Electrical and Computer Engineering

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The Department of Electrical and Computer Engineering offers two undergraduate programs leading to the degree of Bachelor of Science in Electrical Engineering or Computer Engineering. These programs are accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. The department provides programs that incorporate analysis, design and development of electrical, electronic, and computer systems, and prepares graduates for entry into the profession as productive and effective engineers.

Electrical Engineering (B.S.)

The program is directed toward sequential development of course work to provide breadth and depth in engineering. It provides instructions to cover broad areas that include electronics, communication systems, computer systems, control systems, power systems, electromagnetics and signal processing. The program is intended to develop the ability of graduates to apply knowledge of mathematics, sciences and engineering. It ensures that graduates have an opportunity to work on multi-disciplinary teams, and also develop effective communication skills. In addition to a strong focus on computer skills and computer software, the program provides a design experience, which is developed and integrated throughout the program by introducing fundamental elements of design process in course work. The program includes a two-semester design sequence to provide a meaningful, major engineering design experience that also focuses on professional practice. Several modern laboratories in the program provide “hands-on” experience. There is a strong emphasis on the studies of humanities and social sciences that serve not only to fulfill an objective appropriate to the engineering profession but also to meet Saint Louis University’s educational objectives. The overall program provides an integrated educational experience and training to maintain professional competency through life-long learning.

Students can also choose the B.S. degree in Electrical Engineering with a concentration in Bioelectronics (Emphasis in Engineering or Pre-Health).

Students are highly encouraged and assisted to seek an internship opportunity with local and national companies. Qualified students are also invited to join department faculty to carry out cutting edge research.

Student professional organizations such as the Institute of Electrical and Electronics Engineers (IEEE), Society of Women Engineers (SWE) and others are active and very successful in local and national competitions such as “Black Box”, Hardware Design, Robotics, and Ethics.

Program Mission
Within the context of Saint Louis University and Parks College of Engineering, Aviation and Technology, the mission of the Electrical Engineering Program is to adequately prepare graduates to enter into the engineering professions, especially in the areas of analysis, design, and development of electrical and/or computer systems and components, and also to prepare graduates to enter post-graduate studies.

Objectives and outcomes apply to concentrations within Electrical Engineering.

Program Educational Objectives

- Our graduates will have acquired advanced degrees or are engaged in advanced study in engineering, business, law, medicine, or other appropriate fields.
- Our graduates will have established themselves as practicing engineers in electrical, computer or related engineering fields.
- Our graduates will be filling the technical needs of society by solving engineering problems using Electrical or Computer engineering principles, tools, and practices.

Student Outcomes
Student outcomes are consistent with the mission statements of the department, the college, and the University. Student outcomes are given below.

a) An ability to apply knowledge of mathematics, science, and engineering.
b) An ability to design and conduct experiments, as well as to analyze and interpret data.

c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) An ability to function on multi-disciplinary teams.

e) An ability to identify, formulate, and solve engineering problems.

f) An understanding of professional and ethical responsibility.

g) An ability to communicate effectively.

h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social context.

i) A recognition of the need for, and an ability to engage in life-long learning.

j) A knowledge of contemporary issues.

k) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

Degree Requirements

Basic Science & Math Requirements (39 credits)
CHEM1110 General Chemistry I 3
CHEM1115 General Chemistry I Lab 1
PHYS 1610 Engineering Physics I 3
PHYS 1620 Engineering Physics I Lab 1
PHYS 1630 Engineering Physics II 3
PHYS 1640 Engineering Physics II Lab 1
MATH1660 Discrete Mathematics 3
MATH1510 Calculus I 4
MATH1520 Calculus II 4
MATH2530 Calculus III 4
MATH3110 Linear Algebra 3
MATH3550 Differential Equations 3
ECE 3052 Probability & RV for Engineers 3
ESCI 2300 Thermodynamics 3

Communications Requirements (3 credits)
ENGL 1920 Adv Writing for Professionals 3

Computer Requirement (3 credits)
CSCI 1060 Intro to Scientific Programming 3

Liberal Arts Requirements (15 credits)
PHIL 3400 Ethics and Engineering 3
THEO 1000 Theological Foundations 3
Cultural Diversity
Humanities

Social & Behavioral Science 3
Cultural Diversity, Humanities, Social and Behavioral Science must be selected from an approved list.

