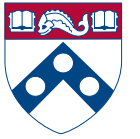


# Penn Engineering



**Undergraduate Programs**  
**UNIVERSITY OF PENNSYLVANIA**

# WHY PENN ENGINEERING?



A PIONEER IN INTERDISCIPLINARY EDUCATION

**With the pace of innovation and technological advancement accelerating ever faster, engineers hold the keys to the next generation's routine wonders.**

Today's undergraduates grew up with the Internet. To them, search engines, social media, nanotechnology and genetic engineering are all familiar — even everyday. The University of Pennsylvania's School of Engineering and Applied Science is uniquely positioned to propel those future intellectual leaders, entrepreneurs, thinkers and innovators to success.

As an Ivy League institution — and the first university in the nation — Penn ensures its engineering and applied science students a transformative experience in the classroom and laboratory and a fully rounded liberal arts education.

Penn Engineering is a pioneer in interdisciplinary education, allowing students the flexibility to craft a program that suits their individual interests, career or graduate education plans. Both Bachelor of Science in Engineering (BSE) and Bachelor of Applied Science (BAS) degrees are offered, along with specialized dual-degree programs, an array of majors and minors, special programs and study-abroad opportunities.

Penn Engineering students get valuable and extensive hands-on experience, conducting research and pursuing creative designs and new products alongside faculty renowned in their fields. The working relationship with faculty pervades Penn Engineering, where full-time faculty teach all core undergraduate courses and each student has a faculty advisor.

As the global marketplace for technology grows, graduates go on to leadership roles in business, medicine, law and academia, armed with the technical knowledge, imagination, communication skills and understanding of the social and human context of their work, all engendered with a fervor for the future, at Penn Engineering.



**Benjamin Franklin, America's first scientist and engineer, founded the University and his spirit of scientific inquiry still drives the passion for research at Penn Engineering.**

Undergraduates work alongside faculty renowned in their fields at cutting-edge, interdisciplinary research centers and institutes that span all Penn Engineering departments and foster collaborations with faculty, students and postdocs in the Schools of Medicine, Arts and Sciences and Wharton Business School, just to name a few. Penn's research centers and institutes in fields including biotechnology, robotics, computer animation and nanotechnology are at the forefront of research on each scientific and technological frontier.

**To enhance students' research experience,**

Penn offers a wide range of support services, such as the University's Center for Undergraduate Research and Fellowships and the Penn Undergraduate Research Mentoring Program. Students may also participate in research projects such as SUNFEST, the Summer Undergraduate Fellowship in Sensor Technologies, and Penn Electric Racing, among others.

**Capping the Penn Engineering experience**

is the yearlong Senior Design project in which students design a new approach to a real-world problem.

**The Rachleff Scholars Program**

offers Penn Engineering undergraduates the opportunity to focus on research with standing faculty and to participate in a community of peers who share a common interest in research and scholarly inquiry. Rachleff Scholars participate in a 10-week, paid Summer Research Experience, complete honors coursework and gain real-world skills and knowledge through interaction with industrial, corporate and community partners.



# MAJORS

## BIOENGINEERING

The Department of Bioengineering (BE) at Penn, renowned as a pioneer in the field, provides a solid foundation in science and engineering, exposure to a wide variety of bioengineering areas and extensive research opportunities.

At the confluence of medicine and engineering, bioengineers — also known as biomedical engineers — use principles from electrical, mechanical, chemical and materials engineering to advance knowledge and innovation in healthcare and the biological sciences. The growing field of bioengineering ranges from its traditional applications in technical design, basic and applied research, health professions and industry, particularly the medical device industry, to business, investing, intellectual property law and government, including the regulation of patents and medical devices.

The Bachelor of Science in Engineering (BSE) degree in Bioengineering, the fully accredited flagship professional engineering degree, provides rigorous preparation for professional practice in a great variety of engineering and technical fields. The Bachelor of Applied Science (BAS) degree in Biomedical Sciences presents an option for a more flexible curriculum in bioengineering for those with broader interests. Pre-medical students may choose either the BSE or BAS degree program. Both are identical for the first two years, and students may easily change from one to the other as their career plans become clearer.

