Bachelor of Science in Engineering Physics

Engineering Physics Undergraduate Program

The engineering physics program is designed for undergraduates with an interest in both science and engineering. The program is focused on those students who wish to work in areas of rapid technological change, where a good background in the underlying science is an important ingredient to success in their careers. The curriculum includes classical and modern physics, mathematics, and their applications to one or more areas of engineering. The student learns the physical science and engineering principles underlying modern technology. Four design concentrations are offered:

- Aerospace systems
- Chemical systems
- Digital electronic systems
- Electromechanical control systems

Each option incorporates a significant design component and provides a strong base in one or more engineering disciplines. The degree is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

For programs in physics, see Physics and Astronomy (http://catalog.ku.edu/liberal-arts-sciences/physics-astronomy) in the College of Liberal Arts and Sciences section of the online catalog.

Educational Objectives

Engineering physics graduates will be capable of

- Completing or successfully progressing toward completion of an advanced degree in graduate or professional school,
- Using their analytical, problem-solving, and communications skills to conduct research or contribute to technology development projects, individually or as a team member,
- Using their background knowledge in physics and engineering fundamentals as a foundation for developing new knowledge and experience in their chosen disciplines.

Careers

Professional Opportunities

Engineering physics enables graduates to combine an extensive background in physics, the science that underlies modern technology, with an engineering degree. Their broad training and technical breadth provide a unique flexibility. They have the science background to pursue pure research opportunities, the engineering degree and design concentration to solve practical problems in industry or a variety of other settings, and the understanding to act as a communication link between highly diversified divisions of an organization. Engineering physics graduates typically work in aerospace and avionic industries, electronics industries, research and development laboratories, telecommunications, design and consulting firms, and government agencies, and as defense contractors. Many engineering physics graduates attend graduate or professional school before entering the work force.

The Bachelor of Science in Engineering Physics is a collaborative program between the Department of Physics and Astronomy (http://physics.ku.edu) and the School of Engineering. As such, there are no specific additional requirements for admission beyond those listed below for the entire School of Engineering.

Undergraduate Admission to the School of Engineering

Admission to the KU School of Engineering (and its degree programs) is selective.

Students may be admitted to an engineering or computer science degree program (http://engr.ku.edu/sites/engr.drupal.ku.edu/files/docs/pdfs/Majors_and_Curriculum_Guide_2014_Online.pdf) as freshmen (first year) students, but all admissions, for both in-state and out-of-state students, are selective. Applications are judged on several factors, such as high school record, scores on national tests, academic record at college or university level, and trend of grades and more. High school transcripts and ACT scores (or equivalent SAT scores) are required.

Minimum Academic Standards for Admission

To be considered for admission to the School of Engineering, beginning first-year students must meet or exceed the following minimum standards:

- Must be admissible (http://admissions.ku.edu/apply/requirements/usfreshmen) to the University of Kansas by assured admissions or individual review AND
- Have a 3.0+ GPA AND
- Have a mathematics ACT score of 22 (or math SAT score of 540).

Important: Simply meeting these requirements won’t guarantee admission to a School of Engineering degree program. Students who perform beyond these minimums will have a better probability of being admitted to their selected major.

Minimum Academic Standards for Direct Admission into Degree Program for incoming Freshmen

Students with a 26+ Math ACT (600+ Math SAT) meet eligibility requirements for MATH 125 (Calculus I) (http://catalog.ku.edu/liberal-arts-sciences/math/#undergraduatetext) may be admitted directly into their chosen major, with the exception of those seeking admission into an EECS program. Electrical Engineering, Computer Science, Computer Engineering, and Interdisciplinary Computing students must have a 28+ Math ACT (640+ Math SAT) or eligibility for MATH 125 for direct admission.

