

# ENGINEERING PHYSICS, B.S.

Physics is the branch of science that studies the nature of matter, energy and spacetime at the most fundamental level. It provides a foundation for all the natural sciences and engineering disciplines. Physics has brought such revolutions as relativity, quantum mechanics and the Big Bang theory, profoundly altering the way mankind views the universe.

Physicists have played a major role in the discovery of many phenomena leading to whole new technologies. The invention of the transistor, by physicists, has made the modern computer possible, while the development of lasers has led to diverse applications ranging from supermarket scanners to laser surgery. The physicist is a versatile problem solver and able to excel in many technical fields.

A training in physics leads to a broad-based understanding of natural phenomena, analytical and computer skills, experience with electronics and the operation of sophisticated equipment, an understanding of measurements and their limitations, and the ability to formulate and solve technical problems.

Physics students have a strong interest in mathematics, computers and science along with a desire to understand how the universe works. Students are interested in questions such as "Why do elementary particles behave the way they do?", "What is the nature of light?" or "How did the universe begin, and what will eventually happen to it?" Some students pursue double majors in mathematics, computer science or an engineering field.

## Curriculum Overview

The Department of Physics, in collaboration with the Engineering Departments of Parks College offers a Bachelor of Science Degree in Engineering Physics that prepares students for a broad range of careers requiring scientific and technical knowledge. This program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>. This program is ideally suited for those students who have an interest in and aptitude for both physics and engineering. The curriculum satisfies the requirements for a minor in Engineering Mathematics and has essentially the same physics content as our traditional B. S. degree. Students may select a concentration in Aerospace, Biomedical, Computer, Electrical, or Mechanical Engineering, or choose the Interdisciplinary Option. Each student completes a senior design project, typically as a member of a multidisciplinary team.

The required courses listed below are accompanied by the Parks College core. This degree is conferred by Parks College. This curriculum also satisfies all requirements for a Minor in Engineering Mathematics.

## Fieldwork and Research Opportunities

Benefits of the physics program also include several internship and career opportunities. The physics department employs some of its students as teaching and research assistants during the summer. Students have held summer internships at NASA-Langley, the Argonne National Laboratory and other laboratories. Students have worked both during the summer and during the year at local industries such as Boeing and Anheuser-Busch. Numerous opportunities exist for summer research in basic and applied physics in the Parks Summer Undergraduate Research Experience (SURE) program and in national laboratories and in National Science Foundation-sponsored programs at universities throughout the United States.

The program stresses undergraduate research and applications of computers in physics. New state-of-the-art research facilities allow for students to work directly alongside faculty members on research projects.

## Careers

Graduates with a bachelor's degree in physics enter a variety of careers that depend on the technical skills gained in college. Alumni are employed in product development and quality control in large industries such as RCA, Boeing or Lockheed-Martin. Alumni are computer specialists at Anheuser-Busch and other companies. Some are now involved in the marketing of technical products, while others are in management positions. A few graduates have entered military careers. Students frequently earn double majors, combining physics with mathematics, computer science or chemistry.

## Admission Requirements

### Freshman

All applications are thoroughly reviewed with the highest degree of individual care and consideration to all credentials that are submitted. Solid academic performance in college preparatory course work is a primary concern in reviewing a freshman applicant's file. College admission test scores (ACT or SAT) are used as an additional indicator of the student's ability to meet the academic rigors of Saint Louis University and are used as qualifiers for certain University scholarship programs. To be considered for admission to any Saint Louis University undergraduate program, the applicant must be graduating from an accredited high school or have an acceptable score on the General Education Development (GED) test.

### Transfer

Applicants must be a graduate of an accredited high school or have an acceptable score on the GED. An official high school transcript and official test scores are required only of those students who have attempted fewer than 24 transferable semester credits (or 30 quarter credits) of college credit. Those having completed 24 or more of college credit need only submit a transcript from previously attended college(s). In reviewing a transfer applicant's file, the office of admission holistically examines the student's academic performance in college-level coursework as an indicator of the student's ability to meet the academic rigors of Saint Louis University.

### International Applicants

All admission policies and requirements for domestic students apply to international students along with the following:

- Demonstrate English Language Proficiency (<http://catalog.slu.edu/academic-policies/office-admission/undergraduate/english-language-proficiency>)
- Proof of financial support must include:
  - A letter of financial support from the person(s) or sponsoring agency funding the time at Saint Louis University
  - A letter from the sponsor's bank verifying that the funds are available and will be so for the duration of study at the University
- Academic records, in English translation, of students who have undertaken postsecondary studies outside the United States must include the courses taken and/or lectures attended, practical laboratory work, the maximum and minimum grades attainable, the

grades earned or the results of all end-of-term examinations, and any honors or degrees received. WES and ECE transcripts are accepted.

