

- American Council on the Teaching of Foreign Languages (ACTFL) (<https://www.actfl.org>)
- Language Teaching Professional Organizations (<http://languageconsortium.org/professional-organizations/>)

Accreditation

The College of Education educator preparation programs are fully accredited at the Initial and Advanced levels by the Council for the Accreditation of Educator Preparation (CAEP). The next CAEP program review will be Fall 2026. CAEP advances excellence in educator preparation through evidence-based accreditation that assures quality and supports continuous improvement to strengthen P-12 student learning.

MORE INFORMATION ABOUT ACCREDITATION OF THE WORLD LANGUAGES (K-12) EDUCATION PROGRAM (<https://ed.psu.edu/about/accreditations/>)

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF CURRICULUM AND INSTRUCTION
141 Chambers Building
University Park, PA 16802
814-865-1500
rmz101@psu.edu

<https://ed.psu.edu/academics/departments/department-curriculum-and-instruction/undergraduate-studies-ci/world-languages-education-bs-k-12/> (<https://ed.psu.edu/academics/departments/department-curriculum-and-instruction/undergraduate-studies-ci/world-languages-education-bs-k-12/>)

Engineering

About the College

Tonya Peeples, Interim Dean of Engineering

For more than a century, our college has been a leader in engineering education and research, preparing young people to become leaders within their professions and communities. Our faculty and students produce game-changing research that advances our society and solves global problems, creating jobs that grow our economy, and informing policy to shape our world. Today we look forward, seeing endless possibilities ahead, especially as we prioritize the pursuit of equity across our community of students, faculty, and staff. We are driven to build an inclusive and diverse community where everyone thrives. We are driven to perform research that impacts the lives of people around the world. We are committed to impacting society and embracing the challenges ahead with a passion for a bright future for humankind. We invite you to join us and be part of this exciting future.

MORE INFORMATION ABOUT THE COLLEGE (<https://www.engr.psu.edu/>)

Mission and Goals

To nurture and train world-class socially aware, globally connected, diverse engineers, educators, and researchers with rigorous core knowledge and problem-solving skills, who understand complex, interacting engineering and societal systems. To develop innovative solutions to the world's most pressing challenges through transformational interdisciplinary research.

MORE INFORMATION ABOUT THE MISSION AND GOALS OF THE COLLEGE OF ENGINEERING (<https://www.engr.psu.edu/strategic-plan-and-initiatives/>)

Accreditation

All the engineering baccalaureate programs in the College of Engineering are accredited by the Engineering Accreditation Commission of ABET, <https://abet.org> (<https://www.abet.org>).

The Computer Science program in the College of Engineering is accredited by the Computing Accreditation Commission of ABET, <https://www.abet.org> (<https://www.abet.org>).

Departments and Schools

Department of Aerospace Engineering

Aerospace engineering is the primary field of engineering concerned with the design, development, testing, and production of aircraft, spacecraft, and related systems and equipment. The field has traditionally focused on problems related to atmospheric and space flight, with two major and overlapping branches: aeronautical engineering and astronautical engineering.

MORE INFORMATION ABOUT THE DEPARTMENT OF AEROSPACE ENGINEERING (<https://www.aero.psu.edu/>)

Department of Agricultural and Biological Engineering

Department of Agricultural and Biological Engineering is the integration of engineering fundamentals with biological, agricultural, and environmental sciences. Students take a holistic approach to study agricultural production, processing of food and other bio-based materials, and natural resource protection. They apply this understanding to engineering challenges, such as providing safe food and clean water.

MORE INFORMATION ABOUT THE DEPARTMENT OF AGRICULTURAL AND BIOLOGICAL ENGINEERING (<https://abe.psu.edu/>)

Department of Architectural Engineering

Architectural Engineering focuses on the scientific and engineering aspects of planning, designing, analyzing, constructing, and operating buildings, supporting the mission of the occupants and owner. Coursework focuses on integrated building solutions related to the structural system; heating, ventilating, and air conditioning systems; acoustics; lighting and electrical systems, and construction management.

MORE INFORMATION ABOUT THE DEPARTMENT OF ARCHITECTURAL ENGINEERING (<https://www.ae.psu.edu/>)

Department of Biomedical Engineering

The Department of Biomedical Engineering is built upon the apex of engineering, medicine, healthcare policy and biological discovery. Biomedical Engineering prepares students to become future leaders in

the areas of medical device design, instrumentation, medical imaging, healthcare management, biomedical research and academia.

MORE INFORMATION ABOUT THE DEPARTMENT OF BIOMEDICAL ENGINEERING (<https://www.bme.psu.edu/>)

Department of Chemical Engineering

Chemical Engineering combines the principles of chemistry, biology, mathematics and physics to solve some of today's most pressing societal issues in human health, environmental sustainability, and energy.

MORE INFORMATION ABOUT THE DEPARTMENT OF CHEMICAL ENGINEERING (<https://www.che.psu.edu/>)

Department of Civil and Environmental Engineering

Civil Engineering educates future engineers through solid science and engineering principles by identifying engineering challenges, creating pioneering solutions, and leading the industry with research discoveries and design innovations. We tackle some of the major problems facing society today in order to advance the fields of civil and environmental engineering.

MORE INFORMATION ABOUT THE DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING (<https://www.cee.psu.edu/>)

School of Electrical Engineering and Computer Science

The majors in the School of Electrical Engineering and Computer Science (EECS) provide engineering education in fields that are at the forefront of 21st century technology: computation, cyber security, communications, materials, machine learning, power/energy systems, and information processing.

MORE INFORMATION ABOUT THE SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE (<https://www.eecs.psu.edu/>)

Department of Engineering Science and Mechanics

Engineering science is a broad discipline that encompasses the many different scientific principles and associated mathematics that underlie engineering. It integrates engineering, biological, chemical, mathematical, and physical sciences with the arts, humanities, social sciences, and the professions to tackle the most demanding challenges and advance the well-being of global society. Engineering scientists research, develop, and design new materials, devices, sensors, and processes for a diverse range of applications.

