Engineering Physics

Home Department: Physics

Department Head:
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Room 2-323A, 810-762-7488
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Program Overview

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.

The Bachelor of Science in Engineering Physics (EP) 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.

• Engineering Physics (EP) students at Kettering take the same core physics courses as physics students at other universities. Furthermore, our 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 the most distinctive physics program 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 at Kettering University is an ABET accredited engineering physics program.

For more information about the Engineering Physics program, including pictures and descriptions of our laboratory facilities and minors, please visit our degree program website, or send an email to physics@kettering.edu.

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 leads to or has overlaps with nearly every science and engineering discipline, it makes it very easy to pursue a dual option. Pursuing a dual option will create greater flexibility in terms of future career or graduate studies.

When an undergraduate student simultaneously completes two sets of major requirements, he or she earns 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. If capstone courses are required in both majors both must be completed. Only one thesis is required. Approval and academic advising from both academic departments is required.

For further information please contact the Physics Department Head at physics@kettering.edu.

Specialization within the Physics Program

Applied and Engineering Physics students may obtain a minor in acoustics, applied optics, medical physics, or materials science, but they are not eligible for a minor in physics. See the catalog description of minors for more information, or please contact the Physics Department Head at physics@kettering.edu.

Track of Studies and International Programs

Engineering Physics students may utilize the flexibility built in the physics curriculum to use their elective courses toward a collection of courses in a chosen area of engineering. This in particular could be useful in designing a track of study that may facilitate student participation in an existing study abroad program. This flexibility in the Physics curriculum may also be useful in better planning and preparing for future graduate studies and career. For further information about this please contact the Physics Department Head at physics@kettering.edu.

Engineering Physics Program Curriculum Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CILE-101</td>
<td>First Year Foundations</td>
<td>1</td>
</tr>
</tbody>
</table>
General Education

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMM-101</td>
<td>Rhetoric &amp; Writing I</td>
<td>4</td>
</tr>
<tr>
<td>COMM-201</td>
<td>Rhetoric &amp; Writing II</td>
<td>4</td>
</tr>
<tr>
<td>ECON-201</td>
<td>Economic Principles</td>
<td>4</td>
</tr>
<tr>
<td>LS-201</td>
<td>Sophomore Seminar: Exploring the Human Condition</td>
<td>4</td>
</tr>
<tr>
<td>LS-489</td>
<td>Senior Seminar: Leadership, Ethics, and Contemporary Issues</td>
<td>4</td>
</tr>
</tbody>
</table>

Advanced Humanities Elective 1  4
Advanced Comm, Humanities or Social Science Elective 1  4
Advanced Social Science Elective 1  4

Credit Hours Subtotal: 33

Total Credit Hours

33

1 Humanities, Social Science, and Communications advanced electives must be selected from approved 300 and 400 level courses, including one Humanities course and one Social Science Course. Additionally, two of the three advanced electives must be writing intensive.

Code | Title | Credit Hours
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**Engineering**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP-235</td>
<td>Computers in Physics</td>
<td>4</td>
</tr>
<tr>
<td>EP-485</td>
<td>Acoustic Testing and Modeling</td>
<td>4</td>
</tr>
<tr>
<td>EE-240</td>
<td>Electromagnetic Fields and Applications</td>
<td>4</td>
</tr>
<tr>
<td>IME-100</td>
<td>Interdisciplinary Design and Manufacturing</td>
<td>4</td>
</tr>
<tr>
<td>MECH-210</td>
<td>Statics</td>
<td>4</td>
</tr>
<tr>
<td>MECH-212</td>
<td>Mechanics of Materials</td>
<td>4</td>
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Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>EE-210</td>
<td>Circuits I &amp; Circuits I Lab</td>
<td>4</td>
</tr>
<tr>
<td>EE-212 &amp; MECH-231L</td>
<td>Applied Electrical Circuits and Signals for Mechanical Systems Lab</td>
<td>4</td>
</tr>
</tbody>
</table>

Select one of the following:

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<thead>
<tr>
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<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>EP-342</td>
<td>Introduction to Materials Science and Engineering</td>
<td>4</td>
</tr>
<tr>
<td>MECH-307</td>
<td>Materials Engineering</td>
<td>4</td>
</tr>
</tbody>
</table>