## Additional Admission Requirements

In addition to the general admission and matriculation requirements of the University, the engineering physics program has the following additional requirements:

- GPA: Minimum cumulative 3.00 high school GPA for freshmen applicants and 2.70 college GPA for transfer applicants.
- ACT/SAT: ACT composite score of 24 or higher, or SAT composite score of 1160 or higher. ACT sub scores minimums of 22 in English, 24 in Mathematics, 22 in Reading Comprehension and 22 in Scientific Reasoning, or SAT Math sub score of 620.
- Coursework: Fifteen total units of high school work are required: three or four units of English; four or more units of mathematics including algebra I and II, geometry and precalculus (Algebra II with Trigonometry is not sufficient). Students should be prepared to start the first semester freshmen year in Calculus I or higher; three or four units of science including general science, introduction to physical science, earth science, biology, physics or chemistry; two or three units of social sciences including history, psychology or sociology; and three units of electives.

Admission requirements to Parks College of Engineering, Aviation and Technology degree programs are based on a combination of secondary school grades, college admission test scores, co-curricular activities and attempted college course work, as well as other indicators of the applicant's ability, career focus and character. This process respects the non-discrimination policy of the University and is designed to select a qualified, competent and diverse student body with high standards of scholarship and character, consistent with the mission of the University.

## Scholarships and Financial Aid

There are two principal ways to help finance a Saint Louis University education:

- Scholarships: awarded based on academic achievement, service, leadership and financial need.
- Financial Aid: provided in the form of grants and loans, some of which require repayment.

For priority consideration for merit-based scholarships, applicants should apply for admission by Dec. 1 and complete a Free Application for Federal Student Aid (FAFSA) by March 1.

For information on other scholarships and financial aid, visit the student financial services office online at <http://finaid.slu.edu>.

## Accreditation

The Aerospace Engineering, Biomedical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Engineering Physics and Mechanical Engineering undergraduate curricula are accredited by the Engineering Accreditation Commission of ABET, [www.abet.org](http://www.abet.org) (<https://www.abet.org>).

Enrollment and graduation data for engineering physics is listed here (<https://www.slu.edu/parks/pdfs/2018-engineering-physics-enrollment-and-graduation-data.pdf>)

## Learning Outcomes

The undergraduate engineering physics program is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>).

### Program Educational Objectives

The undergraduate program is designed to meet the following specific objectives in order to fulfill the departmental and institutional missions. By three to five years after graduation, graduates of the engineering physics program will be:

- Engaged in successful public or private sector careers in engineering physics or a related field or as students pursuing advanced or professional degrees
- Collaborating effectively on multi-disciplinary teams and communicating effectively both within the team and with stakeholders
- Advancing in their professional careers through taking on increasing responsibilities, pursuing lifelong learning, continuing professional development, and seeking professional registration as appropriate for their employers
- Acting responsibly, ethically and in the service of humanity when making personal and professional decisions

### Student Outcomes

- an ability to apply knowledge of mathematics, science, and engineering;
- an ability to design and conduct experiments, as well as to analyze and interpret data;
- 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;
- an ability to function on multi-disciplinary teams;
- an ability to identify, formulate, and solve engineering problems;
- an understanding of professional and ethical responsibility;
- an ability to communicate effectively;
- the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- a recognition of the need for, and an ability to engage in life-long learning;
- a knowledge of contemporary issues;
- an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

## Requirements

### Standard Track

Code	Title	Credits
<b>Professional Orientation</b>		
Select one of the following:		1
PHYS 1110	Introduction to Physics	
AENG/MENG 1001	Introduction to Aerospace & Mechanical Engineering	
BME 1000	Introduction to Biomedical Engineering I	
ECE 1001	Introduction to Electrical and Computer Engineering	

### Basic Science & Mathematics

CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
CHEM 1120 & CHEM 1125	General Chemistry 2 and General Chemistry 2 Laboratory	4
BIOL 1240 & BIOL 1245	Principles of Biology I and Principles of Biology I Laboratory	4
BIOL 1260 & BIOL 1265	Principles of Biology II and Principles of Biology II Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
MATH 3550	Differential Equations	3
MATH 3240	Numerical Analysis	3
MATH 3270	Advanced Mathematics for Engineers	3
MATH 3850	Foundation of Statistics	3
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 4610	Quantum Mechanics	3

**Engineering Mechanics**

Select one of the following pairs: 6

BME 3200 Mechanics & BME 4200 and Biomechanics

ESCI 2100 Statics & ESCI 2150 and Dynamics

**Computation**

BME 2000 BME Computing 3  
or CSCI 1060 Introduction to Computer Science: Scientific Programming

**Thermodynamics**

PHYS 3410 Thermodynamics and Statistical Mechanics 3  
or ESCI 2300 Thermodynamics

**Electricity & Magnetism**

PHYS 4210 Electricity & Magnetism I 3  
ECE 2001 Introduction to Electrical Engineering and Electrical Engineering Lab 4  
& ECE 2002 or PHYS 3510 Analog & Digital Electronics

**Optics**

PHYS 3310 Optics 4  
& PHYS 3320 and Optics Laboratory

**Track Requirements**

Select one of the following tracks: 6

BME 3400 Materials Science & ESCI 3100 and Mechanics of Solids (Materials Science Track)