Electrical Engineering Core (50 credits)
ECE 1001 Intro to ECE I 1
ECE 1002 Intro to ECE II 1
ECE 2101 Electrical Circuits I 3
ECE 2102 Electrical Circuits II 3
ECE 2103 Electrical Circuits Lab 1
ECE 2205 Digital Design 3
ECE 2206 Digital Design Lab 1
ECE 3110 Electric Energy Conversion 3
ECE 3225 Microprocessors 3
ECE 3226 Microprocessors Lab 1
ECE 3130 Semiconductor Devices 3
ECE 3131 Electronic Circuit Design 3
ECE 3132 Electronic Circuit Design Lab 1
ECE 3140 Electromagnetic Fields 3
ECE 3150 Linear Systems 3
ECE 3151 Linear Systems Lab 1
ECE 3090 Junior Design 1
ECE 4120 Automatic Control Systems 3
ECE 4140 Electromagnetic Waves 3
ECE 4160 Communication Systems 3
ECE 4800 ECE Design I 3
ECE 4810 ECE Design II 3

ECE Electives for EE majors (6 credits)
Students are required to take six credits from an approved list and as offered. A partial list is given below. Please check with the ECE department for a complete list of approved electives.

ECE 3217 Computer Architecture & Organization 3
ECE 4170 Energy Technologies I 3
ECE 4110 Power Systems Analysis I 3
ECE 4153 Image Processing 3
ECE 4226 Mobile Robotics 3
ECE 4132 Analog IC Design 3
ECE 4235 Digital IC Design 3
ECE 4141 Radar Systems 3
ECE 4245 Computer Networks Design 3
ECE 4150 Filter Design 3
ECE 4151 Digital Signal Processing 3
ECE 4161 Satellite Communications 3
ECE 4162 Cellular Communications 3

One Open Elective (3 credits)
One course of three credits satisfying another minor/major or must satisfy the requirements of a technical elective.
Two Technical Electives (6 credits)
Two 3 credit courses selected from an approved list in science, mathematics, Computer Science, or engineering, at the 2000-level or higher. This course cannot be used to satisfy other curriculum requirements.

Internship and Co-op
Although not required, students can elect to participate in an internship or cooperative experience before graduation.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ECE 2910 Co-op</td>
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<tr>
<td>ECE 3910 Co-op</td>
<td>0-3</td>
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<tr>
<td>ECE 4910 Co-op</td>
<td>0-3</td>
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<tr>
<td>ECE 2915 Internship</td>
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<tr>
<td>ECE 3915 Internship</td>
<td>0-3</td>
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<tr>
<td>ECE 4915 Internship</td>
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Minimum BS Credits 125

Bioelectronics Concentration
Electrical Engineering Emphasis

The Bioelectronics concentration is a joint effort by the Electrical and Computer Engineering Department and the Biomedical Engineering Department of Parks College. The course of study combines science and engineering, incorporating courses in biology, chemistry, math, biomedical engineering, electrical and electronic engineering, and others. Students in the Bioelectronics track will pursue either of two emphases, engineering or pre-health, and will graduate with a B.S. in Electrical Engineering and coursework in Biomedical Engineering.

While pursuing the degree, the students can expect to spend a significant time in our well-equipped laboratories, complementing classroom instruction with hands-on experience. Design experience is well integrated throughout the four-year curriculum; student begins to conduct laboratory experiments immediately, starting from the freshman year. The program culminates with a full-year senior design experience in which students work in interdisciplinary teams to carry out a major project.

Students are also welcome to work with faculty to carry out research and further enhance their educational experience. Faculty members strongly encourage students to bolster their learning experience by seeking internship and co-op opportunities locally and nationally within the bioengineering industry.

When students graduate from the program with the Electrical Engineering Degree with a Bioelectronics concentration, they will find a wealth of career opportunities open to them as effective engineers in bioengineering industries. Graduates can find employment with hospitals’ Clinical Engineering Divisions, medical equipment and medical device manufacturers, healthcare R&D centers, healthcare services companies, medical laboratories, university laboratories, and equipment vendors. Degree-holders could also choose to work in the electrical engineering and biomedical engineering industries. Graduates will be able to provide much needed training and support in the use of highly sophisticated medical equipment to researchers, clinicians, medical doctors, and other healthcare professionals.