First-Year General Engineering Program

Students with a 22-25 Math ACT (540-580 Math SAT) meet eligibility requirements for Math 104 (Pre-Calculus) (http://catalog.ku.edu/liberal-arts-sciences/math/#undergraduatetext) are admitted to the School of Engineering First-Year Experience non-degree program for undergraduate students.

First-year Engineering students have one academic year (two semesters and one summer) to transition into a degree program. Admission to a degree program is possible after one of the following is met:
• Complete 12+ credit hours at KU, earn a "B" or higher in Math 104 (Pre-Calculus), earn a "C" or higher in all science and engineering courses, and earn a KU GPA of 2.5+ OR
• Earn a "C" or better in MATH 125 (Calculus I), earn a "C" or better in all science and engineering courses, and earn a KU GPA of 2.5+

Exploring Engineering
Students not admitted directly to the School of Engineering or their major but who are admissible to the university may be admitted to the College of Liberal Arts and Sciences as an Undecided student. They can later re-apply to the School of Engineering during the semester they are completing the admission requirements for transfer students.

Transfer Admission Standards
Applications from all transfer students, whether from other institutions or from other academic schools at the University of Kansas, are evaluated on a case-by-case basis. Transfer students must be admissible (http://admissions.ku.edu/apply/requirements/ustransfer) to KU AND have a cumulative college transferable grade-point average of 2.5+ to be considered. In addition, students must have grades of "C" or better in those courses in math (must include MATH 125 Calculus I or equivalent), science, and engineering applicable to the engineering degree.

Students interested in the Information Technology program are admitted as juniors. They must have completed 60 hours of pre-requisite courses including foundational courses in math, science, and computer science and have a 2.5+ cumulative GPA or better. The Information Technology program resides at the Edwards Campus in Overland Park, KS. Click here (http://edwardscampus.ku.edu/overview-bachelors-information-technology) for more information.

Current KU Students admitted to other academic units may apply to the School of Engineering by completing a Change of School form (http://engineering.ku.edu/forms). This must be turned in to the School of Engineering Dean's Office by the appropriate deadlines indicated below.

Already Applied to KU, But Not Engineering?
Don't worry. It's not too late to change your mind if you've already applied to KU and selected a major outside the School of Engineering. If you think one of the 12 engineering or computer science majors is a better fit for your talents, you can still change your requested major — preferably before May 1 — and be considered for admission to the School of Engineering and all the benefits that go with it.

To update your application, visit Undergraduate Admissions (http://admissions.ku.edu/update-your-application) and click on “Change application term, major, mailing address, and/or email address.”

Please contact a member of our recruitment team (studyengineering@ku.edu), 785-864-3881, if you have any difficulty.

Application Deadlines For New Freshman and Transfer Applicants

<table>
<thead>
<tr>
<th>Semester</th>
<th>Applicants</th>
<th>Deadline</th>
</tr>
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<tbody>
<tr>
<td>September 15</td>
<td>Priority deadline</td>
<td>for current KU students to apply for spring admission to Engineering.</td>
</tr>
</tbody>
</table>

November 1  Final deadline for scholarship consideration for incoming freshmen planning to enter in fall or summer semesters.
December 1  Final deadline to apply for the Self Engineering Leadership Fellows Program for incoming freshmen.
February 1  Final deadline for scholarship consideration for transfer students planning to enter in fall or summer semesters. Applications available for the Engineering Learning Community.
February 15 Priority deadline for current KU students to apply for summer or fall admission to Engineering.
May 1       Enrollment Deposit due.