BME 3300 Transport Fundamentals & ESCI 3200 and Fluid Dynamics (Transport/Fluids Track)

BME 3100 Signals & ECE 3150 and Linear Systems (Signals/Systems Track)

**Engineering Depth Focus Area**

Select three Upper Division Engineering Courses 9

**Engineering Physics Electives**

Select two of the following: 6

PHYS 3120 Advanced Classical Mechanics

PHYS 4010 Nanoscience and Nanofabrication Frontiers

PHYS 4020 Experimental Physics

PHYS 4220 Electricity & Magnetism II

PHYS 4620 Application of Quantum Mechanics

**Senior Design Project** 6

AENG 4004 Flight Vehicle Analy & Dsgn I

or BME 4950 Senior Project I

or ECE 4800 ECE Design I

or MENG 4000 Design I

AENG 4014 Flight Vehicle Analy & Dsgn II

or BME 4960 Senior Project II

or ECE 4810 ECE Design II

or MENG 4010 Design II

**College Core**

ENGL 1900 Advanced Strategies Of Rhetoric and Research 3

CMM 2200 Small Group Presentation 1

THEO 1000 Theological Foundations 3

PHIL 2050 Ethics 3

PHIL 3400 Ethics & Engineering 3

Social/Behavioral Science Elective <sup>1</sup> 3

Humanities Elective <sup>1</sup> 3

Cultural Diversity Elective <sup>1</sup> 3

**Concentrations**

Aerospace Engineering (p. 3)

Biomedical Engineering (p. 4)

Computer Engineering (p. 5)

Electrical Engineering (p. 5)

Mechanical Engineering (p. 6)

Total Credits 128

<sup>1</sup> Cultural Diversity, Humanities, and Social/Behavioral Science elective courses must be selected from an approved list. See the Parks College introduction in this catalog for more information.

**Aerospace Engineering Concentration**

<b>Code</b>	<b>Title</b>	<b>Credits</b>
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**Professional Orientation**

PHYS 1110	Introduction to Physics (as a career)	1
or AENG 1001	Introduction to Aerospace & Mechanical Engineering	

**Basic Science & Mathematics**

CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
MATH 3550	Differential Equations	3
MATH 3270	Advanced Mathematics for Engineers	3
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4

PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 4610	Quantum Mechanics	3
<b>Engineering Physics &amp; Engineering Topics</b>		
AENG 1002	Computer-Aided Engineering Design	1
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
ESCI 2100	Statics	3
ESCI 2150	Dynamics	3
ESCI 2300	Thermodynamics	3
ESCI 3200 & ESCI 3201	Fluid Dynamics and Fluid Dynamics Laboratory	4
ESCI 3110	Linear Vibrations	3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
PHYS 3510	Analog & Digital Electronics	4
PHYS 4210	Electricity & Magnetism I	3
<b>Engineering Physics Electives</b>		
Select two of the following:		6
PHYS 3120	Advanced Classical Mechanics	
PHYS 4010	Nanoscience and Nanofabrication Frontiers	
PHYS 4020	Experimental Physics	
PHYS 4220	Electricity & Magnetism II	
PHYS 4620	Application of Quantum Mechanics	
<b>Track Requirements</b>		
Select one of the following tracks:		15
<i>Aeronautics</i>		
AENG 2000	Intro to Aeronautics & Astron	
AENG 3000	Performance	
AENG 4400	Stability and Control	
Two Upper Division Courses (AENG/ESCI 3xxx, 4xxx)		
<i>Astronautics</i>		
AENG 2000	Intro to Aeronautics & Astron	
AENG 3150	Astrodynamics	
AENG 4150	Orbital Mechanics	
Two Upper Division Courses (AENG/ESCI 3xxx, 4xxx)		
<b>Senior Design Project</b>		
AENG 4004	Flight Vehicle Analys & Dsgn I	3
AENG 4014	Flight Vehicle Analy & Dsgn II	3
<b>College Core</b>		
ENGL 1900	Advanced Strategies Of Rhetoric and Research	3
CMM 2200	Small Group Presentation	1
THEO 1000	Theological Foundations	3
PHIL 2050	Ethics	3
PHIL 3400	Ethics & Engineering	3
Social/Behavioral Science Elective <sup>1</sup>		3
Humanities Elective <sup>1</sup>		3
Cultural Diversity Elective <sup>1</sup>		3
<b>Open Elective</b>		

Select one course	3
<b>Total Credits</b>	<b>127</b>

<sup>1</sup> Cultural Diversity, Humanities, and Social/Behavioral Science elective courses must be selected from an approved list. See the Parks College introduction in this catalog for more information.

