projects that 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 Department of Electrical Engineering and Computer Science participates in three major national competitions, and all students in the department (including freshmen) are eligible to participate in these projects. IEEE sponsors a robot competition each year, which takes place at a southeastern university. This is a team (two to three students) project and requires a one-year effort. 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. More recently the department has begun competing in a Robo-Waiter competition in which an autonomous robot must retrieve a tray from a refrigerator and place it in front of a seated person. Some of these projects are done by students as senior design projects, but most often the projects are sponsored by the student chapters of IEEE and ACM.

Students who wish to publish or present their research results may do so in several forums. There is a national conference for undergraduate research, a paper contest at the IEEE southeastern spring meeting, and a regional undergraduate research conference at Butler University.
<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>Telephone/E-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dick Blandford, Chair</td>
<td>KC 266A</td>
<td>812-488-2291 <a href="mailto:blandford@evansville.edu">blandford@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering and Computer Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Katherine Chandler</td>
<td>KC 258</td>
<td>812-488-1351 <a href="mailto:kc270@evansville.edu">kc270@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jeffrey Cron</td>
<td>KC 140</td>
<td>812-488-1220 <a href="mailto:jc435@evansville.edu">jc435@evansville.edu</a></td>
</tr>
<tr>
<td>Staff Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vicky Hasenour, Admin. Asst.</td>
<td>KC 266</td>
<td>812-488-2570 <a href="mailto:vh12@evansville.edu">vh12@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering and Computer Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christina Howe</td>
<td>KC 252</td>
<td>812-488-2691 <a href="mailto:ct27@evansville.edu">ct27@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deborah Hwang</td>
<td>KC 264</td>
<td>812-488-2193 <a href="mailto:hwang@evansville.edu">hwang@evansville.edu</a></td>
</tr>
<tr>
<td>Computer Science Program Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mohsen Lotfalian</td>
<td>KC 256</td>
<td>812-488-2792 <a href="mailto:lotfalia@evansville.edu">lotfalia@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marc Mitchell</td>
<td>KC 263</td>
<td>812-488-2330 <a href="mailto:mm73@evansville.edu">mm73@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert Morse</td>
<td>KC 262</td>
<td>812-488-2994 <a href="mailto:morse@evansville.edu">morse@evansville.edu</a></td>
</tr>
<tr>
<td>Computer Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mark Randall</td>
<td>KC 247</td>
<td>812-488-2498 <a href="mailto:mr63@evansville.edu">mr63@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anthony Richardson</td>
<td>KC 261</td>
<td>812-488-2250 <a href="mailto:richardson@evansville.edu">richardson@evansville.edu</a></td>
</tr>
<tr>
<td>Electrical Engineering Program Director</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don Roberts</td>
<td>KC 259</td>
<td>812-488-2667 <a href="mailto:dr47@evansville.edu">dr47@evansville.edu</a></td>
</tr>
<tr>
<td>Computer Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Contacts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ying Shang, Dean</td>
<td>KC 250A</td>
<td>812-488-2651 <a href="mailto:ys46@evansville.edu">ys46@evansville.edu</a></td>
</tr>
<tr>
<td>College of Engineering and Computer Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kimberly Higgins, Asst to Dean</td>
<td>KC 268A</td>
<td>812-488-2661</td>
</tr>
<tr>
<td>College of Engineering and Computer Science</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Engineering Stockroom</td>
<td>KC 250</td>
<td>812-488-2651 <a href="mailto:kh209@evansville.edu">kh209@evansville.edu</a></td>
</tr>
<tr>
<td>Computer Science Lab</td>
<td>KC 141</td>
<td>812-488-2498</td>
</tr>
<tr>
<td>College of Engineering and Computer Science Fax Line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department of Electrical Engineering and Computer Science Fax Line</td>
<td>KC 266</td>
<td>812-488-2662</td>
</tr>
</tbody>
</table>
ELECTRICAL ENGINEERING
COURSE LIST

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


EE 224 Electrical Engineering Programming Laboratory (2) Prerequisites: Engineering 123 or Computer Science 210. Spring.

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

EE 310 Linear Systems and DSP I (3) Prerequisites: Electrical Engineering 215, Mathematics 324. Fall.

EE 311 Linear Systems and DSP II (3) Prerequisite: Electrical Engineering 310. Spring.

EE 320 Engineering Electromagnetics (3) Prerequisite: Electrical Engineering 215 or permission of instructor, Mathematics 324. Physics 211. Fall.

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


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

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

EE 356 Small Computer Software (3) Prerequisites: Engineering 123 or Computer Science 210, and Electrical Engineering 254 or Computer Science 220. Fall.

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

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

EE 410 Analog Circuit Synthesis (3) Prerequisite: Electrical Engineering 310, Electrical Engineering 343.
EE 415 Image Processing (3) Prerequisite: Electrical Engineering 310.

EE 421 Photonics I (3) Prerequisite: Electrical Engineering 320 or permission of instructor. Spring.

