

BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Phone: (209) 946-2153

Location: Anderson Hall

Website: Engineering Physics (<https://engineering.pacific.edu/engineering/academics/engineering-physics/>)

Programs Offered

Bachelor of Science in Engineering Physics

Engineering Physics

The Bachelor of Science in Engineering Physics is offered in cooperation with the Department of Physics in the College of the Pacific. The degree is granted by the School of Engineering and Computer Science. Engineering Physics is well suited for the student with a strong interest in physics but with the desire to apply that knowledge to real world problems.

The Engineering Physics curriculum is designed to educate students to work in areas where technology is changing rapidly and where the boundaries of several traditional engineering disciplines overlap. These areas include sensors, robotics, energy, and semiconductor materials particularly in nano-scale electronic devices. The curriculum develops sufficient depth in both engineering and science to produce graduates who are able to relate basic knowledge to practical problems in engineering. The physics engineer is a person with the training of an applied physicist that can function as an engineer with a deeper understanding of physics.

Engineering Physics Program Educational Objectives

Through their careers in engineering or related profession, Pacific graduates are expected to demonstrate the following within a few years of earning their Bachelor's degree in Engineering Physics:

- Competency in an engineering or science profession via promotion to positions of increasing responsibility, publications, and/or conference presentations
- Adaptability to new developments in science and technology by successfully completing or pursuing graduate education in engineering or related fields, participating in professional development and/or industrial training courses, or pursuing professional licensure.

Students graduating with a BS in Engineering Physics will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Bachelor of Science in Engineering Physics

Students must complete a minimum of 120 units of academic work and a minimum of 32 units of Cooperative Education in order to earn the bachelor of science in engineering physics.

I. General Education Requirements

For more details, see General Education (<https://catalog.pacific.edu/uop/generalinformation/generaleducation/>)

Minimum 28 units and 9 courses that include:

A. CORE Seminars (2 courses)

CORE 001	Problem Solving & Oral Comm	3
CORE 002	Writing and Critical Thinking	4

Note: 1) CORE Seminars cannot be taken for Pass/No Credit. 2) Transfer students with 28 or more transfer credits taken after high school are exempt from both CORE seminars.

B. Breadth Requirement (7 courses, at least 3 units each)

At least one course from each of the following areas:

Artistic Process & Creation
Civic & Global Responsibility
Language & Narratives
Quantitative Reasoning
Scientific Inquiry
Social Inquiry
World Perspectives & Ethics

Note: 1) No more than 2 courses from a single discipline can be used to meet the Breadth Requirement.

C. Diversity and Inclusion Requirement

All students must complete Diversity and Inclusion coursework (at least 3 units)

Note: 1) Diversity and Inclusion courses can also be used to meet the breadth category requirements, or major or minor requirements.

D. Fundamental Skills

Students must demonstrate competence in:

Writing
Quantitative Analysis (Math)

Note: 1) Failure to satisfy the fundamental skills requirements by the end of four semesters of full-time study at the University is grounds for academic disqualification.

II. Major Requirements

Mathematics and Science (minimum of 30 units)

ECPE 127	Random Signals	3
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MATH 051	Calculus I	4
MATH 053	Calculus II	4
MATH 055	Calculus III	4
MATH 057	Applied Differential Equations I: ODEs	4
Select one of the following Chemistry courses: *		4-5
CHEM 024	Fundamentals of Chem	
CHEM 025	General Chemistry	
CHEM 027	General Chemistry	
PHYS 053	Principles of Physics I	5
PHYS 055	Principles of Physics II	5

Engineering Science

Select one of the following:		3-4
COMP 051	Introduction to Computer Science	
ENGR 019	Computer Applications in Engineering	
ECPE 041	Circuits	3
ECPE 041L	Circuits Laboratory	1
ECPE 071	Digital Design	3
ECPE 071L	Digital Design Lab	1
IDEA 010	Interdisciplinary Design and Success (**)	2
IDEA 020	Interdisciplinary Design and Innovation (**)	2
ENGR 020	Engineering Mechanics I (Statics)	3
ENGR 030	Engineering and Computing Ethics in Society	3
ENGR 045 & 045L	Materials Engineering and Materials Engineering Lab	4