## Biomedical Engineering Concentration

Code	Title	Credits
<b>Professional Orientation</b>		
PHYS 1110 or BME 1000	Introduction to Physics (as a career) Introduction to Biomedical Engineering I	1
<b>Basic Science &amp; Mathematics</b>		
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
CHEM 1120 & CHEM 1125	General Chemistry 2 and General Chemistry 2 Laboratory	4
BIOL 1240 & BIOL 1245	Principles of Biology I and Principles of Biology I Laboratory	4
BIOL 1260 & BIOL 1265	Principles of Biology II and Principles of Biology II Laboratory	4
BME 2200	Applied Physiology for Engineers	3
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
MATH 3550	Differential Equations	3
MATH 3270	Advanced Mathematics for Engineers	3
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 4610	Quantum Mechanics	3
<b>Engineering Physics &amp; Engineering Topics</b>		
BME 1010	Introduction to Biomedical Engineering II	1
BME 2000	BME Computing	3
BME 3200	Mechanics	3
BME 4200	Biomechanics	3
PHYS 3410	Thermodynamics and Statistical Mechanics	3
ECE 2001 & ECE 2002	Introduction to Electrical Engineering and Electrical Engineering Lab	4
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
PHYS 4210	Electricity & Magnetism I	3
<b>Engineering Physics Electives</b>		
Select two of the following:		6
PHYS 3120	Advanced Classical Mechanics	
PHYS 4010	Nanoscience and Nanofabrication Frontiers	
PHYS 4020	Experimental Physics	
PHYS 4220	Electricity & Magnetism II	
PHYS 4620	Application of Quantum Mechanics	

<b>Track Requirements</b>		
Select two of the following tracks:		12
<i>Transport</i>		
BME 3300	Transport Fundamentals	
BME 4300	Biotransport	
<i>Material Science</i>		
BME 3400	Materials Science	
BME 4400	Biomaterials	
<i>Measurements</i>		
MENG 3430	Measurements	
BME 3150	Biomedical Instrumentation	
	or BME 4600 Quantitative Physiology I	
<i>Signals &amp; Systems</i>		
BME 3100	Signals	
BME 4100	Biomedical Signals	
<b>Senior Design Project</b>		
BME 4950	Senior Project I	3
BME 4960	Senior Project II	3
<b>College Core</b>		
ENGL 1900	Advanced Strategies Of Rhetoric and Research	3
CMM 2200	Small Group Presentation	1
THEO 1000	Theological Foundations	3
PHIL 2050	Ethics	3
PHIL 3400	Ethics & Engineering	3
	Social/Behavioral Science Elective <sup>1</sup>	3
	Humanities Elective <sup>1</sup>	3
	Cultural Diversity Elective <sup>1</sup>	3
Total Credits		129

<sup>1</sup> Cultural Diversity, Humanities, and Social/Behavioral Science elective courses must be selected from an approved list. See the Parks College introduction in this catalog for more information.

## Computer Engineering Concentration

Code	Title	Credits
<b>Professional Orientation</b>		
Select one of the following:		1
PHYS 1110	Introduction to Physics	
ECE 1001	Introduction to Electrical and Computer Engineering	
<b>Basic Science &amp; Mathematics</b>		
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
MATH 3550	Differential Equations	3
MATH 3270	Advanced Mathematics for Engineers	3
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4

PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 3110	Classical Mechanics	3
PHYS 4610	Quantum Mechanics	3
<b>Engineering Physics &amp; Engineering Topics</b>		
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
ECE 2101	Electrical Circuits I	3
ECE 2102	Electrical Circuits II	3
ECE 2103	Electrical Circuits Lab	1
ECE 2205 & ECE 2206	Digital Design and Digital Design Lab	4
ECE 3130	Semiconductor Devices	3
ECE 3140	Electromagnetic Fields	3
ECE 3215 & ECE 3216	Computer Systems Design and Computer Systems Design Lab	4
ECE 3225 & ECE 3226	Microprocessors and Microprocessors Laboratory	4
Two Engineering Electives selected with Faculty Mentor		6
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
PHYS 3410	Thermodynamics and Statistical Mechanics	3
<b>Engineering Physics Electives</b>		
Select two of the following:		6
PHYS 3120	Advanced Classical Mechanics	
PHYS 4010	Nanoscience and Nanofabrication Frontiers	
PHYS 4020	Experimental Physics	
PHYS 4220	Electricity & Magnetism II	
PHYS 4620	Application of Quantum Mechanics	
<b>Senior Design Project</b>		
ECE 4800	ECE Design I	3
ECE 4810	ECE Design II	3
<b>College Core</b>		
ENGL 1900	Advanced Strategies Of Rhetoric and Research	3
CMM 2200	Small Group Presentation	1
THEO 1000	Theological Foundations	3
PHIL 2050	Ethics	3
PHIL 3400	Ethics & Engineering	3
	Social/Behavioral Science Elective <sup>1</sup>	3
	Humanities Elective <sup>1</sup>	3
	Cultural Diversity Elective <sup>1</sup>	3
<b>Open Electives</b>		
Select two courses		6
Total Credits		128

<sup>1</sup> Cultural Diversity, Humanities, and Social/Behavioral Science elective courses must be selected from an approved list. See the Parks College introduction in this catalog for more information.