First- and Second-Year Preparation
Recommended enrollments for the first 2 years vary with the design concentration selected (see below). Consult a departmental advisor as early as possible. Courses common to all concentrations are

<table>
<thead>
<tr>
<th>Fall</th>
<th>Hours</th>
<th>Spring</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 150, 130, 170, or 190</td>
<td>5</td>
<td>KU Core Goal 2.1</td>
<td>3</td>
</tr>
<tr>
<td>and 191</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KU Core Goal 2.1</td>
<td>3</td>
<td>PHSX 211, and PHSX 216, or PHSX 213</td>
<td>5</td>
</tr>
<tr>
<td>PHSX 150</td>
<td>0.5</td>
<td>MATH 126</td>
<td>4</td>
</tr>
<tr>
<td>MATH 125</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12.5</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

Total Hours: 41.5

Bachelor of Science in Engineering Physics Degree Requirements
Each student takes a common core of courses and selects 1 of 4 design concentrations.
### Common Core

**Physics**
- PHSX 150: Seminar in Physics, Astronomy and Engineering Physics 0.5
- PHSX 211: General Physics I 1.5
- & PHSX 216: General Physics I Laboratory or PHSX 213: General Physics I Honors
- PHSX 212: General Physics II 1.4
- & PHSX 236: General Physics II Laboratory or PHSX 214: General Physics II Honors
- PHSX 313: General Physics III 3
- PHSX 316: Intermediate Physics Laboratory I 1
- PHSX 516: Physical Measurements 4
  - or EPHX 516: Physical Measurements
- PHSX 521: Mechanics I 3
  - or EPHX 521: Mechanics I
- PHSX 531: Electricity and Magnetism 3
  - or EPHX 531: Electricity and Magnetism
- EPHX 601: Design of Physical and Electronic Systems 4

**Chemistry**
- CHEM 150: Chemistry for Engineers (Note: CHEM 170 required for Chemical Systems Concentration) 3-5
  - or CHEM 130: General Chemistry I
  - or CHEM 170: Chemistry for the Chemical Sciences I
  - or CHEM 190: Foundations of Chemistry I, Honors

**Mathematics**
- MATH 125: Calculus I 4
  - or MATH 145: Calculus I, Honors
- MATH 126: Calculus II 4
  - or MATH 146: Calculus II, Honors
- MATH 127: Calculus III 4
  - or MATH 147: Calculus III, Honors
- MATH 290: Elementary Linear Algebra 2-3
  - or MATH 291: Elementary Linear Algebra, Honors
  - or MATH 590: Linear Algebra
- MATH 220: Applied Differential Equations 3
  - or MATH 320: Elementary Differential Equations

**KU Core Curriculum Goals 2.1, 2.2, 3H, 3S, 4.1, & 4.2 (21)** 21

### Design Concentrations

**Aerospace Systems**
- AE 245: Introduction to Aerospace Engineering 3
- AE 345: Fluid Mechanics 3
- AE 421: Aerospace Computer Graphics 3
- AE 445: Aircraft Aerodynamics and Performance 3
- AE 507: Aerospace Structures I 3
- AE 545: Fundamentals of Aerodynamics 4
- AE 550: Dynamics of Flight I 4
- AE 551: Dynamics of Flight II 4
- AE 572: Fundamentals of Jet Propulsion 3
- C&PE 221: Chemical Engineering Thermodynamics 3
  - or ME 312: Basic Engineering Thermodynamics

**Chemical Systems**
- C&PE 211: Material and Energy Balances 4
- C&PE 221: Chemical Engineering Thermodynamics 3
- C&PE 325: Numerical Methods and Statistics for Engineers 3
- C&PE 511: Momentum Transfer 3
- C&PE 512: Chemical Engineering Thermodynamics II 3
- C&PE 521: Heat Transfer 3
- C&PE 522: Economic Appraisal of Chemical and Petroleum Projects 2
- CHEM 330: Organic Chemistry I 3
- CHEM 530: Physical Chemistry I 3-4
  - or CHEM 525: Physical Chemistry for Engineers
  - or CHEM 510: Biological Physical Chemistry
- EPHX 536: Electronic Circuit Measurement and Design 4
- EPHX 511: Introductory Quantum Mechanics 3