Students pursuing the pre-health emphasis are well prepared to enter a highly challenging and rewarding field of medicine. Bioelectronics with pre-health emphasis provides an excellent opportunity for future medical doctors to be well versed in technological advances. It allows for much greater integration and innovation of technology in medicine. Technological advances such as MRI, CAT scan, and many others are clear examples of such innovative integration.

Engineering Emphasis Degree Requirements

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<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
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<tr>
<td>BIOL 1240/1245</td>
<td>Biology I &amp; Lab</td>
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<tr>
<td>BIOL 1260/1265</td>
<td>Biology II &amp; Lab</td>
<td>4</td>
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<tr>
<td>BIOL 2600</td>
<td>Human Physiology</td>
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<td>CHEM 1110</td>
<td>General Chemistry I</td>
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<td>CHEM 1115</td>
<td>General Chemistry I Lab</td>
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<tr>
<td>CHEM 1120</td>
<td>General Chemistry II</td>
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<tr>
<td>CHEM 1125</td>
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<td>PHYS 1610</td>
<td>Engineering Physics I</td>
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<td>PHYS 1620</td>
<td>Engineering Physics I Lab</td>
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<td>PHYS 1630</td>
<td>Engineering Physics II</td>
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<td>PHYS 1640</td>
<td>Engineering Physics II Lab</td>
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<td>MATH 1660</td>
<td>Discrete Math</td>
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<td>MATH 1510</td>
<td>Calculus I</td>
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<td>MATH 1520</td>
<td>Calculus II</td>
<td>4</td>
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<td>MATH 2530</td>
<td>Calculus III</td>
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<td>MATH 3110</td>
<td>Linear Algebra</td>
<td>3</td>
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<td>MATH 3550</td>
<td>Differential Equations</td>
<td>3</td>
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<td>ECE 3025</td>
<td>Probability &amp; RV for Engineers</td>
<td>3</td>
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Communications (3 credits)
ENGL 1920 Adv Writing for Professionals 3
Liberal Arts (15 credits)
PHIL 3400 Ethics and Engineering 3
THEO 1000 Theological Foundations 3
Cultural Diversity 3
Humanities 3
Social & Behavioral Science 3

Cultural Diversity, Humanities, and Social and Behavioral Science must be selected from an approved list.

Electrical Engineering Core (41 credits)
ECE 1001 Intro to ECE I 1
ECE 1002 Intro to ECE II 1
ECE 2101 Electrical Circuits I 3
ECE 2102 Electrical Circuits II 3
ECE 2103 Electrical Circuits Lab 1
ECE 2205 Digital Design 3
ECE 2206 Digital Design Lab 1
ECE 3225 Microprocessors 3
ECE 3226 Microprocessors Lab 1
ECE 3130 Semiconductor Devices 3
ECE 3131 Electronic Circuit Design 3
ECE 3132 Electronic Circuit Design Lab 1
ECE 3140 Electromagnetic Fields 3
ECE 3150 Linear Systems 3
ECE 3151 Linear Systems Lab 1
ECE 3090 Junior Design 1
ECE 4120 Automatic Control Systems 3
ECE 4800 ECE Design I 3
ECE 4810 ECE Design II 3

Biomedical Engineering Core (9 credits)
BME 2000 BME Computing 3
BME 3150 Biomedical Instrumentation 3
BME 4100 Biomedical Signals 3

Biomedical, Electrical, Computer Engineering Electives (6 credits)
Select two 3-credit course from an approved list of ECE or BME courses, two of which must be at the 4000-level or higher.

Internship and Co-op
Although not required, students are encouraged to participate in an internship or cooperative experience before graduation.
ECE 2910 Co-op 0-3
ECE 3910 Co-op 0-3
ECE 4910 Co-op 0-3
ECE 2915 Internship 0-3
ECE 3915 Internship 0-3
ECE 4915 Internship 0-3

Minimum BS Credits 125

Bioelectronics Concentration
Pre-Health Emphasis

Basic Science & Math (59 credits)
BIOL 1240/1245 Biology I & Lab 4
BIOL 1260/1265 Biology II & Lab 4
BIOL 2600 Human Physiology 3
CHEM 1110 General Chemistry I 3
CHEM 1115 General Chemistry I Lab 1
CHEM 1120 General Chemistry II 3
CHEM 1125 General Chemistry II Lab 1
CHEM 2410 Organic Chemistry 3
CHEM 2415 Organic Chemistry Lab 1
CHEM 2420 Organic Chemistry II 3
CHEM 2425 Organic Chemistry II Lab 1
CHEM 3600 Biochemistry 3
PHYS 1610 Engineering Physics I 3
PHYS 1620 Engineering Physics I Lab 1
PHYS 1630 Engineering Physics II 3
PHYS 1640 Engineering Physics II Lab 1
MATH 1160 Discrete Math 3
MATH 1510 Calculus I 4
MATH 1520 Calculus II 4
MATH 2530 Calculus III 4
MATH 3550 Differential Equations 3
ECE 3052 Probability &RV for Engineers 3