**Elective Sequence**

Credit Hours Subtotal: 52

**Chemistry**

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM-137</td>
<td>General Chemistry I &amp; Principles of Chemistry Lab</td>
<td>4</td>
</tr>
<tr>
<td>CHEM-135</td>
<td>Principles of Chemistry &amp; Principles of Chemistry Lab</td>
<td>4</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 4

**Mathematics**

<table>
<thead>
<tr>
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<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>MATH-101</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH-101X</td>
<td>Calculus I</td>
<td>4</td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
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<tr>
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<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>MATH-102</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH-102X</td>
<td>Calculus II</td>
<td>4</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 4

**Physics**

<table>
<thead>
<tr>
<th>Code</th>
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</tr>
</thead>
<tbody>
<tr>
<td>PHYS-114</td>
<td>Newtonian Mechanics &amp; Newtonian Mechanics Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PHYS-224 &amp; PHYS-225</td>
<td>Electricity and Magnetism &amp; Electricity and Magnetism Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PHYS-302</td>
<td>Vibration, Sound and Light</td>
<td>4</td>
</tr>
<tr>
<td>PHYS-362</td>
<td>Modern Physics and Lab</td>
<td>4</td>
</tr>
<tr>
<td>PHYS-412</td>
<td>Theoretical Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS-452</td>
<td>Thermodynamics and Statistical Physics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS-462</td>
<td>Quantum Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS-477</td>
<td>Optics and Lab</td>
<td>4</td>
</tr>
</tbody>
</table>

Advanced Physics Elective

Credit Hours Subtotal: 60

**Electives**

Free Electives

Credit Hours Subtotal: 8

**Culminating Undergraduate Experience**

CILE-400 | Culminating Undergraduate Experience: Thesis | 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**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CILE-101</td>
<td>First Year Foundations</td>
<td>1</td>
</tr>
<tr>
<td>CHEM-137</td>
<td>General Chemistry I or Principles of Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>CHEM-136</td>
<td>Principles of Chemistry Lab</td>
<td>1</td>
</tr>
<tr>
<td>COMM-101</td>
<td>Rhetoric &amp; Writing I</td>
<td>4</td>
</tr>
</tbody>
</table>

Freshman I
IME-100  Interdisciplinary Design and Manufacturing  4
MATH-101  Calculus I  4

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  17

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
COMM-201  Rhetoric & Writing II  4
EP-235  Computers in Physics  4
MATH-204  Differential Equations & Laplace Transforms  4
PHYS-362  Modern Physics and Lab  4

Credit Hours  16

Junior I
Select one of the following:  4
EE-210  Circuits I  4
& EE-211  Circuits I Lab  
EE-212  Applied Electrical Circuits and Signals for Mechanical Systems Lab  
PHYS-302  Vibration, Sound and Light  4
Engineering Elective Sequence  4
Advanced Humanities Elective  4

Credit Hours  16

Junior II
EE-240  Electromagnetic Fields and Applications  4
EP-252  Introduction to Materials Science and Engineering or Materials Engineering  4
MATH-258  Probability and Statistics or Probability & Stochastic Modeling  4
or MATH-327  Advanced Physics Elective  4
Engineering Elective Sequence  4

Credit Hours  20

Senior I
MATH-305  Numerical Methods and Matrices or Matrix Algebra  4
PHYS-412  Theoretical Mechanics  4
PHYS-477  Optics and Lab  4
Advanced Social Science Elective  4

Engineering Elective Sequence  4

Credit Hours  20

Senior II
EP-485  Acoustic Testing and Modeling  4
PHYS-452  Thermodynamics and Statistical Physics  4
Advanced Comm, Humanities or Social Science Elective  4
Engineering Elective Sequence  4
Free Elective  4

Credit Hours  20

Senior III
LS-489  Senior Seminar: Leadership, Ethics, and Contemporary Issues  4
PHYS-462  Quantum Mechanics  4
Engineering Elective Capstone Design  4
Free Elective  4

Any Term
CILE-400  Culminating Undergraduate Experience: Thesis  4

Credit Hours  4

Total Credit Hours  16

(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.