**Digital Electronic Systems**
- EECS 140: Introduction to Digital Logic Design 4
- EECS 168: Programming I 4
- EECS 268: Programming II 4
- EECS 211: Circuits I 3
- EECS 212: Circuits II 4
- EECS 312: Electronic Circuits I 3
- EECS 360: Signal and System Analysis 4
- EECS 388: Embedded Systems 4
- EECS 443: Digital Systems Design 4
- EECS 448: Software Engineering I 4
- EECS 470: Electronic Devices and Properties of Materials 3
- MATH 526: Applied Mathematical Statistics I (We also accept MATH 628, but MATH 628 is offered only in the spring and requires MATH 627 as a prerequisite) 3
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<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>or MATH 628</td>
<td>Mathematical Theory of Statistics</td>
<td></td>
</tr>
<tr>
<td>EECS 541</td>
<td>Computer Systems Design Laboratory I</td>
<td>3</td>
</tr>
<tr>
<td>EECS 542</td>
<td>Computer Systems Design Laboratory II</td>
<td>3</td>
</tr>
<tr>
<td>EECS 645</td>
<td>Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>One EECS Elective (specific electives not required)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>EPHX 511</td>
<td>Introductory Quantum Mechanics</td>
<td>3</td>
</tr>
</tbody>
</table>

Electromechanical Control Systems

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>EECS 140</td>
<td>Introduction to Digital Logic Design</td>
<td>4</td>
</tr>
<tr>
<td>EECS 168</td>
<td>Programming I</td>
<td>4</td>
</tr>
<tr>
<td>EECS 268</td>
<td>Programming II</td>
<td>4</td>
</tr>
<tr>
<td>EECS 211</td>
<td>Circuits I</td>
<td>3</td>
</tr>
<tr>
<td>EECS 212</td>
<td>Circuits II</td>
<td>4</td>
</tr>
<tr>
<td>EECS 312</td>
<td>Electronic Circuits I</td>
<td>3</td>
</tr>
<tr>
<td>EECS 360</td>
<td>Signal and System Analysis</td>
<td>4</td>
</tr>
<tr>
<td>EECS 444</td>
<td>Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>or ME 682</td>
<td>System Dynamics and Control Systems</td>
<td></td>
</tr>
<tr>
<td>EPHX 511</td>
<td>Introductory Quantum Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME 210</td>
<td>Introduction to Mechanics</td>
<td>1</td>
</tr>
<tr>
<td>ME 228</td>
<td>Computer Graphics</td>
<td>3</td>
</tr>
<tr>
<td>ME 311</td>
<td>Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>ME 312</td>
<td>Basic Engineering Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>ME 501</td>
<td>Mechanical Engineering Design Process</td>
<td>2</td>
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<tr>
<td>ME 628</td>
<td>Mechanical Design</td>
<td>3</td>
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<tr>
<td>ME 640</td>
<td>Design Project</td>
<td>2-3</td>
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<tr>
<td>or ME 627</td>
<td>Automotive Design</td>
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</tbody>
</table>

Select one of the following: 2-4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 641</td>
<td>Design Project Option A</td>
<td></td>
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<tr>
<td>ME 642</td>
<td>Design Project Option B (Students must complete ME 627 in the previous semester.)</td>
<td></td>
</tr>
<tr>
<td>ME 643</td>
<td>Design Project Option C (Students must complete ME 633 in the previous semester.)</td>
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</tbody>
</table>

ASTR, ENGR, MATH, or PHSX elective **Must be 500 level or above** 3

Graduation Plans

A suggested graduation plan for each of the design concentrations is available on the Engineering Physics website (http://ephx. engr.ku.edu/overview-engineering-physics-bs).

Departmental Honors

Engineering physics undergraduates may graduate with departmental honors by achieving a minimum grade-point average of 3.5 in major courses taken in residence and at other institutions, by completing at least 1 credit hour of undergraduate research with a grade of B or better in EPHX 501 or EPHX 503, and the results presented in a manner specified by the Department. Please see your advisor (https://ephx. engr.ku.edu/advising) for details.