EE 422 Photonics II (3) Prerequisite: Electrical Engineering 421.

EE 425 Lines Waves and Antennas (3) Prerequisite: Electrical Engineering 320. Taught by request.

EE 430 Energy Conversion Systems (3) Prerequisites: Electrical Engineering 310, Mathematics 222.

EE 432 Analysis of Power Systems (3) Prerequisite: Electrical Engineering 330 or Electrical Engineering 430.

EE 437 Power System Planning (3) Prerequisite: Electrical Engineering 330.

EE 438 Electric Power Quality (3) Prerequisite: None.

EE 440 Communication Electronics (3) Prerequisites: Electrical Engineering 320, Electrical Engineering 343. Recommended corequisite: Electrical Engineering 413. Fall.

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

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

EE 456 Small Computer System Design (3) Prerequisites: Electrical Engineering 354, Electrical Engineering 454. Taught by request.


EE 465 Digital Control Systems (3) Prerequisite: Electrical Engineering 360.

EE 470 Communication Theory (3) Prerequisite: Electrical Engineering 310. Spring.

EE 471 Digital Communications (3) Prerequisite: Electrical Engineering 470. 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 498 Independent Study in Electrical Engineering** (variable credit) Requires faculty sponsor and approved detailed study plan.

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

CS 101 Introduction to Computer Science (3) Restricted to computer science majors and minors. Fall.

CS 210 Fundamentals of Programming I (3) Prerequisite: None. Fall, spring.

CS 215 Fundamentals of Programming II (3) Prerequisites: Computer Science 210. Fall, spring.

CS 220 Logic Design and Machine Organization (3) Prerequisite: None. Spring.

CS 290 Object-Oriented Design (3) Prerequisite: Computer Science 215. Spring.

CS 310 Puzzle Programming (1) Prerequisite: Computer Science 215 or permission of the instructor. May be repeated for up to three credit hours. Fall.

CS 315 Algorithms and Data Structures (3) Prerequisites: Computer Science 215, Mathematics 370. Spring.

CS 320 Computer Architecture (3) Prerequisites: Computer Science 210, and Computer Science 220 or Electrical Engineering 254. Spring.

CS 350 Computer/Human Interaction (3) Prerequisite: Computer Science 215.


CS 375 UNIX System Programming (3) Prerequisite: Computer Science 215.

CS 376 Small Computer Software (3) Prerequisites: Engineering 123 or Computer Science 210, and Electrical Engineering 254 or Computer Science 220. Fall.

CS 380 Programming Languages (3) Prerequisite: Computer Science 215. Fall.

CS 381 Formal Languages (3) Prerequisites: Computer Science 210, Mathematics 370. Fall.

CS 390 Software Engineering (3) Prerequisite: Computer Science 215. Recommended: Computer Science 290. Fall.

CS 415 Cryptography (3) Prerequisites: Computer Science 215, Mathematics 370.
CS 430 Artificial Intelligence (3) Prerequisite: Computer Science 215. Recommended: Computer Science 315, Computer Science 380.

CS 440 Databases (3) Prerequisites: Computer Science 215, Mathematics 222.

CS 455 Advanced Graphics (3) Prerequisites: Computer Science 355.


CS 472 Concurrent and Parallel Programming (3)

CS 473 Mobile Application Development (3) Prerequisites: Computer Science 215.

CS 475 Networks (3) Prerequisites: Computer Science 215, Mathematics 222.


CS 494 Senior Project Seminar (0) Prerequisite: 12 hours of 300-level computer science courses. Computer engineers may substitute Electrical Engineering 494. Spring.

CS 495 Senior Project Phase I (3) Prerequisites: Computer Science 494, GPA of at least 2.0. Computer engineers may substitute Electrical Engineering 495. Fall.

CS 497 Senior Project Phase II (3) Prerequisite: Computer Science 495. Computer engineers may substitute Electrical Engineering 497.

CS 498 Independent Study in Computer Science (variable credit) Requires faculty sponsor and approved detailed study plan.

CS 499 Special Topics in Computer Science (1-3) Prerequisites will be announced when scheduled.
COMPUTER ENGINEERING
FREQUENTLY ASKED QUESTIONS

What degrees are offered by the Department of Electrical Engineering and Computer Science?
- Bachelor of Science in Computer Engineering
- Bachelor of Science in Computer Science
- Bachelor of Science in Electrical Engineering
- Bachelor of Science in Software Engineering

What are the general education requirements for the engineering degree?
The general education requirements in engineering and computer science are the same as for any degree:
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

In addition to taking courses to meet the outcomes above, students must complete the writing overlay requirement, which consists of four courses. In electrical and computer 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 some courses that also satisfy the writing overlay requirement. Quantitative literacy, scientific literacy, and the communications/capstone requirements are all met by courses that are part of the engineering and computer science requirements. By carefully choosing courses, the general education requirements can be met with seven courses plus foreign language. Students should see an academic advisor before choosing general education courses.
Is it necessary that engineering and computer science majors take a foreign language?
The requirement is for six hours of course work or demonstrated proficiency. On entry, all students have the opportunity to take a proficiency exam in a foreign language of their choice. Students who have had two or more years of a foreign language during the last two years of high school usually pass this exam.