### BIOENGINEERING (BE) BSE SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Calculus I General Chemistry I & Lab Principles of Physics I Introduction to Bioengineering I Social Sciences elective	Calculus II General Chemistry II & Lab Principles of Physics II Introduction to Bioengineering II Writing seminar
<b>YEAR TWO</b>	
Calculus III Biomechanics Statistics Molecular Biology & Lab Social Sciences elective	Calculus IV Biomaterials Introduction to Computing Genetics, Cell Biology or Physiology Humanities elective
<b>YEAR THREE</b>	
Engineering Physiology Physical Chemistry Systems and Signals Bioengineering Lab I Free elective	Cell Engineering Bioengineering Lab II Biotransport Technical elective Humanities elective
<b>YEAR FOUR</b>	
Senior Design Bioengineering 4xx/5xx Engineering elective SSH/TBS elective (Social Sciences & Humanities/ Technology, Business and Society) Free elective	Senior Design Bioengineering 4xx/5xx Technical elective SSH/TBS elective Free elective

Prepares you to apply quantitative analysis techniques to understand complex biological systems, to design innovative biomedical products and develop new drugs

## CHEMICAL AND BIOMOLECULAR ENGINEERING

Penn's Chemical and Biomolecular Engineering (CBE) program, founded in 1893, has a proud history at the forefront of undergraduate education. Penn added the word "biomolecular" to the program's name in 2002 to reflect the essential role that disciplines such as molecular biology, cellular mechanobiology and genetic engineering now play in the field.

Penn's CBE program combines engineering principles with concepts from chemistry, physics and biology. The program's flexible curriculum includes theory, problem-solving techniques and experimental work. Small classes encourage professor-student interactions and the senior process design course utilizes the expertise of industrial colleagues from local chemical and pharmaceutical companies.

The CBE program's interdisciplinary approach prepares students for leadership roles in industry, academia and the public sector in a variety of technical areas including energy storage and conversion, chemical, petro-chemical and materials processing, biotechnology, pharmaceutical manufacturing and environmental remediation.

Prepares you to analyze complex biological and chemical processes, understand the interactions between biomolecules and chemicals and develop new processes

### CHEMICAL AND BIOMOLECULAR ENGINEERING (CBE) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Calculus I Principles of Physics I General Chemistry I & Lab Writing seminar Introduction to Biotechnology or Technical elective	Calculus II Principles of Physics II General Chemistry II & Lab Introduction to Chemical Engineering Free elective
<b>YEAR TWO</b>	
Material and Energy Balances Calculus III Organic Chemistry I SSH elective (Social Sciences & Humanities) Free elective	Thermodynamics of Fluids Calculus IV Organic Chemistry II Engineering Computer elective SSH elective
<b>YEAR THREE</b>	
Fluid Mechanics Advanced Chemical Engineering Science Physical Chemistry I CBE elective SSH elective Free elective	Heat and Mass Transport Separation Processes Organic Chemistry, Physical Chemistry or Biotech and Genetic Chemistry SSH elective
<b>YEAR FOUR</b>	
Introduction to Process Design Chemical Engineering Lab Chemical Reactor Design SSH elective Technical elective	Process System Design Projects Chemical Process Control CBE elective Technical elective SSH elective



## COMPUTER ENGINEERING

Prepares you to design and engineer computer systems from hardware, to software, to networking and worldwide-distributed systems, ensuring their performance, energy-efficiency, reliability and security

The pace at which computers are transforming our world is breathtaking. New ideas and new applications are changing the very fabric of our public and private lives. Think robots, smartphones and tablets, video games, wireless networks, medical devices and anti-lock brakes, to name a few. And it is computer engineers who are pivotal in translating new technological capabilities into new products and services for a global high-tech marketplace.

