

PENNSTATE



Engineering Science

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EDUCATIONAL OPPORTUNITIES

Educational opportunities for qualified engineering science majors include:

- An integrated undergraduate/graduate program that allows students to count up to 12 credits for both bachelor's and master's degrees.
- A summer internship program sponsored by the Department of Engineering Science and Mechanics provides laboratory research experience to students of all levels.
- The College of Engineering's Cooperative Education program enables student to alternate semesters of work and study beginning in their junior year. The certificate program requires three semesters of work.
- Study abroad can be arranged through the College

Engineering science is a multidisciplinary honors program that emphasizes enhanced understanding and integrated application of engineering, scientific, and mathematical principles. The program is unique in providing a broad foundation in the sciences and associated mathematics that underlie engineering and provides students the opportunity to obtain a depth of knowledge in an area of their choosing through technical electives and an honors thesis. The curriculum is designed for students who seek to link the engineering disciplines with science. In addition to taking core courses in mathematics, physics, chemistry, and biology, students study thermodynamics, heat transfer, electromagnetics, solid and fluid mechanics, electrical devices, materials science, and failure analysis. During the senior year, all students select a focus area of study, complete a capstone research and design project and write a thesis that integrates the scientific principles of research, design, and analysis and applies them to engineering. Focus areas of study include, but are not limited to, electrical, mechanical, civil, bioengineering, and materials and are typically interdisciplinary. Hence, engineering science students achieve both depth and breadth in engineering and science, are able to function across disciplines, and graduate well prepared for advanced studies, as well as professional employment.

The expected accomplishments of engineering science graduates in the first several years following graduation are:

1. participate in lifelong learning activities including, but not limited to, masters, doctorate, medical, and law degrees, continuing education, business, management training, and global involvement/awareness;
2. engage in practice in a wide variety of fields including, but not limited to, electrical systems, electronics, mechanical systems, materials development, forensics, biomaterials, medicine, law, and business;
3. research, develop, design, and/or utilize new products, processes, materials, devices, systems, and/or tools;
4. communicate findings and best practices at conferences, meetings, and to the general public through technical publications (journals, reports, memoranda), presentations, intellectual property generation, and patent filings;
5. use state-of-the-art tools for the benefit of society;
6. participate in and promote the value of diversity in society; and
7. encourage and foster future generations of engineers through mentoring, service, and outreach.

of Engineering's international studies program.

- Exceptional students are nominated for the Schreyer Honors College by faculty in the Department of Engineering Science and Mechanics.

CAREER OPPORTUNITIES

Career opportunities for engineering science graduates are limited only by one's imagination. Many graduates continue their education at the top institutions in the nation in graduate programs such as bioengineering, electrical engineering, mechanical engineering, materials, and physics, while others attend medical, business, or law schools. Approximately half of our students enter the workforce directly, accepting a variety of entry-level positions at organizations such as AT&T, Bechtel Bettis, DuPont, ExxonMobil, Ford, GE, IBM, Lockheed Martin, Lucent Technologies, the Naval

Research Lab, and the U.S. Patent Office.

DEPARTMENT STATISTICS

The Department of Engineering Science comprises approximately 38 faculty, 75 undergraduate students, and 103 graduate students. The department offers B.S., M.Eng., M.S., and Ph.D. degrees.

ADMISSION REQUIREMENTS

To be accepted into engineering science, a student must attain a B or better average in the first three semesters or be recommended by the faculty.

Engineering Science is accredited by the Accreditation Board for Engineering and Technology (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012; 410-347-7700; www.abet.org.

PROGRAM REQUIREMENTS

First Semester		CR	Second Semester		CR
(a)	<i>CHEM 110 Chemical Principles</i>	3	(a)	<i>MATH 141 Calculus with Analytic Geometry II</i>	4
(a)	<i>MATH 140 Calculus with Analytic Geometry I</i>	4	(a)	<i>PHYS 211 General Physics: Mechanics</i>	4
	ECON 002 Introductory Microeconomic Analysis and Policy <i>or</i> ECON 004 Introductory Macroeconomic Analysis and Policy <i>or</i> ECON 014 Principles of Economics (Social Science)	3	(b)	Foundational Elective	3
	EDSGN 100 Introduction to Engineering Design	3		CHEM 111 Experimental Chemistry	1
	ENGL 015 Rhetoric and Composition <i>or</i> ENGL 030 Honors Freshman Composition	3		E SC 261M Computational Methods in Engineering <i>or</i> CMPSC 201 Programming for Engineers Using C <i>or</i> CMPSC 202 Programming for Engineers Using Fortran	3
	Total	16		First-Year Seminar	1
				Total	16
Third Semester		CR	Fourth Semester		CR
(c,d)	<i>E MCH 210H Equilibrium Mechanics</i> <i>or</i> <i>E MCH 210 Statics and Strength of Materials</i>	5	(c,d)	<i>E MCH 212H Mechanics of Motion</i> <i>or</i> <i>E MCH 212 Dynamics</i>	3
	MATH 220 Matrices	2	(e)	CAS 100A/B Effective Speech	3
	MATH 230 Calculus and Vector Analysis	4		MATH 251 Ordinary and Partial Differential Equations	4
	PHYS 212 General Physics: Electricity and Magnetism	4		PHYS 214 General Physics: Wave Motion and Quantum Physics	2
	Arts, Humanities, Social Sciences	3		Arts, Humanities, Social Sciences	3
	Total	18		Total	15
Fifth Semester		CR	Sixth Semester		CR
(c,d)	<i>E SC 407H Computer Methods in Engineering Science</i>	3	(c)	<u>M E 302 Engineering Thermodynamics</u>	4
(c,d)	<i>E SC 414M Elements of Material Engineering</i>	3	(b)	Foundational Elective	3
(c)	<u>E SC 312 Engineering Applications of Wave, Particle, and Ensemble Concepts</u>	3	(b)	Foundational Elective	3
(c)	<u>E SC 433H Laboratory Experience</u>	1	(b)	Foundational Elective	3
	E E 210H Circuits and Devices	4	(b)	Foundational Elective	3
	Arts, Humanities, Social Sciences	3		Total	16
	Total	17			
Seventh Semester		CR	Eighth Semester		CR
(c,d)	<i>E SC 404H Analysis in Engineering Science</i>	3		E SC 411H Senior Research and Design Project II	3
	E SC 410H Senior Research and Design Project I	3		Technical Elective	3
	ENGL 202C Technical Writing	3		Technical Elective	3
	Technical Elective	3		Arts, Humanities, Social Sciences	3
	Technical Elective	3		Arts, Humanities, Social Sciences	3
(f)	Health and Physical Activity	1.5	(f)	Health and Physical Activity	1.5
	Total	16.5		Total	16.5

- (a) Any course listed in ***boldface italic type*** requires a grade of C or better for entrance into any College of Engineering major.
- (b) The list of Foundational Electives is posted on the ESM website www.esm.psu.edu and is available in the ESM office.
- (c) Underlined courses are only offered once a year in the semester indicated on the schedule (odd-numbered semesters correspond to Fall, even-numbered semesters correspond to Spring).
- (d) Any course listed in ***boldface type*** requires a grade of C or better for graduation.
- (e) Engineering scientists must effectively communicate their designs/results. Additionally, they serve society well by explaining technology and its impacts to the general public. CAS 100 can be optimized for engineering scientists if they select their speech topics with this in mind.
- (f) Students can fulfill the Health and Physical Activity requirement of 3 credits in a variety of ways with courses distributed throughout the eight semesters.