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)

CHEM	1110	General Chemistry I	3
CHEM	1115	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
MATH	1660	Discrete Mathematics	3
MATH	1510	Calculus I	4
MATH	1520	Calculus II	4
MATH	2530	Calculus III	4
MATH	3110	Linear Algebra	3
MATH	3550	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			3
Humanities			3
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 1	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.

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 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

Basic Science & Math (51 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
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	1660	Discrete Math	3
MATH	1510	Calculus I	4
MATH	1520	Calculus II	4
MATH	2530	Calculus III	4
MATH	3110	Linear Algebra	3
MATH	3550	Differential Equations	3
ECE	3025	Probability & RV for Engineers	3

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 1	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	1660	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 1	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 (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)

CHEM	1110	General Chemistry I	3
CHEM	1115	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
MATH	1660	Discrete Mathematics	3
MATH	1510	Calculus I	4
MATH	1520	Calculus II	4
MATH	2530	Calculus III	4
MATH	3110	Linear Algebra	3
MATH	3550	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**