MORE INFORMATION ABOUT THE DEPARTMENT OF ENGINEERING SCIENCE AND MECHANICS (<https://www.esm.psu.edu/>)

Department of Industrial and Manufacturing Engineering

Industrial Engineers (IEs) design systems and processes to eliminate wastefulness and improve efficiencies. IEs are trained to be problem solvers that have an eye toward innovation and sustainability. They work in a variety of fields to develop solutions for challenges in management, manufacturing, logistics, health systems, retail, service, and ergonomics.

MORE INFORMATION ABOUT THE DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING (<https://www.ime.psu.edu/>)

Department of Mechanical Engineering

Mechanical engineering uses a combination of physics, chemistry, mathematics, and materials science to study mechanical, fluid, and thermal systems. Mechanical engineers create things that help improve

the health, happiness and safety of our everyday lives such as biomedical devices, aircraft propulsion, and ways to store renewable energies.

MORE INFORMATION ABOUT THE DEPARTMENT OF MECHANICAL ENGINEERING (<https://www.me.psu.edu/>)

Department of Nuclear Engineering

Nuclear engineering is a multidisciplinary field that includes providing nuclear power for electrical production, and includes understanding and improving nuclear science, nuclear safety, and nuclear security. Graduates may apply their skills to treat diseases, operate nuclear energy systems, develop regulations to ensure safety, or facilitate space exploration.

MORE INFORMATION ABOUT THE DEPARTMENT OF NUCLEAR ENGINEERING (<https://www.nuce.psu.edu/>)

School of Engineering Design and Innovation

The School of Engineering Design and Innovation (SEDI) delivers effective engineering education through active, collaborative, project-based, and professionally oriented classroom experiences. SEDI offers a variety of programs that partner faculty, students, and industry in the study of real-life engineering problems and solve them with innovative, humanitarian solutions.

MORE INFORMATION ABOUT THE SCHOOL OF ENGINEERING DESIGN AND INNOVATION (<https://www.sedi.psu.edu/>)

Baccalaureate Degrees

- Aerospace Engineering, B.S.
- Architectural Engineering, B.A.E.
- Biological Engineering, B.S.
- Biomedical Engineering, B.S.
- Chemical Engineering, B.S.
- Civil Engineering, B.S. (Engineering)
- Computer Engineering, B.S. (Engineering)
- Computer Science, B.S. (Engineering)
- Data Sciences, B.S. (Engineering)
- Electrical Engineering Technology, B.S. (Engineering)
- Electrical Engineering, B.S. (Engineering)
- Electro-Mechanical Engineering Technology, B.S. (Engineering)
- Engineering Science, B.S.
- Engineering, B.S.
- Industrial Engineering, B.S. (Engineering)
- Mechanical Engineering, B.S. (Engineering)
- Nuclear Engineering, B.S.
- Surveying Engineering, B.S.

Associate Degrees

- Biomedical Engineering Technology, A.ENG.T.
- Electrical Engineering Technology, A.ENG.T. (Engineering)
- Mechanical Engineering Technology, A.ENG.T. (Engineering)
- Surveying Engineering Technology, A.ENG.T.

Minors

- Biological Engineering, Minor
- Biomedical Engineering, Minor

- Computational Sciences, Minor
- Computer Engineering, Minor (Engineering)
- Cybersecurity Computational Foundations, Minor
- Engineering Design, Minor
- Engineering Leadership Development, Minor
- Engineering Mechanics, Minor
- Environmental Engineering, Minor
- Information Sciences and Technology for Aerospace Engineering, Minor
- Information Sciences and Technology for Industrial Engineering, Minor
- International Engineering, Minor
- Nanotechnology, Minor
- Residential Construction, Minor
- Service Enterprise Engineering, Minor
- Six Sigma, Minor

Certificates

- Engineering and Community Engagement, Certificate
- Engineering Design with Digital Tools, Certificate
- Engineering Design, Certificate
- Housing, Certificate
- International Engineering, Certificate
- Nanotechnology, Certificate
- Product Innovation Entrepreneurship, Certificate
- Space Systems Engineering, Certificate

College Procedures

Administrative Enrollment Controls

Students should work with an appropriate academic adviser to determine their Entrance to Major (ETM) requirements for their intended College of Engineering major.

MORE INFORMATION ABOUT ADMINISTRATIVE ENROLLMENT CONTROLS FOR PROGRAMS IN THE COLLEGE OF ENGINEERING (<https://advising.engr.psu.edu/advising/entrance-to-major/>)

Change of Campus

Students generally declare their academic major at the end of their second year of enrollment during the entrance to major process. If the student applies for a major that is not offered at the student's current location, the student will be required to select an approved location during the entrance to major process.

MORE INFORMATION ABOUT CHANGE OF CAMPUS (<https://advising.engr.psu.edu/student-resources/change-of-campus.aspx>)

Concurrent Major

A Concurrent Majors Program is one in which students take courses to concurrently meet the requirements of at least two majors, with graduation for all majors in the program occurring during the same semester.

MORE INFORMATION ABOUT CONCURRENT MAJORS (<https://advising.engr.psu.edu/student-resources/multiple-majors.aspx>)

READ SENATE POLICY 60-00: COMPLETING MORE THAN ONE UNDERGRADUATE MAJOR PROGRAM (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/60-00-completing-more-than-one-undergraduate-program/#60-00>)

Academic Warning

A student who fails to earn a 2.00 cumulative grade-point average will be placed on academic warning. A student placed on academic warning will have a hold placed on registration and will be required to meet with an academic adviser in order for this registration hold to be removed. To remove academic warning, the cumulative grade-point average must be 2.00 or higher.