What is the average class size in electrical engineering and computer science?
The student to faculty ratio is about 13:1. Lower division classes tend to run 20 to 30 students per section. Upper division classes are smaller with 12 to 18 being typical. Some upper level electives have as few as six students.

What is the size of the engineering program at UE?
UE offers degrees in electrical, mechanical, civil, and computer engineering, and computer science. The number of students in these programs is about 360. About 160 of these students are in the electrical engineering, computer science, computer engineering, or informational technology program. There are currently 11 faculty members in the Department of Electrical Engineering and Computer Science and 10 faculty members in the Department of Mechanical and Civil Engineering.

I am undecided between computer engineering, electrical engineering, and computer science. How soon do I have to choose my major?
Computer engineering majors share a common freshman year with computer science majors. At the beginning of the sophomore year, computer engineering majors take the electrical engineering circuits courses that are not taken by the computer science majors. You should decide between computer engineering and computer science by the end of the freshman year.

The only difference between the computer engineering and electrical engineering curriculum in the first year is the programming course. Computer engineering majors take Computer Science 210 (with the computer science majors) and electrical engineering majors take Engineering 123. Both emphasize structure and understanding of the language, but Computer Science 210 emphasizes design and documentation. Preferably students decide between electrical engineering and computer science or electrical engineering and computer engineering by the end of the first semester. As a practical matter, bright students can change majors from electrical engineering to computer science without having to make up course work at the end of the freshman year. Well-prepared electrical engineering majors can choose between electrical engineering and computer engineering as late as the end of the first semester of the sophomore year.
Is a personal computer required in electrical engineering, computer engineering, or computer science?
Yes. All students are expected to have their own computer. This means that classes are taught in such a way that assumes students have ready access to a computer at home or in the residence hall for homework and projects. Most courses have websites and many professors communicate with students frequently by e-mail.

The department does not endorse a particular brand of computer, but most student software runs on Windows-based machines. In computer science and computer engineering, at the junior and senior level, a dual-boot Linux/Windows machine may be more convenient.

UE is a Microsoft campus and lab machines typically support Windows-based software. Some computer science labs are Linux-based.

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 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 they 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, and others.

How should I prepare for going to 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. In Evansville, the general test is given by Prometric Testing Center at 923 South Kenmore
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.

At UE, the FE 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.

The PE license is considered critical for those who work in civil engineering where public work is the norm for a practicing engineer. The PE license is also important in mechanical engineering although many mechanical engineers who work for relatively large employers do so without a PE license. The PE license is not critical to the practice of electrical or computer engineering although it could become important in the foreseeable future. Computer scientists rarely, if ever, participate in the professional engineering license procedure.

The website www.ncees.org is the official site for the FE and PE exams.

How does computer engineering differ from electrical engineering and from computer science?

Computer science deals with software. Computer scientists typically work on large programs and on software applications in which many users will directly apply their software for a specific problem.
Electrical engineering deals with hardware. This may involve power systems, computers, electronics, systems, electro-optics, device fabrication, or other areas. Software may be involved but it is typically peripheral to the problem being solved.

Computer engineering deals with those applications that involve both hardware and software. A typical application might be an engine controller for an automobile. The computer engineer knows enough about the hardware to do the electronics involved in interfacing the controller to the engine, and she will know enough about the software to write the program for the controller. Such systems are said to be “embedded.” Computer engineers may also be involved with computer architecture or in networking.

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

A few senior project titles from the past two 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 EECS department regularly competes in the Fire Fighting Robot Contest at Trinity College in Connecticut, the The Robo-Waiter Contest in Connecticut, the IEEE Hardware Competition at South-Eastcon, and the High Altitude Balloon Contest on the UE campus.

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

Computer engineering majors at UE have nine hours (three courses) of technical electives and no free electives. The three courses may be chosen in areas such as linear systems and signal processing, computer hardware, graphics, networks, real-time systems, or artificial intelligence.

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

Computer engineering majors at UE are required to take three semesters of calculus, one semester of differential equations, one semester of discrete mathematics (combinatorics), and a mathematics elective.

**Is the UE computer engineering program accredited by the Accreditation Board of Engineering and Technology (ABET)?**

The computer engineering program is accredited by ABET. The first accreditation for computer engineering was in 1996.
How does the computer engineering degree program differ from computer engineering technology programs?
The computer engineering (CoE) degree program emphasizes design and invention whereas a computer engineering technology (CoET) program emphasizes maintenance and repair.

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

As an example, if you wanted your computer network 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 a new computer network, you would ask an engineer to do that because she has the fundamentals and background necessary for design.