Penn's Computer Engineering (CMPE) major is an innovative and timely degree program, preparing students for a wide range of career opportunities and the kind of intellectual entrepreneurship that is fast shaping the future.

In classes led by Penn Engineering's renowned faculty from the departments of Computer and Information Science, Electrical and Systems Engineering, students combine study of the fundamentals of automated information processing and control with rigorous engineering design and optimization, link theory with practice through hands-on experiments and design a new approach to a real-world problem in a yearlong senior design project.

### COMPUTER ENGINEERING (CMPE) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Calculus I Principles of Physics I & Lab Introduction to Programming General Chemistry I or Introduction to Biology I	Calculus II Principles of Physics II & Lab Principles of Digital Design Principles of Digital Design Lab Writing seminar
<b>YEAR TWO</b>	
Calculus III Introduction to Computer Architecture Electrical Circuits & Systems Electric Circuits & Systems Lab SSH elective (Social Sciences & Humanities) Free elective	Math Foundations of Computer Science Programming Languages & Techniques I Digital Audio Basics Embedded Systems & Microcontroller Lab SSH elective
<b>YEAR THREE</b>	
Statistics Programming Languages & Techniques II Circuit-Level Design for Digital Systems Life Critical Embedded Computing Lab SSH elective	Software Design/Engineering Computer Organization & Design Concurrency Lab SSH elective M/NS elective (Math & Natural Sciences)
<b>YEAR FOUR</b>	
Senior Design Project I Computer Operating Systems Introduction to Networks & Protocols Technical elective SSH elective	Senior Design Project II Technical elective SSH elective Two free electives



## COMPUTER SCIENCE

Prepares you to combine fundamental computing principles with software systems design for applications encompassing everything from artificial intelligence, to graphics, to mobile and networked systems

The infrastructure of business, government, science and even everyday social interaction is today dependent upon computers and digital communication. Every time we download music, post an update on social media, drive a car, trade stocks, produce a movie, perform or undergo a medical procedure, play a video game or submit an income tax return, we rely upon networks of computers that store, exchange and process information in evermore elaborate and innovative ways.

A Penn Engineering degree in Computer Science (CS) provides students with an in-depth education in the conceptual foundations of computer science and in complex software and hardware systems. It allows them to explore the connections between computer science and a variety of other disciplines in engineering and outside. Combined with a strong education in mathematics, sciences and the liberal arts, it prepares students to be leaders in computer science practice, to create applications for other disciplines or research and to pursue an array of careers, advanced degrees or personal interests at the vanguard of technological innovation.

### COMPUTER SCIENCE (CS) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Computer Programming Calculus I Principles of Physics I & Lab Writing Seminar SSH elective (Social Sciences & Humanities)	Programming Languages I Calculus II Math Foundations of Computer Science Principles of Physics II & Lab SSH elective
<b>YEAR TWO</b>	
Programming Languages II Computer Architecture Discrete Probability (or statistics course) Engineering elective SSH elective	Digital Organization & Design CIS elective Math elective Technical elective SSH elective
<b>YEAR THREE</b>	
Automata, Computability and Complexity Computing Operating Systems Natural Science elective Technical elective Free elective	Introduction to Algorithms CIS Project Course Technical elective SSH elective Free elective
<b>YEAR FOUR</b>	
Senior Design I CIS elective Math elective Engineering elective SSH elective	Senior Design II CIS elective Technical elective SSH elective Free elective



## DIGITAL MEDIA DESIGN

Prepares you to understand, program and apply theoretical, artistic, aesthetic and experiential principles associated with computer graphics, animation and digital media design

Computer-generated imagery is transforming communication — from educational software and motion picture special effects to architectural simulations and medical visualizations. With these new technologies come new questions about the creation and design of virtual environments and their impact upon society.

To address these questions, Penn Engineering, in collaboration with the University's Annenberg School for Communication and the School of Design, created the Digital Media Design (DMD) program, an elite Bachelor of Science in Engineering (BSE) degree program for a small number of students. The program is designed to educate a new generation of experts in computer graphics: people who, through their combined education in engineering, design, and communications, are prepared to be and to collaborate effectively with technologists and artists.