Students on academic warning should work closely with their assigned academic adviser or the College of Engineering Advising Center to identify and address issues impacting their academic success.

MORE INFORMATION ABOUT ACADEMIC WARNING (<https://advising.engr.psu.edu/academic-support/policies-and-procedures.aspx>)

READ SENATE POLICY 54-20: ACADEMIC WARNING (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/54-00-academic-progress/#54-20>)

Academic Suspension

A student in academic warning who fails to maintain a semester grade-point average of 2.00 or higher will be academically suspended. A student who has been academically suspended may not schedule courses at the University for two consecutive semesters. (Note: Summer session is equal to one semester.)

A student seeking to return to the College of Engineering after academic suspension is required to meet with an academic adviser and follow the procedures outlined by the Engineering Advising Center (<https://advising.engr.psu.edu/assets/docs/return-from-suspension-fa21.pdf>).

MORE INFORMATION ABOUT ACADEMIC SUSPENSION (<https://advising.engr.psu.edu/student-resources/returning-to-the-university.aspx>)

READ SENATE POLICY 54-40: ACADEMIC SUSPENSION (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/54-00-academic-progress/#54-40>)

Resources

Engineering Advising Center

The Engineering Advising Center is the source for information about undergraduate engineering major options, scheduling, degree requirements, entrance-to-major, and more. With a team of dedicated academic advisers, students are provided resources and support as they explore choices regarding their academic interests and co-curricular opportunities.

MORE INFORMATION ABOUT THE ENGINEERING ADVISING CENTER (<https://advising.engr.psu.edu/>)

Center for Engineering Outreach and Inclusion

The Center for Engineering Outreach and Inclusion (CEOI) assists all students in the pursuit of their undergraduate and graduate degrees. Founded to serve students from groups underrepresented in engineering, the center has grown to assist all students, faculty, and staff in the

College with their engagement in equity and inclusion through evidence-based best practices and programs.

MORE INFORMATION ABOUT THE CENTER FOR ENGINEERING OUTREACH AND INCLUSION (<https://inclusion.engr.psu.edu/>)

Career Resources & Employer Relations

Career Resources & Employer Relations (CR&ER) provides career advising and resources to all engineering students and alumni from all Penn State campuses. CR&ER staff review résumés and cover letters, provide guidance about the job search process, encourage student engagement with Engineering Career Envoys for peer mentorship, and help students find internship, co-op, and entry-level full-time jobs through Nittany Lion Careers and other online platforms. We also connect students with employers across a range of industries at a wide variety of career events each academic year, including information sessions, career fairs, and seminars.

MORE INFORMATION ABOUT THE CAREER RESOURCES & EMPLOYER RELATIONS (<https://career.engr.psu.edu/>)

Global Engineering Engagement

Engineering students can choose from a variety of study abroad programs spanning six continents, from short-term or semester-long programs to global experiences embedded in the curriculum. Global Engineering Fellows are engineering students who can offer peer-to-peer information, advice, and insight on study abroad.

MORE INFORMATION ABOUT GLOBAL ENGINEERING ENGAGEMENT (<https://global.engr.psu.edu/>)

Honors Programs

Schreyer Honors College

The Schreyer Honors College, regarded as one of the nation's top programs of its kind, promotes achieving academic excellence with integrity, building a global perspective, and creating opportunities for leadership and civic engagement. Schreyer Scholars, including those admitted after their first or second year of enrollment, are a diverse and motivated group of approximately 2,000 students at University Park and 20 Commonwealth campuses. The College strives to educate students who will have an important and ethical influence in the world, to improve educational practice, and to continue to be recognized as a leading force in honors education nationwide.

MORE INFORMATION ABOUT THE SCHREYER HONORS COLLEGE (<https://www.shc.psu.edu>)

Honors in the College of Engineering

The Engineering Science major - also the College of Engineering's honors program - is a multidisciplinary honors program for engineering students who demonstrate superior academic potential or achievement. Students obtain depth of knowledge through technical electives and a capstone research and design project (senior honors thesis).

MORE INFORMATION ABOUT HONORS IN THE COLLEGE OF ENGINEERING (<https://www.esm.psu.edu/academics/undergraduate/engineering-science-major.aspx>)

Contact

COLLEGE OF ENGINEERING
208 Hammond Building

University Park, PA 16802
814-863-1033
adviser@engr.psu.edu

<https://advising.engr.psu.edu>

Aerospace Engineering, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

This major emphasizes the analysis, design, and operation of aircraft and spacecraft. Students learn the theories and practices in the fundamental subjects of aeronautics, astronautics, aerodynamics and fluid dynamics, aerospace materials and structures, dynamics and automatic control, aircraft stability and control and/or orbital and attitude dynamics and control, air-breathing and rocket propulsion, aircraft systems design and /or spacecraft systems design. All of these place significant weight on the development and use of teamwork and communications skills for effective problem-solving. Graduates in aerospace engineering find employment in the customary settings such as government laboratories, large and small aerospace firms, and in nontraditional positions that also require the use of systems-engineering approaches to problem-solving; they can also pursue graduate study in aerospace engineering and related fields.

What is Aerospace Engineering?

Aerospace engineering is the primary field of engineering concerned with the design, development, testing, and production of aircraft, spacecraft, and related systems and equipment. The field has traditionally focused on problems related to atmospheric and space flight, with two major and overlapping branches: aeronautical engineering and astronautical engineering. Aerospace engineers develop leading-edge technologies and integrate them into aerospace vehicle systems used for transportation, communications, exploration, and defense applications. This involves the design and manufacturing of aircraft, spacecraft, propulsion systems, satellites, and missiles, as well as the design and testing of aircraft and aerospace products, components, and subassemblies. Successful aerospace engineers possess in-depth skills in, and an understanding of, aerodynamics, materials and structures, propulsion, vehicle dynamics and control, and software.

