ENGINEERING PHYSICS

Home Department: Natural Sciences

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Program Overview

The Bachelor of Science in Engineering Physics degree at Kettering University unifies physics knowledge and applications in optics, acoustics, and advanced materials with a comprehensive engineering component to prepare graduates for engineering applications in emerging technology. The well balanced curriculum in Engineering Physics provides a solid education combined with desirable skills that could lead to a career in industry and government sector as well as graduate studies in applied sciences and engineering.

Physics is the most fundamental science and underlies the understanding of nearly all areas of science, technology, and engineering. Physics is concerned with the study of energy, space, time, matter, the interaction between material objects and the laws that govern these interactions at various scales from sub nano-scale to light-years scale. Physicists study mechanics, sound, heat, light, electric and magnetic fields, gravitation, relativity, atomic and nuclear physics, solid state physics, wave-like properties of particles and particle-like properties of radiation. Engineering physics is not a specific branch of physics but the application of all branches of physics to the broad realm of practical problems in scientific and industrial settings, engineering design and applications, applied science, and advanced industry. Engineering Physics (EP) is the interface of physics with specific areas of advanced or emerging technology, which are not covered in depth under the traditional engineering education, such as applications of optics, acoustics, and materials in fields like nanotechnology, telecommunications, medical physics and devices, or advanced and electronic materials. The Engineering Physics degree is a flexible degree designed to interface physics with applied sciences and engineering disciplines.

- Engineering Physics (EP) students at Kettering take the same core physics courses as physics students at other universities. Furthermore, Kettering's Physics students are required to take a sequence of courses in optics, acoustics and materials.
- Engineering Physics (EP) students at Kettering University will graduate from a distinctive physics program, unique in the nation. The cooperative education and experiential learning model at Kettering University provides Engineering Physics students with a rich co-op experience, complete with a senior thesis while they are undergraduates.
- The Engineering Physics (EP) program includes a thorough background in mathematics, science, engineering fundamentals, social sciences, humanities, and communication coupled with an individually designed engineering component.
- Engineering Physics (EP) students complete an individually designed sequence of courses in engineering that culminates in an engineering capstone design experience. Popular options include sequences such as energy systems engineering or mechanical design.
- The Engineering Physics program is accredited by the Engineering Accreditation Commission (EAC) of ABET.

For more information about the Engineering Physics program, including pictures and descriptions of our laboratory facilities and minors, please visit the degree program website.

Program Educational Objectives

Engineering Physics graduates will:

- Thrive in graduate studies, technical careers, or engineering practices using broad based scientific knowledge.
- Work effectively in diverse professional environments and multi-disciplinary projects.
- Improve their workplaces and communities, and the society through professional and personal activities.

Dual Majors

One of the advantages of being an Engineering Physics major is that because physics meshes well with nearly every science and engineering discipline, it is very easy to pursue a dual option. Pursuing a dual major will create greater flexibility in terms of future career or graduate studies.

When an undergraduate student simultaneously completes two sets of major requirements, they earn a dual major. Students must complete a minimum of 161 credit hours to earn the Bachelor of Science degree AND complete all course requirements for both majors. Dual majors will require additional credits beyond the 161 minimum. The capstone course required in other engineering majors will be part of the Engineering Elective sequence for the Engineering Physics major. Only one thesis is required. Approval and academic advising from both academic departments is required.

Specialization within the Physics Program

Applied and Engineering Physics students may obtain a minor in acoustics, but they are not eligible for a minor in physics.

International Programs

Engineering Physics students often utilize the flexible Engineering Elective sequence built in their curriculum to study more deeply in a chosen area of engineering. This can be used to facilitate student participation in an existing study abroad program. This flexibility in the Engineering Physics curriculum may also be useful in better planning and preparing for future graduate studies and career.

Engineering Physics Program Curriculum Requirements

Code	Title	Credit Hours
First Year Experience		
CILE-101	First Year Foundations	1
General Education		
COMM-101	Rhetoric & Writing	4
ECON-201	Economic Principles	4
LA-201	Sophomore Seminar: Exploring the Human Condition	4
LA-489	Sr. Seminar:Leadership, Ethics	4

Advanced Humanities Electives [1]	8
Advanced Social Science Electives [1]	8
Total Credit Hours	**33**

[1] Humanities and Social Science advanced electives must be selected from approved 300 and 400 level courses.