The curriculum gives students a foundation in three areas: computational basis for the creation of digital media imagery, including simulation of 3D environments; informed understanding of the aesthetic aspects of digital media design; and theory and research concerning viewers' psychological responses to, and uses of, visual media as well as broader sociocultural effects. Students in the program participate in one or two summers of real-world experience in a major multimedia industry.

### DIGITAL MEDIA DESIGN (DMD) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Programming Languages I	Programming Languages II
Calculus I	Calculus II
Drawing I	Drawing II
Writing Seminar	Math Foundations of Computer Science
SSH elective (Social Sciences & Humanities)	Intro Psychology (SSH)
<b>YEAR TWO</b>	
Introduction to Computer Architecture	Introduction to Computer Graphics Techniques
Principles of Physics I	Principles of Physics II
Automata, Computability and Complexity 3D	Introduction to Film, Form and Context
3D Computer Modeling	App of Scientific Computing
Calculus III	SSH elective
<b>YEAR THREE</b>	
Computer Graphics	Visual Communications
Introduction to Algorithms	CIS elective
CIS elective	Natural Science elective
Psychology (Perception, Learning, etc.)	Info Design
Comm/FNAR elective (Communication/Fine Arts)	Free elective
<b>YEAR FOUR</b>	
DMD Senior Project	Physically-Based Animation
Computer Animation	Comm/FNAR elective
CIS elective	SSH elective
SSH elective	SSH elective
Comm/FNAR elective	Free elective

## ELECTRICAL ENGINEERING

Prepares you to develop new technologies and create novel devices that use electricity to sense, acquire, store and process information or transform and transmit power

Today's electrical engineers are at the vanguard of innovation across a wide spectrum of products and services ranging from communication systems, computers and computer networks to instruments for healthcare and diagnostics.

Penn's Electrical Engineering (EE) curriculum covers all major areas of the field including telecommunications and networks, imaging, remote sensing, microelectronics and integrated circuits, computer engineering, image and speech processing, robotics, video coding, neural computation, self-organizing systems, electromagnetics and photonics, electronic materials, silicon micromechanics and nanofluidics.

The program is a broad-based major that provides a rigorous grounding in the analytical and experimental foundations of electrical engineering while allowing students to craft an individualized program reflecting their interests and career goals or plans for graduate study.

### ELECTRICAL ENGINEERING (EE) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Calculus I	Calculus II
Principles of Physics I & Lab	Principles of Physics II & Lab
Introduction to Computer Programming	Electrical Engineering (EE) area elective
Writing seminar	SSH elective
SSH elective (Social Sciences & Humanities elective)	
<b>YEAR TWO</b>	
Calculus III	Mathematics elective
General Chemistry I or General Biology (with Labs)	Electrical Systems and Circuits II
Electrical Systems and Circuits I	EE area elective (ESE)
Ethics (SSH elective)	Professional elective (Engineering/Math/Natural Science)
SSH elective	
<b>YEAR THREE</b>	
Engineering Probability	Mathematics or Natural Science elective (M/NS)
Introduction to Dynamic Systems	EE area elective (ESE)
Two EE area electives (ESE)	EE specialization elective (ESE)
SSH elective	SSH elective
Free elective	
<b>YEAR FOUR</b>	
Senior Design Project I	Senior Design Project II
EE specialization elective (ESE)	Professional elective (E)
Professional elective (E)	Two professional electives (E/M/NS)
Professional elective (E/M/NS)	Free elective
Free elective	



## MARKET AND SOCIAL SYSTEMS ENGINEERING

Prepares you to engineer and analyze systems, protocols and markets for tomorrow's social and technological networks

Networks — the Internet, social networks such as Facebook, and traditional organizational and economic networks — touch virtually every aspect of modern life from business and investments, to communication and information access, scientific discovery and medicine, and government information and security.