You Might Like This Program If...

- You are interested in developing leading-edge technologies and integrating them into aerospace vehicle systems used for transportation, communications, exploration, and defense applications.
- You want to obtain a solid understanding of the foundations of aerospace systems: aerodynamics, structures, propulsion, dynamics and controls, and software, as well as unmanned air vehicles (UAVs), nano-materials, autonomous systems, and wind energy.
- You want to develop professional excellence, engineering thinking, and gain deep technical knowledge in the core disciplines and integrative systems of aerospace engineering through an innovative curriculum and world-class instruction.
- You want to make a significant global impact.

Entrance to Major

This program currently has administrative enrollment controls. Administrative Enrollment Controls are initiated when limitations of space, faculty, or other resources in a major prevent accommodating all students who request them. Students must follow the administrative enrollment controls that are in effect for the semester that they enter the university.

First-Year Students Entering Summer 2024, Fall 2024, Spring 2025

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- be enrolled in the College of Engineering or the Division of Undergraduate Studies
- 29-55 graded Penn State credits (excludes transfer and AP credits)
- completed with a grade of C or better: CHEM 110, EDSGN 100, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 2.90

Students Who Entered Prior to Summer 2024

Students who entered the University from Summer 2018 through Spring 2024 should view the administrative enrollment controls in the appropriate Undergraduate Bulletin archive (<https://bulletins.psu.edu/undergraduate/archive/>). Students who entered the University prior to the summer 2018 semester should consult with their academic adviser about the administrative enrollment controls in effect for the semester they entered the university.

Degree Requirements

For the Bachelor of Science degree in Aerospace Engineering, a minimum of 131 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	113-117

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

The first two years of study are similar to those in other engineering majors and provide students with a basic education for the engineering profession. Students need to complete EMCH 212, CMPSC 121 or CMPSC 131 or CMPSC 200 or CMPSC 201, MATH 220, MATH 230, and MATH 250 or MATH 251 prior to the start of the junior year in order to meet graduation requirements in the following two years. Six of the nine technical-elective credits taken in the senior year must be aerospace engineering courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
AERSP 304	Dynamics and Control of Aerospace Systems	3

AERSP 305W	Aerospace Technology Laboratory	3
AERSP 312	Aerodynamics II	3
AERSP 410	Aerospace Propulsion	3
EMCH 315	Mechanical Response of Engineering Materials	2
EMCH 316	Experimental Determination of Mechanical Response of Materials	1
MATH 220	Matrices	2-3
MATH 230	Calculus and Vector Analysis	4
ME 201	Introduction to Thermal Science	3
PHYS 214	General Physics: Wave Motion and Quantum Physics	2

<i>Prescribed Courses: Require a grade of C or better</i>		
AERSP 301	Aerospace Structures	3
AERSP 306	Aeronautics	3
AERSP 309	Astronautics	3
AERSP 311	Aerodynamics I	3
AERSP 313	Aerospace Analysis	3
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EMCH 212	Dynamics	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4

Additional Courses		
Select 1 credit of First-Year Seminar		1
AERSP 413	Stability and Control of Aircraft	3
or AERSP 450	Orbit and Attitude Control of Spacecraft	
Select 3 credits from the following:		3
CMPSC 121	Introduction to Programming Techniques	
CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 200	Programming for Engineers with MATLAB	
CMPSC 201	Programming for Engineers with C++	
Select 3 credits from the following:		3
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	
ECON 14	Principles of Economics	
Select 5-6 credits of the following:		5-6
EMCH 210	Statics and Strength of Materials	
EMCH 211	Statics	
& EMCH 213	and Strength of Materials	
Select one of the following sequences:		5
AERSP 401A	Spacecraft Design–Preliminary	
& AERSP 401B	and Spacecraft Design–Detailed	
AERSP 402A	Aircraft Design–Preliminary	
& AERSP 402B	and Aircraft Design–Detailed	
Select 3-4 credits from the following:		3-4
AERSP 424	Advanced Computer Programming	
EE 210	Circuits and Devices	
EE 212	Introduction to Electronic Measuring Systems	
<i>Additional Courses: Require a grade of C or better</i>		
CAS 100A	Effective Speech	3

or CAS 100B	Effective Speech	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
MATH 250	Ordinary Differential Equations	3-4
or MATH 251	Ordinary and Partial Differential Equations	

Supporting Courses and Related Areas

Select 6 credits of Aerospace Technical Elective (ATE) courses from department list	6
Select 3 credits of General Technical Elective (GTE) courses from department list	3
Select 3 credits of Limited Elective (LE) courses from department list ¹	3

¹ Students who complete Basic ROTC may substitute 6 of the ROTC credits for 3 credits of LE and 3 credits of GHW.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3

credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Aerospace Engineering and M.I.A. in International Affairs

Requirements for the Integrated B.S. in Aerospace Engineering and M.I.A. in International Affairs can be found in the Graduate Bulletin (<https://bulletins.psu.edu/graduate/programs/majors/international-affairs/#integratedundergradprogramtext>).

Program Educational Objectives

Within a few years after graduation, we expect graduates of our program will be:

- Engaged in careers in the discipline of aerospace engineering, and in related disciplines where aerospace engineering knowledge and skills are beneficial, that applies the knowledge and skills for precise engineering analysis and open-ended problem solving and design.
- Pursuing continued professional development through multiple pathways including graduate programs in aerospace engineering, and in related disciplines where aerospace engineering knowledge and skills bring a useful perspective, with the skills needed for engineering research and more advanced studies.