## Electrical Engineering Concentration

Code	Title	Credits
<b>Professional Orientation</b>		
PHYS 1110 or ECE 1001	Introduction to Physics (as a career) or Introduction to Electrical and Computer Engineering	1

<sup>1</sup> Cultural Diversity, Humanities, and Social/Behavioral Science elective courses must be selected from an approved list. See the Parks College introduction in this catalog for more information.

**Basic Science & Mathematics**

CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
MATH 3550	Differential Equations	3
MATH 3270	Advanced Mathematics for Engineers	3
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 3110	Classical Mechanics	3
PHYS 4610	Quantum Mechanics	3

**Engineering Physics & Engineering Topics**

CSCI 1060	Introduction to Computer Science: Scientific Programming	3
ECE 2101	Electrical Circuits I	3
ECE 2102	Electrical Circuits II	3
ECE 2103	Electrical Circuits Lab	1
ECE 3130	Semiconductor Devices	3
ECE 3140	Electromagnetic Fields	3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
PHYS 3410	Thermodynamics and Statistical Mechanics	3

**Engineering Physics Electives**

Select two of the following:		6
PHYS 3120	Advanced Classical Mechanics	
PHYS 4010	Nanoscience and Nanofabrication Frontiers	
PHYS 4020	Experimental Physics	
PHYS 4220	Electricity & Magnetism II	
PHYS 4620	Application of Quantum Mechanics	

**Track Requirements**

Select one of the following tracks: 15-16

*Electromagnetic Fields and Waves*

ECE 3110	Electric Energy Conversion	
ECE 4160	Communication Systems	
ECE 4140	Electromagnetic Waves	
Two Engineering Electives selected with Faculty Mentor		

*Analog Electronics*

ECE 3150	Linear Systems	
ECE 3131 & ECE 3132	Electronic Circuit Design and Electronic Circuit Design Lab	
ECE 4120	Automatic Control Systems	
Two Engineering Electives selected with Faculty Mentor		

*Communications*

ECE 2205 & ECE 2206	Digital Design and Digital Design Lab	
ECE 3150	Linear Systems	

ECE 4160	Communication Systems	
Two Engineering Electives selected with Faculty Mentor		
<b>Senior Design Project</b>		
ECE 4800	ECE Design I	3
ECE 4810	ECE Design II	3
<b>College Core</b>		
ENGL 1900	Advanced Strategies Of Rhetoric and Research	3
CMM 2200	Small Group Presentation	1
THEO 1000	Theological Foundations	3
PHIL 2050	Ethics	3
PHIL 3400	Ethics & Engineering	3
Social/Behavioral Science Elective <sup>1</sup>		3
Humanities Elective <sup>1</sup>		3
Cultural Diversity Elective <sup>1</sup>		3
<b>Open Electives</b>		
Select two courses		6
Total Credits		125-126

<sup>1</sup> Cultural Diversity, Humanities, and Social/Behavioral Science elective courses must be selected from an approved list. See the Parks College introduction in this catalog for more information.

**Mechanical Engineering Concentration**

Code	Title	Credits
<b>Professional Orientation</b>		
PHYS 1110	Introduction to Physics	1
or MENG 1001 Introduction to Aerospace & Mechanical Engineering		
<b>Basic Science &amp; Mathematics</b>		
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
MATH 1510	Calculus I	4
MATH 1520	Calculus II	4
MATH 2530	Calculus III	4
MATH 3550	Differential Equations	3
MATH 3270	Advanced Mathematics for Engineers	3
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 4610	Quantum Mechanics	3
<b>Engineering Physics &amp; Engineering Topics</b>		
AENG 3100	Computer Aided Engineering	3
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
MENG 1002	Computer-Aided Engineering Design	1
ESCI 2100	Statics	3
ESCI 2150	Dynamics	3
ESCI 2300	Thermodynamics	3
ESCI 3100 & ESCI 3101	Mechanics of Solids and Mechanics of Solids Lab	4

ESCI 3200 & ESCI 3201	Fluid Dynamics and Fluid Dynamics Laboratory	4
ESCI 3110	Linear Vibrations	3
MENG 2000	Foundation to Engineering Design	3
MENG 3010	Machine Design	3
Upper Div. Engineering Course (MENG/ESCI 3xxx, 4xxx)		3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
PHYS 3510	Analog & Digital Electronics	4
PHYS 4210	Electricity & Magnetism I	3
<b>Engineering Physics Electives</b>		
Select two of the following:		6
PHYS 3120	Advanced Classical Mechanics	
PHYS 4010	Nanoscience and Nanofabrication Frontiers	
PHYS 4020	Experimental Physics	
PHYS 4220	Electricity & Magnetism II	
PHYS 4620	Application of Quantum Mechanics	
<b>Senior Design Project</b>		
MENG 4004	Design I	3
MENG 4014	Design II	3
<b>College Core</b>		
ENGL 1900	Advanced Strategies Of Rhetoric and Research	3
CMM 2200	Small Group Presentation	1
THEO 1000	Theological Foundations	3
PHIL 2050	Ethics	3
PHIL 3400	Ethics & Engineering	3
Social/Behavioral Science Elective <sup>1</sup>		3
Humanities Elective <sup>1</sup>		3
Cultural Diversity Elective <sup>1</sup>		3
<b>Open Electives</b>		
Select one course		3
Total Credits		128

<sup>1</sup> Cultural Diversity, Humanities, and Social/Behavioral Science elective courses must be selected from an approved list. See the Parks College introduction in this catalog for more information.