Code	Title	Credit Hours
Engineering		
EE-240	Electromagnetic Fields and Applications	4
EP-335	Computational Physics	4
EP-485	Acoustic Testing and Modeling	4
IME-100	Interdisciplinary Design and Manufacturing	4
Select an intermediate engineering option:		8
MECH-210 & MECH-212	Statics and Mechanics of Materials	
CE-210 & CE-320	Intro to Digital Systems Design and Intro to Microcomputers	
Select one of the following:		4
EE-210 & EE-211	Circuits I and Circuits I Lab	
EE-212 & MECH-231L	Applied Electrical Circuits and Signals for Mechanical Systems Lab	
Select one of the following:		4
EP-342	Introduction to Materials Science and Engineering	
MECH-307	Materials Engineering	
Engineering Elective Sequence [2]		20
	Credit Hours Subtotal:	*52*
Chemistry		
Select one of the following:		4
CHEM-137 & CHEM-136	General Chemistry I and Principles of Chemistry Lab	
CHEM-135 & CHEM-136	Principles of Chemistry and Principles of Chemistry Lab	
	Credit Hours Subtotal:	*4*
Mathematics		
MATH-101	Calculus I	4
or MATH-101X	Calculus I	
Select one of the following:		4
MATH-102	Calculus II	
MATH-102X	Calculus II	
MATH-102H	Calculus II - Honors	
MATH-203	Multivariate Calculus	4
or MATH-203H	Multivariate Calculus - Honors	
MATH-204	Differential Equations & Laplace Transforms	4
or MATH-204H	Differential Equations and Laplace Transforms - Honors	
MATH-258	Probability and Statistics	4
or MATH-327	Probability & Stochastic Modeling	
MATH-305	Numerical Methods and Matrices	4
or MATH-307	Matrix Algebra	
Physics		
PHYS-114 & PHYS-115	Newtonian Mechanics and Newtonian Mechanics Laboratory	4
PHYS-224 & PHYS-225	Electricity and Magnetism and Electricity and Magnetism Laboratory	4
PHYS-302	Vibration, Sound and Light	4
PHYS-362	Modern Physics and Lab	4
PHYS-412	Theoretical Mechanics	4
PHYS-452	Thermodynamics and Statistical Physics	4
PHYS-462	Quantum Mechanics	4
PHYS-477	Optics and Lab	4
Advanced Physics Elective	Any PHYS or EP course that is not a core physics requirement listed above	4
	Credit Hours Subtotal:	*60*
Electives		
Free Electives		8
	Credit Hours Subtotal:	*8*
Culminating Undergraduate Experience		
CILE-400	Culminating Undergraduate Experience: Thesis [3]	4
Total Credit Hours		**128**

(Minimum) Total Credits Required for Program: 161

[2] The Engineering Elective Sequence provides a depth of study in a specific engineering field, and must culminate in a senior level capstone design experience. Engineering sequence courses will be designed based on individual student interests and their future career or graduate studies plans and will be approved by the academic advisor.

[3] Students are automatically registered for CILE-400 in a co-op term when they reach Junior II status.

Representative Program

Course	Title	Credit Hours
Freshman I		
CILE-101	First Year Foundations	1
CHEM-137 or CHEM-135	General Chemistry I or Principles of Chemistry	3
CHEM-136	Principles of Chemistry Lab	1
COMM-101	Rhetoric & Writing	4
IME-100	Interdisciplinary Design and Manufacturing	4
MATH-101	Calculus I	4
	Credit Hours	**17**
Freshman II		
ECON-201	Economic Principles	4
MATH-102	Calculus II	4
MECH-210	Statics	4

PHYS-114	Newtonian Mechanics	3
PHYS-115	Newtonian Mechanics Laboratory	1
	Credit Hours	**16**
Sophomore I		
LS-201	Sophomore Seminar: Exploring the Human Condition	4
MATH-203	Multivariate Calculus	4
MECH-212	Mechanics of Materials	4
PHYS-224	Electricity and Magnetism	3
PHYS-225	Electricity and Magnetism Laboratory	1
	Credit Hours	**16**
Sophomore II		
EP-335	Computational Physics	4
MATH-204	Differential Equations & Laplace Transforms	4
PHYS-362	Modern Physics and Lab	4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**16**
Junior I		
Select one of the following:		4
EE-210 & EE-211	Circuits I and Circuits I Lab	
EE-212 & MECH-231L	Applied Electrical Circuits and Signals for Mechanical Systems Lab	
PHYS-302	Vibration, Sound and Light	4
Engineering Elective Sequence [1]		4
Advanced Humanities or Social Science Elective		4
	Credit Hours	**16**
Junior II		
EE-240	Electromagnetic Fields and Applications	4
EP-342 or MECH-307	Introduction to Materials Science and Engineering or Materials Engineering	4
MATH-258 or MATH-327	Probability and Statistics or Probability & Stochastic Modeling	4
Advanced Physics Elective [2]		4
Engineering Elective Sequence [1]		4
	Credit Hours	**20**
Senior I		
MATH-305 or MATH-307	Numerical Methods and Matrices or Matrix Algebra	4
PHYS-412	Theoretical Mechanics	4
PHYS-477	Optics and Lab	4
Advanced Humanities or Social Science Elective		4
Engineering Elective Sequence [1]		4
	Credit Hours	**20**
Senior II		
EP-485	Acoustic Testing and Modeling	4
PHYS-452	Thermodynamics and Statistical Physics	4
LS-489	Senior Seminar: Leadership, Ethics, and Contemporary Issues	4
Engineering Elective Sequence [1]		4
Free Elective		4
	Credit Hours	**20**
Senior III		
PHYS-462	Quantum Mechanics	4
Engineering Elective Capstone Design [1]		4
Advanced Humanities or Social Science Elective		4
Free Elective		4
	Credit Hours	**16**
Any Term		
CILE-400	Culminating Undergraduate Experience: Thesis	4
	Credit Hours	**4**
	Total Credit Hours	**161**

(Minimum) Total Credits Required for Program: 161

1 The Engineering Elective Sequence provides a depth of study in a specific engineering field, and must culminate in a senior level capstone design experience. Engineering sequence courses will be designed based on individual student interests and their future career or graduate studies plans and will be approved by the academic advisor.

2 Advanced Physics Electives includes any PHYS or EP course, which is not a core physics requirement as listed above.