

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 a successful career. The curriculum includes classical and modern physics, mathematics, and their applications to one or more areas of engineering, thus allowing students to learn the physical science and engineering principles underlying modern technology. Four design concentrations are offered:

- Aerospace Systems: Aircraft track OR Spacecraft track
- 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 (<https://catalog.ku.edu/liberal-arts-sciences/physics-astronomy/>) in the College of Liberal Arts and Sciences section of the online catalog.

Educational Objectives

The program educational objectives are broad statements that describe what graduates are expected to attain within a few years after graduation. 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

The broad training and technical breadth of the engineering physics degree program provide students a unique flexibility in their future careers. They have the science background to pursue pure research opportunities, the engineering and design experience 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, such as defense contractors. The degree program

also prepares students to attend graduate or professional school in physics, engineering or related disciplines.

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 (<https://enr.ku.edu/admission-requirements/>) 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 are required.

Freshman Admission Standards to the School of Engineering

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

- Must be admissible (<https://admissions.ku.edu/major-specific-requirements/>) to the University of Kansas by assured admissions or individual review, **AND**
- Have a 3.0+ high school GPA, **AND**
- Demonstrate mathematics preparedness by:
 - Obtaining a mathematics ACT score of 22+ (or math SAT score of 540+), OR
 - Achieving a B or better in college algebra or a more advanced mathematics course, OR
 - Achieving a C or better in a high school calculus course; OR
 - Earning credit via IB or AP credit for the above-mentioned courses in accordance with KU placement credit requirements; OR
 - Achieving at minimum a qualifying score for MATH 104 on the ALEKS mathematics placement exam.

Pre-Engineering

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

Transfer Student Admission Standards to the School of Engineering

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**

- Earn a cumulative college transferable grade-point average of 2.5+, **AND**
- Earn a grade of C or better in MATH 125 (Calculus I, or its direct equivalent), **AND**
- Earn grades of C or better in math, science, and engineering courses applicable to the engineering degree.

Students must also complete their last 30 hours of credit at KU (<http://policy.ku.edu/governance/FSRR/#art4sect5>).

Current Student Admission Standards to the School of Engineering

Students who are currently enrolled at KU, need to meet the following:

- Earn a 2.5+ KU GPA, **AND**
- Earn a grade of C or better in MATH 125 or its direct equivalent, **AND**
- Earn a grade of C or better in all math, science, and engineering courses.

Current KU Students admitted to other academic units may apply to the School of Engineering by completing a Change of School form (<https://inowformsprivate.ku.edu/imagenowforms/fs/?form=OUR%20Change%20of%20School%20Form>). Contact the engineering recruitment team (studyengineering@ku.edu) if you have any questions. Per University Registrar deadlines for processing, Change of School applications for the fall semester will be accepted until the last Friday in October of each school year; Change of School applications for the spring semester will be accepted until the last Friday in March of each school year.

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

November 1	Priority scholarship deadline for incoming freshmen.
December 1	Deadline to apply for the Self Engineering Leadership Fellows Program for incoming freshmen.
May 1	Enrollment Deposit due.
Last Friday in October	Deadline to submit Change of School applications for fall semester admission.

Last Friday in March Deadline to submit Change of School applications for spring semester admission.

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

Code	Title	Hours
Physics		
PHSX 150	Seminar in Physics, Astronomy and Engineering Physics	0.5
EPHX 210 & PHSX 216	General Physics I for Engineers and General Physics I Laboratory (Core 34: Natural and Physical Sciences (SGE)) ⁰⁴⁰	3
or PHSX 211 & PHSX 216	General Physics I and General Physics I Laboratory	
PHSX 212 & PHSX 236	General Physics II and General Physics II Laboratory	4
or PHSX 214	General Physics II Honors	
PHSX 313	General Physics III	3
PHSX 316	Intermediate Physics Laboratory I	1
EPHX 521	Mechanics I	3
or PHSX 521	Mechanics I	
EPHX 531	Electricity and Magnetism	3
or PHSX 531	Electricity and Magnetism	
EPHX 611	Introductory Quantum Mechanics	3
or PHSX 611	Introductory Quantum Mechanics	
Capstone Course		
EPHX 601	Design of Physical and Electronic Systems	4
or PHSX 601	Design of Physical and Electronic Systems	
Mathematics		
MATH 125	Calculus I (Core 34: Math and Statistics (SGE)) ⁰³⁰	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
or MATH 291	Elementary Linear Algebra, Honors	
MATH 220	Applied Differential Equations	3
or MATH 221	Applied Differential Equations, Honors	
or MATH 320	Elementary Differential Equations	
Total Hours		41.5