## Continuation Standards

Students must have a GPA of 2.00 in Engineering Physics major coursework to be retained in the major/minor.

## Roadmap

Roadmaps are recommended semester-by-semester plans of study for programs and assume full-time enrollment unless otherwise noted.

Courses and milestones designated as critical (marked with !) must be completed in the semester listed to ensure a timely graduation. Transfer credit may change the roadmap.

This roadmap should not be used in the place of regular academic advising appointments. All students are encouraged to meet with their advisor/mentor each semester. Requirements, course availability and sequencing are subject to change.

## Standard Track

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
PHYS 1110	Introduction to Physics	1
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
ENGL 1900 or ENGL 1920	Advanced Strategies Of Rhetoric and Research or Advanced Writing for Professionals	3
MATH 1510	Calculus I	4
BIOL 1240 & BIOL 1245	Principles of Biology I and Principles of Biology I Laboratory	4
		Credits
		16
<b>Spring</b>		
BIOL 1260 & BIOL 1265	Principles of Biology II and Principles of Biology II Laboratory	4
CHEM 1120 & CHEM 1125	General Chemistry 2 and General Chemistry 2 Laboratory	4
MATH 1520	Calculus II	4
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
		Credits
		16
<b>Year Two</b>		
<b>Fall</b>		
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
MATH 2530	Calculus III	4
CMM 2200	Small Group Presentation	1
		Social/Behavioral Elective
		3
		Engineering Breadth Course
		3
		Credits
		15
<b>Spring</b>		
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
MATH 3550	Differential Equations	3
		Engineering Breadth Course
		3
		Engineering Breadth Course
		3
		General Elective
		3
		Credits
		16
<b>Year Three</b>		
<b>Fall</b>		
MATH 3270	Advanced Mathematics for Engineers	3
PHIL 2050	Ethics	3
THEO 1000	Theological Foundations	3
		Engineering Breadth Course
		4
		Engineering Breadth Course
		3
		Credits
		16
<b>Spring</b>		
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4

PHYS 4210	Electricity & Magnetism I	3
Engineering Breadth Course		3
Credits		16
<b>Year Four</b>		
<b>Fall</b>		
PHIL 3400	Ethics & Engineering	3
PHYS 4610	Quantum Mechanics	3
Engineering Breadth Course		3
Engineering Physics Elective		3
Engineering Depth Elective		3
Senior Project I		3
Credits		18
<b>Spring</b>		
Engineering Depth Elective		3
Engineering Depth Elective		3
Engineering Physics Elective		3
Cultural Diversity Elective		3
Senior Project II		3
Credits		15
Total Credits		128

### Aerospace Engineering Concentration

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
AENG 1001	Introduction to Aerospace & Mechanical Engineering	1
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
ENGL 1900 or ENGL 1920	Advanced Strategies Of Rhetoric and Research or Advanced Writing for Professionals	3
MATH 1510	Calculus I	4
Humanities Elective		3
Credits		15
<b>Spring</b>		
AENG 1002	Computer-Aided Engineering Design	1
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
MATH 1520	Calculus II	4
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
THEO 1000	Theological Foundations	3
Credits		15
<b>Year Two</b>		
<b>Fall</b>		
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
MATH 2530	Calculus III	4
CMM 2200	Small Group Presentation	1
ESCI 2100	Statics	3
Social Science Elective		3

General Elective	3
Credits	18

### Spring

PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
MATH 3240	Numerical Analysis	3
MATH 3550	Differential Equations	3
ESCI 2300	Thermodynamics	3
ESCI 2150	Dynamics	3
Credits		16

### Year Three

#### Fall

AENG Track Course		3
ESCI 3200 & ESCI 3201	Fluid Dynamics and Fluid Dynamics Laboratory	4
MATH 3270	Advanced Mathematics for Engineers	3
PHIL 2050	Ethics	3
PHYS 3510	Analog & Digital Electronics	4
Credits		17

#### Spring

AENG Track Course		3
ESCI 3110	Linear Vibrations	3
MATH 3850	Foundation of Statistics	3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
PHYS 4210	Electricity & Magnetism I	3
Credits		16

### Year Four

#### Fall

AENG Track Course		3
AENG 4004	Flight Vehicle Analys & Dsgn I	3
PHIL 3400	Ethics & Engineering	3
PHYS 4610	Quantum Mechanics	3
Engineering Physics Elective		3
Credits		15