- Acting as professionals representing aerospace engineering concerns with effective communication and teamwork skills, awareness of current issues, and ethical decision making.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Aerospace Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Robert Melton

Aerospace Faculty Adviser
208 Hammond Building
University Park, PA 16802
814-863-1033
adviser@engr.psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Aerospace Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{*#†}	3 EDSGN 100 ^{*#}	3
ECON 102 or 104 (GS) [†]	3 ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3
MATH 140 or 140E (GQ) ^{*†#†}	4 MATH 141 or 141E (GQ) ^{*†#†}	4
PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*#†}	4 PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R) ^{*†}	4
AERSP 1 or 97 (or First Year Seminar) [†]	1 General Education Course [†]	3
	15	17

Second Year

Fall	Credits Spring	Credits
CMPSC 201	3 CAS 100A or 100B (GWS) ^{††}	3
EMCH 210	5 EMCH 212 [*]	3
MATH 220	2 EMCH 315	2
MATH 250 [*]	3 EMCH 316	1
General Education Course [†]	3 MATH 230	4
	ME 201	3
	16	16

Third Year

Fall	Credits Spring	Credits
AERSP 301 [*]	3 AERSP 304	3
AERSP 309 [*]	3 AERSP 305W [†]	3
AERSP 311 [*]	3 AERSP 306 [*]	3
AERSP 313 [*]	3 AERSP 312	3
ENGL 202C (GWS) ^{††}	3 PHYS 214 (GN)	2
General Education Course (GHW) [†]	1.5 General Education Course [†]	3
	16.5	17

Fourth Year

Fall	Credits Spring	Credits
AERSP 401A or 402A	3 AERSP 401B or 402B	2
AERSP 410	3 AERSP 424, EE 210, or EE 212	3
AERSP 413 or 450	3 AERSP Technical Elective	3
AERSP Technical Elective	3 Limited Elective	3
General Technical Elective	3 General Education Course [†]	3

General Education Course (GHW) [†]	1.5 General Education Course [†]	3
	16.5	17

Total Credits 131

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **AERSP 401A/AERSP 401B and AERSP 402A/AERSP 402B:** Students may schedule either the spacecraft design sequence (AERSP 401A and AERSP 401B) or the aircraft design sequence (AERSP 402A and AERSP 402B). The appropriate control course (AERSP 413 or AERSP 450) should be scheduled accordingly.
- **AERSP Technical Elective:** Select from department list. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Technical Elective and 3 co-op credits for a Limited Elective.
- **Health and Physical Activity Elective (GHW):** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Limited Elective.
- **Limited Elective:** Select from department list. Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Limited Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Technical Elective and 3 co-op credits for a Limited Elective.
- **These courses offered at University Park in fall semester only:**
 - AERSP 301
 - AERSP 309
 - AERSP 311
 - AERSP 313
 - AERSP 401A

- AERSP 402A
- AERSP 410
- AERSP 413
- AERSP 450

• **These courses offered at University Park in spring semester only:**

- AERSP 304
- AERSP 306
- AERSP 312
- AERSP 401B
- AERSP 402B

• **These courses offered at University Park in fall and spring semesters:**

- AERSP 305W
- AERSP 424

Career Paths

Aerospace engineers work primarily in the aerospace industry, at systems and software suppliers, corporate labs, government labs, and universities. Their skill set is extremely broad and multidisciplinary, and the experience of aerospace engineers as systems architects and engineers allows them to make contributions in many diverse sectors. Our graduate programs provide outstanding research opportunities across a broad spectrum of topics, and encompass both computational and experimental research approaches. Students may embrace traditional fields like aerodynamics, propulsion, flight science, vehicle dynamics, aeroacoustics, and rotorcraft engineering, as well as leading-edge research areas such as UAVs, commercial space, nanomanufacturing, and wind energy.

Careers

The industries that employed the most aerospace engineers are:

- Aerospace product and parts manufacturing.
- Engineering services.
- Federal government, excluding postal service.
- Research and development in the physical, engineering, and life sciences.
- Navigational, measuring, electromedical, and control instruments manufacturing.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE AEROSPACE ENGINEERING PROGRAM (<http://career.engr.psu.edu/>)

Opportunities for Graduate Studies

The aerospace engineering department offers the following graduate degree options: " Master of Engineering (M.Eng.) " Master of Science (M.S.) " Doctor of Philosophy (Ph.D.) Students may also earn a graduate minor in computational science and/or a graduate certificate in wind energy.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.aero.psu.edu/academics/graduate/prospective-students.aspx>)

Professional Resources

- AHS International (<https://vtol.org/>)
- American Institute of Aeronautics and Astronautics (<https://www.aiaa.org/>)
- American Astronautical Society (<http://astronautical.org/>)

Accreditation

The Bachelor of Science in Aerospace Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Aerospace and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF AEROSPACE ENGINEERING
229 Hammond Building
814-865-2569
aerospace@engr.psu.edu

<https://www.aero.psu.edu/index.aspx> (<https://www.aero.psu.edu/>)

Architectural Engineering, B.A.E.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

This major emphasizes the application of scientific and engineering principles to the planning, design, and construction of buildings and building systems. The goal of the program is to provide engineering graduates with the best education available for careers in the building professions. Graduates will have the ability to practice as registered professional engineers in a variety of areas, both public and private, related to the planning, design, construction, and operation of buildings and to assume a place of leadership in society.

Four options are available in the ten-semester major:

1. the Construction option, which emphasizes building construction engineering and construction management;
2. the Lighting/Electrical option, which emphasizes the design of lighting and electrical systems for buildings;
3. the Mechanical option, which emphasizes the design of heating, ventilating and air-conditioning systems in buildings; and
4. the Structural option, which emphasizes the analysis and design of building structural systems.

Courses in architectural design are included in all options to give the engineering student an understanding of architectural design and its relation to engineering. Courses in engineering design are provided throughout the program. The design experience is culminated in a year-long capstone design course.

The professional degree, Bachelor of Architectural Engineering, is granted upon the satisfactory completion of the five-year program.

What is Architectural Engineering?