Communications (3 credits)
ENGL 1900 Adv Rhetoric 3

Liberal Arts (18 credits)
PHIL 3400 Ethics and Engineering 3
THEO 1000 Theological Foundations 3
Cultural Diversity 3
Humanities: English Literature Elective 3
PSY 1010 Intro to Psychology 3
SOC 1100 Intro to Sociology 3

Cultural Diversity, Humanities, Social and Behavioral Science must be selected from an approved list.

Electrical Engineering Core (41 credits)
ECE 1001 Intro to ECE I 1
ECE 1002 Intro to ECE II 1
ECE 2101 Electrical Circuits I 3
ECE 2102 Electrical Circuits II 3
ECE 2103 Electrical Circuits Lab 1
ECE 2205 Digital Design 3
ECE 2206 Digital Design Lab 1
ECE 3225 Microprocessors 3
ECE 3226 Microprocessors Lab 1
ECE 3130 Semiconductor Devices 3
ECE 3131 Electronic Circuit Design 3
ECE 3132 Electronic Circuit Design Lab 1
ECE 3140 Electromagnetic Fields 3
ECE 3150 Linear Systems 3
ECE 3151 Linear Systems Lab 1
ECE 3090 Junior Design 1
ECE 4120 Automatic Control Systems 3
ECE 4800 ECE Design I 3
ECE 4810 ECE Design II 3

Minimum BS Credits 125
Biomedical Engineering Core (3 credits)  
BME 2000 BME Computing 3

Biomedical, Electrical, Computer Engineering Option (3 credits)  
Select one 3-credit course from a list of approved ECE or BME courses at the 3000-level or higher.

Minimum BS Credits 127

Computer Engineering (B.S.)

The Computer Engineering degree program is directed toward sequential development of course work to provide breadth and depth in electrical engineering and computer science. It provides instruction to cover broad areas that include analog and digital electronics, signal processing, computer systems, Computer Architecture, Operating Systems, Advanced Digital Design, Computer Networks and others. The program is intended to develop the ability of graduates to apply knowledge of mathematics, sciences, engineering, and computer science. It ensures that graduates have an opportunity to work on multi-disciplinary teams, and also develop effective communication skills. In addition to a strong focus on computer skills and computer software, the program provides a design experience that is developed and integrated throughout the program by introducing fundamental elements of the design process in course work. The program also includes a two-semester design sequence to provide a meaningful, major engineering design experience that also focuses on professional practice. Several modern laboratories in the program provide “hands-on” experience. There is also a strong emphasis on the studies of humanities and social sciences that serve not only to fulfill an objective appropriate to the engineering profession but also to meet Saint Louis University’s educational objectives. The overall program provides an integrated educational experience and training to maintain professional competency through life-long learning.

Students are highly encouraged and assisted to seek an internship opportunity with local and national companies. Qualified students are also invited to join department faculty to carry out cutting edge research.

Student professional organizations such as the Institute of Electrical and Electronics Engineers (IEEE), Society of Women Engineers (SWE), and others are active and very successful in local and national competitions such as “Black Box”, Hardware Design, Robotics, and others.

Program Mission

Within the context of Saint Louis University and Parks College of Engineering, Aviation and Technology, the mission of the Computer Engineering Program is to adequately prepare graduates to enter into the engineering professions, especially in the areas of analysis, design, and development of electrical and/or computer systems and components.

Program Educational Objectives

- Our graduates will have acquired advanced degrees or are engaged in advanced study in engineering, business, law, medicine, or other appropriate fields.
- Our graduates will have established themselves as practicing engineers in electrical, computer or related engineering fields.
- Our graduates will be filling the technical needs of society by solving engineering problems using Electrical or Computer engineering principles, tools, and practices.