#### Spring

AENG 4014	Flight Vehicle Analy & Dsgn II	3
ESCI or AENG Upper Division Course		3
ESCI or AENG Upper Division Course		3
Engineering Physics Elective		3
Cultural Diversity Elective		3
Credits		15
Total Credits		127

### Biomedical Engineering Concentration

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
BME 1000	Introduction to Biomedical Engineering I	1
BIOL 1240 & BIOL 1245	Principles of Biology I and Principles of Biology I Laboratory	4
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4



ENGL 1900 or ENGL 1920	Advanced Strategies Of Rhetoric and Research or Advanced Writing for Professionals	3
MATH 1510	Calculus I	4
Credits		16

**Spring**

BME 1010	Introduction to Biomedical Engineering II	1
BIOL 1260 & BIOL 1265	Principles of Biology II and Principles of Biology II Laboratory	4
CHEM 1120 & CHEM 1125	General Chemistry 2 and General Chemistry 2 Laboratory	4
MATH 1520	Calculus II	4
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
Credits		17

**Year Two**

**Fall**

BME 2000	BME Computing	3
BME 3200	Mechanics	3
BME 2200	Applied Physiology for Engineers	3
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
MATH 2530	Calculus III	4
Credits		17

**Spring**

BME 4200	Biomechanics	3
ECE 2001 & ECE 2002	Introduction to Electrical Engineering and Electrical Engineering Lab	4
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
MATH 3550	Differential Equations	3
Social Science Elective		3
Credits		17

**Year Three**

**Fall**

MATH 3270	Advanced Mathematics for Engineers	3
PHIL 2050	Ethics	3
PHYS 4610	Quantum Mechanics	3
THEO 1000	Theological Foundations	3
BME 3000 or 4000 Level Course		3
Credits		15

**Spring**

MATH 3240	Numerical Analysis	3
BME 3000 or 4000 Level Course		3
MATH 3850	Foundation of Statistics	3
PHYS 3410	Thermodynamics and Statistical Mechanics	3
PHYS 4210	Electricity & Magnetism I	3
Credits		15

**Year Four**

**Fall**

BME 4950	Senior Project I	3
CMM 2200	Small Group Presentation	1

PHIL 3400	Ethics & Engineering	3
BME 3000 or 4000 Level Course		3
Engineering Physics Elective		3
Humanities Elective		3
Credits		16

**Spring**

BME 4960	Senior Project II	3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
Engineering Physics Elective		3
BME 4000 Level Course		3
Cultural Diversity Elective		3
Credits		16
Total Credits		129

**Computer Engineering Concentration**

Course	Title	Credits
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**Year One**

**Fall**

ECE 1001	Introduction to Electrical and Computer Engineering	1
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
ENGL 1900 or ENGL 1920	Advanced Strategies Of Rhetoric and Research or Advanced Writing for Professionals	3
MATH 1510	Calculus I	4
Humanities Elective		3
Credits		15

**Spring**

CSCI 1060	Introduction to Computer Science: Scientific Programming	3
MATH 1520	Calculus II	4
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
THEO 1000	Theological Foundations	3
General Elective		3
Credits		17

**Year Two**

**Fall**

ECE 2101	Electrical Circuits I	3
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
MATH 2530	Calculus III	4
CMM 2200	Small Group Presentation	1
Social Science Elective		3
Credits		15

**Spring**

ECE 2102 & ECE 2103	Electrical Circuits II and Electrical Circuits Lab	4
ECE 3140	Electromagnetic Fields	3
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 3110	Classical Mechanics	3

MATH 3550	Differential Equations	3
	Credits	17
<b>Year Three</b>		
<b>Fall</b>		
ECE 2205 & ECE 2206	Digital Design and Digital Design Lab	4
ECE 3130	Semiconductor Devices	3
MATH 3270	Advanced Mathematics for Engineers	3
PHIL 2050	Ethics	3
PHYS 4610	Quantum Mechanics	3
	Credits	16
<b>Spring</b>		
ECE 3215 & ECE 3216	Computer Systems Design and Computer Systems Design Lab	4
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 3410	Thermodynamics and Statistical Mechanics	3
General Elective		3
	Credits	16
<b>Year Four</b>		
<b>Fall</b>		
ECE 3225 & ECE 3226	Microprocessors and Microprocessors Laboratory	4
ECE 4800	ECE Design I	3
PHIL 3400	Ethics & Engineering	3
ECE Elective		3
Engineering Physics Elective		3
	Credits	16
<b>Spring</b>		
ECE 4810	ECE Design II	3
PHYS 3310 & PHYS 3320	Optics and Optics Laboratory	4
ECE Elective		3
Engineering Physics Elective		3
Cultural Diversity Elective		3
	Credits	16
	Total Credits	128

### Electrical Engineering Concentration

Course	Title	Credits
<b>Year One</b>		
<b>Fall</b>		
ECE 1001	Introduction to Electrical and Computer Engineering	1
CHEM 1110 & CHEM 1115	General Chemistry 1 and General Chemistry 1 Laboratory	4
ENGL 1900 or ENGL 1920	Advanced Strategies Of Rhetoric and Research or Advanced Writing for Professionals	3
MATH 1510	Calculus I	4
Humanities Elective		3
	Credits	15