Architectural Engineering is an interdisciplinary field focused on creating integrated building solutions, both in outcome and design process, to produce optimally engineered building systems. This is achieved through close coordination between several primary focus areas, including Structural, Mechanical, Lighting, Electrical, Acoustical, and Construction. The interdisciplinary approach of Architectural Engineering seeks to reduce the carbon footprint of buildings while improving the health, comfort, and productivity of building occupants. This interdisciplinary approach is necessary to respond to the most urgent societal and environmental challenges emerging from urbanization across the globe.

You Might Like This Program If...

- You have aptitude in math and science.
- You appreciate the artistic and emotive aspects of architecture.
- You are passionate about human-centric design, indoor environmental quality, sustainability, energy conservation, or net-zero and high-performance buildings.
- You like to organize parts of a system or process, a handy skill in the planning, coordinating, budgeting, design, construction, and operation of building projects.
- You seek a team-oriented work environment with excellent prospects for advancement into project management and corporate leadership.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out:

- 29-55 cumulative credits (excludes transfer and AP credits)
- completed with a grade of C or better: EDSGN 100 or EDSGN 130, CHEM 110, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 2.60

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Transfer Students

Under the new Entrance to Major (ETM) parameters, transfer students requesting admission to the College of Engineering at University Park will be evaluated in the following way:

Transfer Admission into College of Engineering Pre-Major Status

Applicants who have attempted or completed 18 or more credits but no more than 2 full-time academic semesters at another college or university after high school graduation may apply for transfer admission to pre-major status in the College of Engineering (ENGR_PMAJ). A minimum cumulative grade point average (GPA) of 3.00 and at least 4 credits of college calculus, completed with a C or better, are required for consideration.

After Penn State admission, to be eligible for entrance into a College of Engineering major, transfer students (TRN admit status) must meet all the ETM course and GPA requirements and have completed at least 12 credits earned at Penn State but not more than 25 credits.

Transfer Admission Directly into a College of Engineering Major Majors Not Under Administrative Enrollment Controls

Applicants who have more than one year (2 full-time academic semesters) of attempted college coursework post-high school may only apply for admission directly into a College of Engineering major that does not have administrative enrollment controls. These students are not eligible to enter College of Engineering pre-major status (ENGR_PMAJ). A minimum cumulative grade point average (GPA) of 3.00 and the following coursework completed with a C or better are required for consideration:

- 8 credits of college calculus
- 3 credits of college chemistry
- 4 credits of college physics - mechanics

The individual department will make the final admission determination, considering possible alternatives for Penn State specific ETM course requirements (such as EDSGN 100).

Majors under Administrative Enrollment Controls

Applicants who have more than one year (2 full-time academic semesters) of attempted college coursework post-high school may not apply for admission to any College of Engineering major under administrative enrollment controls.

Degree Requirements

For the Bachelor of Architectural Engineering degree in Architectural Engineering, a minimum of 160 credits is required:

Requirement	Credits
General Education	45
Electives	3
Requirements for the Major	145-149

33 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GA courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
AE 202	Introduction to Architectural Engineering Concepts	3
AE 221	Architectural Building Materials	3
AE 222	Building Materials, Methods and Modeling II	3
AE 240	Programming and Data Science for Architectural Engineering	3
AE 309	Fundamentals of Architectural Acoustics	3
AE 441	Engineering Lifecycle Economic Analysis for Buildings	1
AE 481W	Comprehensive Architectural Engineering Senior Project I	4
AE 482	Comprehensive Architectural Engineering Senior Project II	4

ARCH 130A	Basic Design and Research I	3
ARCH 441	Architectural Design Analysis	3
ARTH 202N	Renaissance to Modern Architecture	3
CHEM 111	Experimental Chemistry I	1
EMCH 211	Statics	3
EMCH 212	Dynamics	3
EMCH 213	Strength of Materials	3
MATH 220	Matrices	2-3
PHYS 212	General Physics: Electricity and Magnetism	4
PHYS 213	General Physics: Fluids and Thermal Physics	2

Prescribed Courses: Require a grade of C or better

AE 308	Introduction to Structural Analysis	4
AE 310	Fundamentals of Heating, Ventilating, and Air Conditioning	3
AE 311	Fundamentals of Electrical and Illumination Systems for Building	3
AE 372	Introduction to the Building Construction Industry	3
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4

Additional Courses

ARCH 100	Architecture and Ideas	3
or LARCH 60	Cultural History of Designed Places	
MATH 231	Calculus of Several Variables	2-4
or MATH 230	Calculus and Vector Analysis	
MATH 250	Ordinary Differential Equations	3-4
or MATH 251	Ordinary and Partial Differential Equations	
ME 201	Introduction to Thermal Science	3
or ME 300	Engineering Thermodynamics I	
STAT 401	Experimental Methods	3
or IE 424	Process Quality Engineering	
Select one of the following:		1
AE 124	Architectural Engineering Orientation	
1 credit of another First-Year Seminar		
Select one of the following:		3
ECON 14	Principles of Economics	
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	

Additional Courses: Require a grade of C or better

Select one of the following:		3
CAS 100A	Effective Speech	
CAS 100B	Effective Speech	
CAS/ENGL 138T	Rhetoric and Civic Life II	
Select one of the following:		3
ENGL 15	Rhetoric and Composition	
ENGL 30H	Honors Rhetoric and Composition	
ENGL/CAS 137H	Rhetoric and Civic Life I	

Requirements for the Option

Select an option	36
------------------	----

**Requirements for the Option
Construction Option (36 credits)**

Code	Title	Credits
Prescribed Courses		
AE 404	Building Structural Systems in Steel and Concrete	3
AE 405	Geotechnical Engineering	4
AE 472	Building Construction Planning and Management	3
AE 473	Building Construction Management and Control	3
AE 475	Building Construction Engineering I	3
AE 476	Building Construction Engineering II	3
CE 209	Fundamentals of Surveying	2
CE 336	Materials Science for Civil Engineers	3
CE 337	Civil Engineering Materials Laboratory	1
MGMT 326	Organizational Behavior and Design ¹	3

Supporting Courses and Related Areas

Select 8 credits from technical courses on department list ¹	8
---	---

¹ Students having successfully completed ROTC upon graduation, may apply 3 credits of ROTC to these courses. Additionally, 3 credits of ROTC may be applied to GHW.