To understand the Internet, to predict behavior on it and to design new capabilities and services for it, Penn's Singh Program on Market and Social Systems Engineering (MKSE) considers the Internet as an assembly of people and systems, interlinked by a technological network with particular structure and properties.

The world's first course of study to fully integrate the disciplines needed to design and analyze the complex networks that are reshaping our society, the program combines computer science, systems engineering and economics — examining the influence of the Internet as well as the new economies and markets that have developed as a result.

### MARKET AND SOCIAL SYSTEMS ENGINEERING (MKSE) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Calculus I Introduction to Computer Programming Mathematical Foundations of Computer Science Principles of Physics I Networked Life	Calculus II Principles of Physics II Programming Languages I Market and Social Systems on the Internet Writing seminar
<b>YEAR TWO</b>	
Calculus III Programming Languages II Scalable and Cloud Computing Introduction to Dynamic Systems Humanities elective (Ethics) Depth Technical elective	Probability Linear Algebra Intermediate Microeconomics SSH/TBS elective (Social Sciences & Humanities/Technology, Business & Society)
<b>YEAR THREE</b>	
Stochastic Systems Analysis and Simulation Theory of Networks Game Theory SSH elective Depth Technical elective	Optimization of Systems Introduction to Algorithms SSH/TBS elective Technical elective
<b>YEAR FOUR</b>	
Algorithmic Game Theory Senior Project Depth Technical elective Technical elective Technical elective	Senior Project Natural Science elective Free elective Free elective



## MATERIALS SCIENCE AND ENGINEERING

Prepares you to use fundamental scientific principles to synthesize, manipulate, design and characterize the structural and functional properties of advanced engineering materials

Key to the explosive growth in modern technology is the development of advanced materials by materials science engineers and scientists. New materials from nanostructured and biocompatible materials to electronic ceramics and copolymers are paving the way for new fields, new ideas and new technologies that are changing the way we live and work.

Penn's Materials Science and Engineering (MSE) program stresses core principles (thermodynamics, structure, bonding and phase transformations) and areas of concentration (nanoscale materials, biomaterials, polymers, ceramics, mechanical properties and electronic materials). The program offers students advantages seldom found in other MSE programs: the opportunity to tailor the curriculum to their own interests, guaranteed research experience and an excellent student-faculty ratio.

### MATERIALS SCIENCE AND ENGINEERING (MSE) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Calculus I General Chemistry I & Lab Principles of Physics I Introduction to Engineering	Calculus II General Chemistry II & Lab Principles of Physics II Introduction to Nanotechnology Free elective
<b>YEAR TWO</b>	
Structural and Biomaterials Quantum Physics of Materials Calculus III Introduction to Computer Programming Writing seminar	Introduction to Nanoscale Functional Materials Nanoscale Materials Lab Calculus IV Energetics of Macro/Nanoscale Materials SSH elective (Social Sciences & Humanities)
<b>YEAR THREE</b>	
Self Assembly of Soft Materials Structure of Materials Advanced Linear Algebra Engineering elective SSH elective	Fabrication and Characterization of Nanostructured Devices Materials Selection Engineering elective SSH elective Free elective
<b>YEAR FOUR</b>	
Senior Design Project I Polymers and Biomaterials Energy Storage Technology Two SSH electives	Senior Design Project II Phase Transformations Environmental Degradation of Materials SSH elective Free elective



## MECHANICAL ENGINEERING AND APPLIED MECHANICS

Prepares you to analyze, design and manufacture components and systems involving machines and energy conversion systems at nano, micro and macro length scales

Mechanical engineers design and develop everything we think of as a machine — from rocket engines and nano motors to toasters and power tools. As well, mechanical engineering is at the core of any energy harvesting or conversion technology.

Students in Penn's Mechanical Engineering and Applied Mechanics (MEAM) program follow a course of study that contains basic groundwork in all aspects of mechanical engineering, while flexibility in the curriculum allows them to pursue elective programs in fields such as aeronautics, robotics, computers, electronics, automatic controls and materials.