<b>Spring</b>		
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
MATH 1520	Calculus II	4
PHYS 1610 & PHYS 1620	Engineering Physics I and Engineering Physics I Laboratory	4
THEO 1000	Theological Foundations	3
General Elective		3
	Credits	17
<b>Year Two</b>		
<b>Fall</b>		
ECE 2101	Electrical Circuits I	3
PHYS 1630 & PHYS 1640	Engineering Physics II and Engineering Physics II Laboratory	4
MATH 2530	Calculus III	4
CMM 2200	Small Group Presentation	1
Social Science Elective		3
	Credits	15
<b>Spring</b>		
ECE 2102 & ECE 2103	Electrical Circuits II and Electrical Circuits Lab	4
ECE 3140	Electromagnetic Fields	3
PHYS 2610 & PHYS 2620	Modern Physics and Modern Physics Lab	4
PHYS 3110	Classical Mechanics	3
MATH 3550	Differential Equations	3
	Credits	17
<b>Year Three</b>		
<b>Fall</b>		
ECE Track Course With or Without Lab		3-4
ECE 3130	Semiconductor Devices	3
MATH 3270	Advanced Mathematics for Engineers	3
PHIL 2050	Ethics	3
PHYS 3510	Analog & Digital Electronics	4
	Credits	16-17
<b>Spring</b>		
ECE Track Course With or Without Lab		3-4
MATH 3240	Numerical Analysis	3
MATH 3850	Foundation of Statistics	3
PHYS 3410	Thermodynamics and Statistical Mechanics	3
General Elective		3
	Credits	15-16
<b>Year Four</b>		
<b>Fall</b>		
ECE Track Course		3
ECE 4800	ECE Design I	3
ECE Elective		3
PHIL 3400	Ethics & Engineering	3
Engineering Physics Elective		3
	Credits	15
<b>Spring</b>		
ECE 4810	ECE Design II	3

PHYS 3310	Optics	4
& PHYS 3320	and Optics Laboratory	
ECE Elective		3
Engineering Physics Elective		3
Cultural Diversity Elective		3
	Credits	16
	Total Credits	126-128

## Mechanical Engineering Concentration

Course	Title	Credits
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### Year One

#### Fall

MENG 1001	Introduction to Aerospace & Mechanical Engineering	1
CHEM 1110	General Chemistry 1	4
& CHEM 1115	and General Chemistry 1 Laboratory	
ENGL 1900	Advanced Strategies Of Rhetoric and	3
or ENGL 1920	Research or Advanced Writing for Professionals	
MATH 1510	Calculus I	4
Humanities Elective		3
	Credits	15

#### Spring

MENG 1002	Computer-Aided Engineering Design	1
CSCI 1060	Introduction to Computer Science: Scientific Programming	3
MATH 1520	Calculus II	4
PHYS 1610	Engineering Physics I	4
& PHYS 1620	and Engineering Physics I Laboratory	
THEO 1000	Theological Foundations	3
	Credits	15

### Year Two

#### Fall

PHYS 1630	Engineering Physics II	4
& PHYS 1640	and Engineering Physics II Laboratory	
MATH 2530	Calculus III	4
CMM 2200	Small Group Presentation	1
ESCI 2100	Statics	3
Social Science Elective		3
General Elective		3
	Credits	18

#### Spring

ESCI 2150	Dynamics	3
MATH 3240	Numerical Analysis	3
MATH 3550	Differential Equations	3
MENG 2000	Foundation to Engineering Design	3
PHYS 2610	Modern Physics	4
& PHYS 2620	and Modern Physics Lab	
	Credits	16

### Year Three

#### Fall

ESCI 2300	Thermodynamics	3
ESCI 3100	Mechanics of Solids	4
& ESCI 3101	and Mechanics of Solids Lab	

MATH 3270	Advanced Mathematics for Engineers	3
PHIL 2050	Ethics	3
PHYS 3510	Analog & Digital Electronics	4
	Credits	17

#### Spring

AENG 3100	Computer Aided Engineering	3
MATH 3850	Foundation of Statistics	3
MENG 3010	Machine Design	3
PHYS 4210	Electricity & Magnetism I	3
ESCI 3110	Linear Vibrations	3
	Credits	15

### Year Four

#### Fall

ESCI 3200	Fluid Dynamics	4
& ESCI 3201	and Fluid Dynamics Laboratory	
MENG 4004	Design I	3
PHIL 3400	Ethics & Engineering	3
PHYS 4610	Quantum Mechanics	3
Engineering Physics Elective		3
	Credits	16

#### Spring

MENG 4014	Design II	3
PHYS 3310	Optics	4
& PHYS 3320	and Optics Laboratory	
ESCI or mENG Upper Division Course		3
Engineering Physics Elective		3
Cultural Diversity Elective		3
	Credits	16
	Total Credits	128