Lighting/Electrical Option (36 credits)

Code	Title	Credits
Prescribed Courses		
AE 404	Building Structural Systems in Steel and Concrete	3
AE 461	Architectural Illumination Systems & Design	3
AE 464	Advanced Architectural Illumination Systems & Design	3
AE 466	Computer Aided Lighting Design	3
AE 467	Advanced Building Electrical System Design	3
AE 468	Advanced Building Electrical and Communication Systems	3

Additional Courses

AE 453	Load and Energy Use Simulations for Buildings	3
or AE 454	Advanced Heating, Ventilating, and Air Conditioning	

Supporting Courses and Related Areas

Select 15 credits from technical courses on department option list ¹	15
---	----

¹ Students having successfully completed ROTC upon graduation, may apply 3 credits of ROTC to these courses. Additionally, 3 credits of ROTC may be applied to GHW.

Mechanical Option (36 credits)

Code	Title	Credits
Prescribed Courses		
AE 404	Building Structural Systems in Steel and Concrete	3
AE 453	Load and Energy Use Simulations for Buildings	3
AE 454	Advanced Heating, Ventilating, and Air Conditioning	3
AE 455	Advanced Heating, Ventilating, and Air Conditioning System Design	3
AE 457	HVAC Control Systems	3

AE 458	Advanced Architectural Acoustics and Noise Control	3
AE 467	Advanced Building Electrical System Design	3
ME 320	Fluid Flow	3
ME 410	Heat Transfer	3

Supporting Courses and Related Areas

Select 9 credits from technical courses on department option list ¹	9
--	---

¹ Students having successfully completed ROTC upon graduation, may apply 3 credits of ROTC to these courses. Additionally, 3 credits of ROTC may be applied to GHW.

Structural Option (36 credits)

Code	Title	Credits
Prescribed Courses		
AE 401	Design of Steel and Wood Structures for Buildings	3
AE 402	Design of Concrete Structures for Buildings	3
AE 403	Advanced Steel Design for Buildings	3
AE 405	Geotechnical Engineering	4
AE 430	Indeterminate Structures	3
AE 431	Advanced Concrete Design for Buildings	3
CE 209	Fundamentals of Surveying	2
EMCH 315	Mechanical Response of Engineering Materials	2
EMCH 316	Experimental Determination of Mechanical Response of Materials	1

Supporting Courses and Related Areas

Select 12 credits from technical courses on department list ¹	12
--	----

¹ Students having successfully completed ROTC upon graduation, may apply 3 credits of ROTC to these courses. Additionally, 3 credits of ROTC may be applied to GHW.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits

- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.A.E. in Architectural Engineering and M.A.E. or M.S. in Architectural Engineering

Available at the following campuses: University Park

Requirements for the Integrated B.A.E. in Architectural Engineering and Master of Architectural Engineering (M.A.E.) or Master of Science (M.S.) in Architectural Engineering can be found in the Graduate Bulletin (<https://bulletins.psu.edu/graduate/programs/majors/architectural-engineering/#integratedundergradgradprogramtext>).

Program Educational Objectives

The undergraduate program in Architectural Engineering is designed to produce graduates who, within a few years of graduation, are expected to be:

- Progressing in their professional careers in the building industry or other related fields by applying expertise in one or more areas related to the integrated planning, design, construction, operation and maintenance of buildings and infrastructure: including, but not limited to, building construction engineering and management; lighting systems; electrical systems; heating, ventilating and air-conditioning systems; structural systems;
- Demonstrating strong leadership, communication, collaborative, and interdisciplinary skills and a commitment to a sustainable built environment;
- Advancing the building industry and engaged in lifelong learning through activities, such as graduate level study, professional development, mentoring, involvement in professional organizations and service roles;
- Attaining credentials appropriate for their career path, such as professional licenses, registrations or certifications.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Architectural Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Undergraduate Program Officer

104 Engineering A
University Park, PA 16802
814-865-6394
upoarc@engr.psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Construction Option (2nd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Standard Path: Direct Entry from ENGAE to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
AE 124 (or First Year Seminar) [†]	1 ARTH 202N (GA) (US/IL) [†]	3
ECON 102 or 104 (GS) [†]	3 EDSGN 100 [#]	3
CHEM 110 (GN) ^{*#†}	3 MATH 141 or 141E (GQ) ^{*†#†}	4
CHEM 111	1 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 CAS 100A or 100B (GWS) ^{††}	3
MATH 140 or 140E (GQ) ^{*†#†}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
AE 202	3 AE 222	3
AE 221	3 AE 240	3
ARCH 130A	3 ARCH 130B	3
EMCH 211	3 EMCH 213	3
MATH 250	3 PHYS 212 (PHYS 212L and 212R) (GN)	4
PHYS 213	2	
	17	16

Third Year

Fall	Credits Spring	Credits
AE 308 [*]	4 AE 311 [*]	3
AE 309	3 AE 372 [*]	3
AE 310 [*]	3 ARCH 100 or LARCH 60 (GA) [†]	3
MATH 220	2 EMCH 212	3
MATH 231	2 General Education Course (GHW)	3
ME 201	3	
	17	15

Fourth Year

Fall	Credits Spring	Credits
AE 404	3 AE 405	4
AE 441	1 AE 472	3
AE 475	3 AE 476	3
ARCH 441	3 CE 336	3
MGMT 326	3 CE 337	1
General Education Course	3 STAT 401 or IE 424	3
	16	17