Design Concentrations

Aerospace Systems Concentration

The total number of hours required for the Engineering Physics with a concentration in Aerospace Systems degree is 126.5 credit hours.

Code	Title	Hours
Aerospace Systems ¹		
CHEM 130 & CHEM 149 or CHEM 150 or CHEM 190 & CHEM 191	General Chemistry I and Chemistry for Engineers Supplement Chemistry for Engineers Foundations of Chemistry I, Honors and Foundations of Chemistry I Laboratory, Honors	5
AE 211 or EECS 138	Computing for Engineers Introduction to Computing: _____	3
AE 245	Introduction to Aerospace Engineering	3
AE 345 or C&PE 511 or ME 510	Fluid Mechanics Momentum Transfer Fluid Mechanics	3
AE 421 or ME 228	Aerospace Computer Graphics Computer Graphics	3
AE 445	Aircraft Aerodynamics and Performance	3
AE 507 or AE 506	Aerospace Structures I Aerospace Structures I, Honors	3
AE 545 or AE 546	Fundamentals of Aerodynamics Aerodynamics, Honors	3
AE 550	Dynamics of Flight I	3
AE 551 or AE 552	Dynamics of Flight II Honors Dynamics of Flight II	3
AE 572 or AE 573	Fundamentals of Jet Propulsion Honors Propulsion	3
C&PE 221 or ME 212	Chemical Engineering Thermodynamics I Basic Engineering Thermodynamics	3
CE 260	Statics and Dynamics	5
CE 310 or CE 312	Strength of Materials Strength of Materials, Honors	3
EPHX 536 or PHSX 536 or EPHX 616 or EECS 316 & EECS 318	Electronic Circuit Measurement and Design Electronic Circuit Measurement and Design Physical Measurements Circuits, Electronics and Instrumentation and Circuits and Electronics Lab	4
AE 520 or AE 521	Space Systems Design I Aerospace Systems Design I	
AE 508 or AE 509 or AE 523	Aerospace Structures II Honors Aerospace Structures II Space Systems Design II	
Total Hours		50

¹ Spacecraft track students can petition for AE 765 (Orbital Mechanics), AE 766 (Spacecraft Attitude Dynamics and Controls), AE 767 (Spacecraft Environments), AE 768 (Orbit Determination), and/or AE 771 (Rocket Propulsion) to replace AE 550, AE 552, and/or AE 572. Please note that enrolling in these graduate level courses as an undergraduate requires special permission from the Department of Aerospace Engineering.

Chemical Systems Concentration

The total number of hours required for the Engineering Physics with a concentration in Chemical Systems degree is 126.5 credit hours.

Code	Title	Hours
Chemical Systems		
CHEM 170 or CHEM 130 or CHEM 190 & CHEM 191	Chemistry for the Chemical Sciences I General Chemistry I Foundations of Chemistry I, Honors and Foundations of Chemistry I Laboratory, Honors	5
CHEM 175 or CHEM 135 or CHEM 195 & CHEM 196	Chemistry for the Chemical Sciences II General Chemistry II Foundations of Chemistry II, Honors and Foundations of Chemistry II Laboratory, Honors	5
CHEM 330 or CHEM 380	Organic Chemistry I Organic Chemistry I, Honors	3
CHEM 525 or CHEM 530	Physical Chemistry for Engineers Physical Chemistry I	4
C&PE 211	Material and Energy Balances	3
C&PE 221 or ME 212	Chemical Engineering Thermodynamics I Basic Engineering Thermodynamics	3
C&PE 325	Numerical Methods and Statistics for Engineers	3
C&PE 511 or AE 345 or ME 510	Momentum Transfer Fluid Mechanics Fluid Mechanics	3
C&PE 512	Chemical Engineering Thermodynamics II	3
C&PE 524	Chemical Engineering Kinetics and Reactor Design	3
C&PE 525	Heat and Mass Transfer	4
C&PE 611	Design of Unit Operations	3
C&PE 613	Chemical Engineering Design I	4
C&PE 615	Introduction to Process Dynamics and Control	3
C&PE 616	Chemical Engineering Laboratory I	3
C&PE 626	Chemical Engineering Laboratory II	3
Total Hours		55