Career opportunities for mechanical engineers are perhaps the broadest among all the engineering specialties. Aerospace, automotive, electronics, computers, energy and robotics are but a few of the fields that employ mechanical engineers. Positions range from research and development, to design and manufacturing, to field engineering and marketing.

### MECHANICAL ENGINEERING AND APPLIED MECHANICS (MEAM) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Intro to Mechanics & Lab Calculus I General Chemistry I & Lab SSH elective (Social Sciences and Humanities)	Principles of Physics II & Lab Calculus II Introduction to Computing (elective) Introduction to Mechanical Design (elective) Writing seminar
<b>YEAR TWO</b>	
Statics and Strengths of Materials Mechanical Engineering Lab IA Calculus III Machine Design and Manufacturing (elective) SSH elective	Thermodynamics I Engineering Mechanics: Dynamics Mechanical Engineering Lab IB Calculus IV SSH elective
<b>YEAR THREE</b>	
Fluid Mechanics Vibrations Mechanical Engineering Design Lab SSH elective Free elective	Heat and Mass Transfer Mechanics of Solids Mechanical Engineering Design Lab Upper-Level MEAM Course Math elective
<b>YEAR FOUR</b>	
Mechanical Engineering Design Projects Upper-Level MEAM Course Professional elective SSH elective Free elective	Mechanical Engineering Design Projects Upper-Level MEAM Course Professional elective SSH elective Free elective



## SYSTEMS SCIENCE AND ENGINEERING

Prepares you to design, analyze, optimize and deploy complex, networked technological systems that ensure efficient and safe operation

The field of systems engineering originated at Penn in 1953. Since then, many enterprises that directly affect everyday life — computers, environmental organizations, manufacturing, logistics, transportation, information and telecommunications, economic and financial networks, healthcare and military defense among them — have grown evermore complex and demanding of innovative systems to ensure their effective operation.

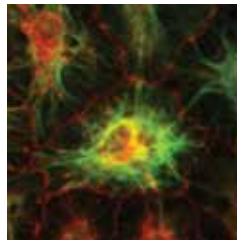
Penn's Systems Science and Engineering (SSE) program specializes in those aspects of engineering that pertain to effectiveness of whole systems and the synthesis of more complex behaviors from simpler components. In contrast to other engineering specialties, which are grounded in specific biological or physical sciences, systems science is grounded primarily in mathematics, computation and design methodologies. The core curriculum focuses on mathematical modeling, simulation and optimization of complex engineered systems.

### SYSTEMS SCIENCE AND ENGINEERING (SSE) SAMPLE CURRICULUM

FALL	SPRING
<b>YEAR ONE</b>	
Calculus I Principles of Physics I & Lab Introduction to Computer Programming Writing seminar SSH elective (Social Sciences & Humanities elective)	Calculus II Principles of Physics II & Lab Systems Science Engineering (SSE) area elective SSH elective
<b>YEAR TWO</b>	
Calculus III General Chemistry I or General Biology (with Labs) Electrical Systems and Circuits I Ethics (SSH elective) SSH elective	Mathematics or Natural Science elective Systems Methodology Optimization of Systems Professional elective (Engineering/Math/Natural Science)
<b>YEAR THREE</b>	
Probability Introduction to Dynamic Systems Engineering Economics Professional elective (Engineering) SSH elective	Statistics Control of Systems SSE area elective (ESE) Professional elective (Application focus) Free elective
<b>YEAR FOUR</b>	
Senior Design Project I Stochastic Systems Analysis SSE specialization elective (ESE) Professional elective (Application focus) Free elective	Senior Design Project II Professional elective (Engineering) Professional elective (Application focus) SSH elective Free elective







# SPECIAL PROGRAMS

With technology evermore complex and the speed of technological change evermore accelerated, engineers and scientists must be prepared to think big picture and across disciplines. Penn Engineering's interdisciplinary special programs offer students a diverse academic experience and the intellectual grounding essential to collaboration and innovation.