Engineering Physics Core

ECPE 121	Digital Signal Processing	4
ECPE 131	Electronics	4
ENGR 025	Professional Practice Seminar	1
ENGR 120	Engineering Mechanics II (Dynamics)	3
EPHY 195	Senior Project I	2
or ECPE 195	Senior Project I	
EPHY 196	Senior Project II	2
or ECPE 196	Senior Project II	
PHYS 057	Modern Physics	4
Select one of the following:		4

EPHY 144	Applied Electromagnetics	
or ECPE 144	Applied Electromagnetics	
PHYS 101	Electricity and Magnetism	
Select one of the following:		3-4
ENGR 122	Thermodynamics I	
PHYS 161	Thermal Physics	

Technical Electives

Electives: Five Courses From Technical Electives Options		15-21
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Physics Electives

Select one of the following:		
PHYS 102	Electrodynamics	
PHYS 105	Optics	
PHYS 127	Computational Physics	
PHYS 137	Mathematical Physics	
PHYS 141	Cosmology	
PHYS 151	Advanced Physics Laboratory	
PHYS 170	Solid State Devices	
PHYS 181	Classical Mechanics	
PHYS 183	Quantum Mechanics	

PHYS 191	Independent Study	
PHYS 197	Undergraduate Research	

Engineering Electives

Select two 100 or 200 level BENG, CIVL, COMP, ECPE, ENGR, EMGT, EPHY, IDEA or MECH courses*** **

Math Elective

Select one of the following:		
MATH 075	Introduction to Linear Algebra	
MATH 110	Numerical Analysis	
MATH 145	Applied Linear Algebra	
MATH 148	Cryptography	
MATH 152	Vector Analysis	
MATH 157	Applied Differential Equations II	
MATH 174	Graph Theory	

Cooperative Education (minimum of 32 units)

ENGR 181	Professional Practice	1-16
ENGR 182	Professional Practice	1-16
ENGR 183	Professional Practice	1-16

* AP CHEM scores of 4 or 5, or IB CHEM Higher Level scores of 5, 6, or 7, will satisfy the elective.

** Students who transfer in with 28 or more units are exempt from taking IDEA 010 and IDEA 020.

*** Engineering Elective excludes: COMP 187, ENGR 181, ENGR 182, ENGR 183 and IDEA 132.

Engineering Physics Courses

EPHY 133. Solid State Devices. 4 Units.

This course introduces concepts related to the crystal structure of semiconductors and electronic, optical, and magnetic properties of semiconductors. Dynamics of carriers under equilibrium and non-equilibrium conditions are presented as a frame work for understanding the behavior of a number of devices including Metal-Oxide-Semiconductor (MOS) and Hetero-junction Bipolar (HBT) devices. On such a background, the course builds an understanding of the latest advances in the field including quantum and nano devices. This course is cross listed with ECPE 133 and PHYS 170. Pre-requisites: PHYS 055 with a "C-" or better. Prerequisite that may be taken concurrently: MATH 057 with a "C-" or better.

EPHY 144. Applied Electromagnetics. 4 Units.

The purpose of this course is for students to gain an understanding of transmission lines and field theory as it applies to communication circuits and systems. Electromagnetic wave propagation, reflection, and transmission through common materials are examined. This course is cross listed with ECPE 144. Prerequisites: MATH 057; PHYS 055 with a "C-" or better.

EPHY 195. Senior Project I. 2 Units.

This course instructs students in the application of design processes and teamwork. Topics include multiple interdisciplinary team design experiences of increasing complexity. Projects incorporate consideration of engineering standards and realistic constraints such as economics, the environment, sustainability, manufacturability, and safety. Students are given instruction and practice in documentation and as well as oral and written communication skills. This course is cross listed with ECPE 195. Prerequisites: Completion of all Fundamental Skills; ECPE 131 with a "C-" or better.

EPHY 196. Senior Project II. 2 Units.

This capstone design course integrates earlier studies, including EPHY 195, to perform interdisciplinary team design projects. Student design teams define a requirements document, a test document, and a design document for a prescribed product, then design, build and test a prototype. Complete documentation is expected. Final oral and written reports and project demonstrations are required. This course is cross listed with ECPE 196. Prerequisites: EPHY 195 or ECPE 195 with a "C-" or better.