Digital Electronic Systems Concentration

The total number of hours required for the Engineering Physics with a concentration in Digital Electronic Systems degree is 125.5 credit hours.

Code	Title	Hours
Digital Electronic Systems		
EECS 140 or EECS 141	Introduction to Digital Logic Design Introduction to Digital Logic: Honors	4
EECS 168 or EECS 169	Programming I Programming I: Honors	4
EECS 268	Programming II	4
EECS 202	Circuits I	4
EECS 212	Circuits II	4
EECS 312	Electronic Circuits I	3
EECS 348	Software Engineering I	4
EECS 361	Signal and System Analysis	3
EECS 388	Embedded Systems	4
EECS 443	Digital Systems Design	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

or MATH 628	Mathematical Theory of Statistics	
EECS 541	Computer Systems Design Laboratory I	3
EECS 542	Computer Systems Design Laboratory II	3
EECS 645	Computer Systems Architecture	3
EECS Elective (Must be 400 level or above)		3
Total Hours		56

Electromechanical Control Systems Concentration

The total number of hours required for the Engineering Physics with a concentration in Electromechanical Control Systems degree is 124.5 to 127.5 credit hours.

Code	Title	Hours
Electromechanical Control Systems		
EECS 140	Introduction to Digital Logic Design	4
or EECS 141	Introduction to Digital Logic: Honors	
EECS 168	Programming I	4
or EECS 169	Programming I: Honors	
EECS 268	Programming II	4
EECS 202	Circuits I	4
EECS 212	Circuits II	4
EECS 312	Electronic Circuits I	3
EECS 361	Signal and System Analysis	3
EECS 444	Control Systems	3
or ME 682	System Dynamics and Control Systems	
EPHX 616	Physical Measurements	4
or PHSX 616	Physical Measurements	
or ME 455	Mechanical Engineering Measurements and Experimentation	
ME 210	Introduction to Mechanics	1
ME 228	Computer Graphics	3
ME 311	Mechanics of Materials	3
or CE 310	Strength of Materials	
& ME 309	and Introduction to Mechanical Design	
ME 212	Basic Engineering Thermodynamics	3
ME 501	Mechanical Engineering Design Process	2
ME 628	Mechanical Design	3
ME 640	Design Project	2-3
or ME 627	Automotive Design	
Select one of the following:		2-3
ME 641	Design Project Option A	
ME 642	Design Project Option B	
ME 643	Design Project Option C	
ASTR, ENGR, MATH, or PHSX elective (Must be 500 level or above)		3
Total Hours		55-57

Sample 4-year plans for the Bachelor of Science in Engineering Physics with the following concentrations can be found here: concentration in Aerospace Systems (<https://catalog.ku.edu/engineering/interdisciplinary-engineering-programs/bs-engineering-physics/aerospace-systems-conc/>), concentration in Chemical Systems (<https://catalog.ku.edu/engineering/interdisciplinary-engineering-programs/bs-engineering-physics/chemical-systems-conc/>), concentration in Digital Electronic Systems (<https://catalog.ku.edu/engineering/interdisciplinary-engineering-programs/bs-engineering-physics/digital-electronic-systems-conc/>), concentration in Electromechanical Control Systems (<https://catalog.ku.edu/engineering/interdisciplinary-engineering-programs/bs-engineering-physics/electromechanical-control-systems-conc/>), or by using the left-side navigation.

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.