Student Outcomes

Student outcomes are consistent with the mission statements of the department, the college, and the university. Student outcomes are given below.

a) An ability to apply knowledge of mathematics, science, and engineering.

b) An ability to design and conduct experiments, as well as to analyze and interpret data.

c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) An ability to function on multi-disciplinary teams.

e) An ability to identify, formulate and solve engineering problems.

f) An understanding of professional and ethical responsibility.

g) An ability to communicate effectively.
h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social context.

i) A recognition of the need for, and an ability to engage in life-long learning.

j) A knowledge of contemporary issues.

k) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

Degree Requirements

**Basic Science & Math (36 credits)**
- CHEM1110 General Chemistry I 3
- CHEM1115 General Chemistry I Lab 1
- PHYS 1610 Engineering Physics I 3
- PHYS 1620 Engineering Physics I Lab 1
- PHYS 1630 Engineering Physics II 3
- PHYS 1640 Engineering Physics II Lab 1
- MATH1660 Discrete Mathematics 3
- MATH1510 Calculus I 4
- MATH1520 Calculus II 4
- MATH2530 Calculus III 4
- MATH3110 Linear Algebra 3
- MATH3550 Differential Equations 3
- ECE 3052 Probability & RV for Engineers 3

**Communications (3 credits)**
- ENGL 1920 Adv Writing for Professionals 3

**Computer Science (14 credits)**
- CSCI 1300 Intro Object Oriented Program 4
- CSCI 2100 Data Structures 4
- CSCI 2300 Object Oriented Software Design 3
- CSCI 3500 Operating Systems 3

**Liberal Arts (15 credits)**
- PHIL 3400 Ethics and Engineering 3
- THEO 1000 Theological Foundations 3
- Cultural Diversity 3
- Humanities 3
- Social & Behavioral Science 3

Cultural Diversity, Humanities, Social and Behavioral Science must be selected from an approved list.

**Computer Engineering Core (48 credits)**
- ECE 1001 Intro to ECE I 1
- ECE 1002 Intro to ECE II 1
- ECE 2101 Electrical Circuits I 3
- ECE 2102 Electrical Circuits II 3
- ECE 2103 Electrical Circuits Lab 1
- ECE 2205 Digital Design 3
- ECE 2206 Digital Design Lab 1
- ECE 3205 Advanced Digital Design 3
- ECE 3215 Computer Systems Design 3
- ECE 3215 Computer Systems Design Lab 1
- ECE 3217 Computer Architecture 3
- ECE 3225 Microprocessors 3
- ECE 3226 Microprocessors Lab 1
- ECE 3130 Semiconductor Devices 3
- ECE 3131 Electronic Circuits 3
- ECE 3132 Electronic Circuits lab 1
- ECE 3150 Linear Systems 3
- ECE 3151 Linear Systems Lab 1
- ECE 3090 Junior Design 1
- ECE 4245 Computer Networks 3
- ECE 4800 ECE Design I 3
- ECE 4810 ECE Design II 3

**ECE (CSCI) Electives for CpE Majors (6 credits)**
Students are required to take six (6) credits from an approved list and as offered. A partial list is given below. Please check with the ECE department for a complete list of approved electives.
- ECE 3110 Energy Conversion 3
- ECE 3140 Electromagnetic Fields 3
- ECE 4225 Hardware Software Co-design 3
- ECE 4226 Mobile Robotics 3
- ECE 4235 Digital IC Design 3
- ECE 4151 Digital Signal Processing 3
- CSCI 3100 Algorithms 3
- CSCI 3200 Programming Languages 3
- CSCI 3820 Computer Graphics I 3
- CSCI 3710 Databases 3
- CSCI 3200 Software Engineering 3
- CSCI 4550 Advanced Operating Systems 3
- CSCI 3760 Artificial Intelligence 3

**Technical Elective (3 credits)**
One 3 credit course selected from an approved list in science, mathematics, or engineering, at the 2000-level or higher, or Computer Science at 3000 or higher. This course cannot be used to satisfy other curriculum requirements.

**Internship and Co-op**
Although not required, students can elect to participate in an internship or cooperative experience before graduation.
- ECE 2910 Co-op 0-3
- ECE 3910 Co-op 0-3
- ECE 4910 Co-op 0-3
- ECE 2915 Internship 0-3
- ECE 3915 Internship 0-3
- ECE 4915 Internship 0-3

**Minimum BS Credits 125**