**THE BACHELOR OF SCIENCE IN ENGINEERING (BSE)** is Penn's flagship program, preparing students for careers in professional engineering, computer science or digital media design. Minimum BSE requirement: 40 course units.

**THE BACHELOR OF APPLIED SCIENCE (BAS)** combines a broader applied science education with specialized interest in engineering and technology. Program options include Biomedical Science, Cognitive Science, Computational Biology, Computer Science and individualized programs. Minimum BAS requirement: 40 course units.

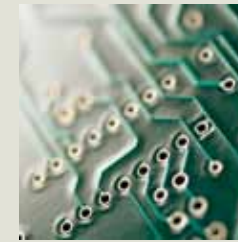
In addition to the minors associated with specific Penn Engineering departments, these interdisciplinary minors allow students to explore technologies and take coursework across departments:

**MINOR IN ENERGY AND SUSTAINABILITY** provides students with broad coverage of critical technical and societal issues and in-depth treatment of selected topics in technical areas relevant to energy and sustainability. [www.seas.upenn.edu/undergraduate/degrees/minor-energy.php](http://www.seas.upenn.edu/undergraduate/degrees/minor-energy.php)

**MINOR IN ENGINEERING ENTREPRENEURSHIP** gives students the skills important to the creation of technology-based startups and the ability to market ideas successfully and profitably. [www.seas.upenn.edu/entrepreneurship/minor.php](http://www.seas.upenn.edu/entrepreneurship/minor.php)

**MINOR IN NANOTECHNOLOGY** prepares students for this rapidly growing field with course offerings reflecting the latest advances in research from nanometer scale science/engineering and nanoscale materials to fabrication of nanostructured devices. [www.nanotech.upenn.edu/minor\\_nanotech.html](http://www.nanotech.upenn.edu/minor_nanotech.html)

**MINOR IN COGNITIVE SCIENCE** is a special minor offered by Penn Engineering and the College of Arts and Sciences. Students do foundational coursework in parent disciplines of computer science, linguistics, neuroscience, philosophy and psychology along with advanced courses in one or more areas. [www.ircs.upenn.edu/education/minor-cogsci.shtml](http://www.ircs.upenn.edu/education/minor-cogsci.shtml)



Making Contact With the Right Career Opportunities is Easy at Penn

Penn Engineering's reputation for top students attracts top employers, many of them Penn alumni. Close to 400 companies recruit annually through the On-Campus Recruiting Service. More than 120 companies, from multi-national conglomerates to high-tech companies, participate in the annual Engineering Career Awareness Day. Students also benefit from advice on careers and job-hunting from the Career Services Center.

Career Paths:  
Penn Engineering Alumni

#### POST-GRADUATION CAREER PATHS

Industry & Business	72%
Graduate School	25%
Other	3%

#### EMPLOYMENT BY JOB TYPE

Manufacturing, information technology	37%
Financial Services	21%
Consulting	18%
Scientific Research	7%
Other (including start ups, government)	17%

#### GRADUATE SCHOOL CHOICES

Engineering	65%
Medicine	17%
Sciences	6%
Law	5%
Biotech	3%
Business	1%
Other	3%

Penn Engineering's specialized dual degree programs allow students to combine their BAS or BSE degree with a second degree in one of Penn's other undergraduate schools, pursuing an integrated curriculum jointly offered by the two schools and incorporating interdisciplinary coursework. Students receive two degrees upon completion of the specialized curricula. Minimum dual degree requirement: 46 course units.

**THE JEROME FISHER PROGRAM IN MANAGEMENT AND TECHNOLOGY (M&T)** enables students to understand and integrate engineering and business concepts. Graduates receive a BSE or BAS from Penn Engineering and a Bachelor of Science (BS) in Economics from the Wharton School. [www.upenn.edu/fisher](http://www.upenn.edu/fisher)

**VAGELOS INTEGRATED PROGRAM IN ENERGY RESEARCH (VIPER)** offers instruction and state-of-the-art research experience in energy science and technology and prepares students to be innovators in the discovery and development of sustainable approaches to harness, convert and use energy. Graduates earn both a Bachelor of Arts (BA) and a BSE degree. [www.viper.upenn.edu](http://www.viper.upenn.edu)

**COMPUTER AND COGNITIVE SCIENCE** combines studies in computer science and engineering with linguistics, mathematics, philosophy or psychology. Graduates receive a BSE or BAS and a BA from the College of Arts and Sciences. [www.cis.upenn.edu/ugrad/Acad.shtml](http://www.cis.upenn.edu/ugrad/Acad.shtml)

Penn Engineering students can also enrich their undergraduate experience by satisfying degree requirements in two BSE curricula as a dual major. (BAS students are not permitted to dual major within engineering.) Or, students may find the second major an attractive alternative to the dual degree. Qualified engineering students may pursue a second major in any major offered through the College of Arts and Sciences.

[www.seas.upenn.edu/undergraduate/handbook/programs/dual-majors.php](http://www.seas.upenn.edu/undergraduate/handbook/programs/dual-majors.php)  
[www.seas.upenn.edu/undergraduate/handbook/programs/second-major.php](http://www.seas.upenn.edu/undergraduate/handbook/programs/second-major.php)

Submatriculation allows Penn Engineering students to enter an engineering graduate program while still completing their undergraduate program, fulfilling both undergraduate and graduate degree requirements.

[www.seas.upenn.edu/undergraduate/degrees/submatriculation.php](http://www.seas.upenn.edu/undergraduate/degrees/submatriculation.php)

Study abroad and global service learning programs offer Penn Engineering students the opportunity to expand their understanding and experience of the world through hands-on engineering challenges as well as academic study. Destinations include virtually all corners of the world, and opportunities range from two-week service programs in the summer to semester-long stays in a leading university overseas.

[www.seas.upenn.edu/community/international-ops.php](http://www.seas.upenn.edu/community/international-ops.php)

**EDUARDO D. GLANDT**  
Dean

**VIJAY KUMAR**  
Deputy Dean, Education

**JAN VAN DER SPIEGEL**  
Associate Dean, Education

**Accreditation**

The following Bachelor of Science in Engineering (BSE) programs are accredited by the Engineering Accreditation Commission of ABET ([www.abet.org](http://www.abet.org)):

- Bioengineering
- Chemical and Biomolecular Engineering
- Computer Engineering
- Electrical Engineering
- Materials Science and Engineering
- Mechanical Engineering and Applied Mechanics
- Systems Science and Engineering

The following Bachelor of Science in Engineering (BSE) program is accredited by the Computing Accreditation Commission of ABET ([www.abet.org](http://www.abet.org)):

- Computer Science

**1852**

Founding date of School of Mines, Arts and Manufactures that gave rise to School of Engineering and Applied Science

**119**

Faculty

**37**

Chaired professors

**9**

Faculty elected to National Academy of Engineering

**14:1**

Student/Faculty ratio

**1650**

Undergraduates

**23%**

Students enrolled in dual-degree programs

**32**

Engineering student clubs and organizations

**410**

Places in entering class

**14.7**

Applicants per place

**35%**

Women in entering class

**Middle 50th Percentile**

SAT score for admitted students

**640-750**

Critical reading

**680-780**

Math

**650-750**

Writing





**FOR MORE INFORMATION ABOUT  
PENN ENGINEERING OR TO  
ARRANGE A PERSONALIZED VISIT  
TO THE CAMPUS, PLEASE CONTACT:**

Recruiting and Admissions  
Office of Academic Programs  
School of Engineering and Applied Science  
University of Pennsylvania  
220 South 33rd Street  
Philadelphia, PA 19104-6391  
Phone: 215.898.7246  
Fax: 215.573.5577  
E-mail: [ug-admit@seas.penn.edu](mailto:ug-admit@seas.penn.edu)

**[WWW.SEAS.UPENN.EDU](http://WWW.SEAS.UPENN.EDU)**

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