Fifth Year

Fall	Credits Spring	Credits
AE 473	3 AE 482	4
AE 481W	4 General Education Course	3
CE 209	2 General Education Course	3
ENGL 202C (GWS) ^{††}	3 Department Elective	3
Department Elective	3 Department Elective	2
	15	15

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.
- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Construction Option (3rd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Alternative Path: Direct Entry from ENGR to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{**†}	3 ARTH 202N (GA) (US/IL) [†]	3
AE 124 (or other First Year Seminar) [†]	1 EDSGN 100 [#]	3
MATH 140 or 140E (GQ) ^{*† #†}	4 MATH 141 or 141E (GQ) ^{*† #†}	4
CHEM 111	1 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ECON 102 or 104 (GS) [†]	3 CAS 100A or 100B ^{††}	3
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3	
	15	17

Second Year

Fall	Credits Spring	Credits
ARCH 100 or LARCH 60 (GA) [†]	3 EMCH 212	3
EMCH 211	3 EMCH 213	3
ME 201	3 MATH 220	2
MATH 250 (GQ)	3 MATH 231	2
PHYS 212 (PHYS 212L and 212R) (GN) [†]	4 PHYS 213	2
	General Education Course (GHW)	1.5
	General Education Course (GHW)	1.5
	16	15

Third Year

Fall	Credits Spring	Credits
AE 202	3 AE 222	3
AE 221	3 AE 240	3
AE 308 [*]	4 AE 310 [*]	3
AE 309	3 AE 311 [*]	3
ARCH 130A	3 AE 372 [*]	3
	ARCH 130B	3
	16	18

Fourth Year

Fall	Credits Spring	Credits
AE 404	3 AE 405	4
AE 441	1 AE 472	3
AE 475	3 AE 476	3

ARCH 441	3 CE 336	3
MGMT 326	3 CE 337	1
General Education Course	3 STAT 401 or IE 424	3
	16	17

Fifth Year

Fall	Credits Spring	Credits
AE 473	3 AE 482	4
AE 481W	4 Department Elective	3
CE 209	2 Department Elective	2
Department Elective	3 General Education Course	3
ENGL 202C (GWS) ^{††}	3 General Education Course	3
	15	15

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."

- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.
- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Lighting/Electrical Option (2nd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Standard Path: Direct Entry from ENGAE to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
AE 124 (or other First Year Seminar course) [†]	1 ARTH 202N (GA) (US/IL) [†]	3
ECON 102 or 104 (GS) [†]	3 EDSGN 100 [#]	3
CHEM 110 (GN) ^{*#†}	3 MATH 141 or 141E (GQ) ^{*†##}	4
CHEM 111	1 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 CAS 100A or 100B ^{††}	3
MATH 140 or 140E (GQ) ^{†##}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
AE 202	3 AE 222	3
AE 221	3 AE 240	3
ARCH 130A	3 ARCH 130B	3
EMCH 211	3 EMCH 213	3
PHYS 213	2 PHYS 212 (PHYS 212L and 212R) (GN) [*]	4
MATH 250	3	
	17	16

Third Year

Fall	Credits Spring	Credits
AE 308 [*]	4 AE 311 [*]	3
AE 309	3 AE 372 [*]	3
AE 310	3 ARCH 100 or LARCH 60 (GA)	3
MATH 220	2 EMCH 212	3
MATH 231	2 General Education Course (GHW) [†]	3
ME 201	3	
	17	15

Fourth Year

Fall	Credits Spring	Credits
AE 404	3 AE 441	1
AE 461	3 AE 466	3
AE 464	3 AE 468	3
AE 467	3 STAT 401 or IE 424	3
ARCH 441	3 General Education Course (GH)	3

	Department Elective	Credits
	15	16
Fifth Year		
Fall	Credits Spring	Credits
AE 453 or 454	3 AE 482	4
AE 481W	4 Department Elective	3
ENGL 202C (GWS) ^{††}	3 Department Elective	3
Department Elective	3 General Education Course [†]	3
Department Elective	3 General Education Course [†]	3
	16	16

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.

- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Lighting/Electrical Option (3rd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Alternative Path: Direct Entry from ENGR to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
AE 124 (or other First Year Seminar) [†]	1 ARTH 202N (GA) (US/IL) [†]	3
CHEM 110 ^{*#†}	3 EDSGN 100 [#]	3
CHEM 111	1 MATH 141 or 141E (GQ) ^{*†##}	4
ECON 102 or 104 (GS) [†]	3 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 CAS 100A or 100B ^{††}	3
MATH 140 or 140E (GQ) ^{*†##}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
ARCH 100 or LARCH 60 (GA) [†]	3 EMCH 212	3
EMCH 211	3 EMCH 213	3
ME 201	3 MATH 220	2
MATH 250	3 MATH 231	2
PHYS 212 (PHYS 212L and 212R) (GN) [†]	4 PHYS 213	2
	General Education Course (GHW)	1.5
	General Education Course (GHW)	1.5
	16	15

Third Year

Fall	Credits Spring	Credits
AE 202	3 AE 222	3
AE 221	3 AE 240	3
AE 308 [*]	4 AE 310 [*]	3
AE 309	3 AE 311 [*]	3
ARCH 130A	3 AE 372 [*]	3
	ARCH 130B	3
	16	18

Fourth Year

Fall	Credits Spring	Credits
AE 404	3 AE 441	1
AE 461	3 AE 466	3
AE 464	3 AE 468	3

AE 467	3 STAT 401 or IE 424	3
ARCH 441	3 General Education Course	3
	Department Elective	3
	15	16

Fifth Year

Fall	Credits Spring	Credits
AE 453 or 454	3 AE 482	4
AE 481W	4 Department Elective	3
ENGL 202C (GWS) ^{††}	3 Department Elective	3
Department Elective	3 General Education Course	3
Department Elective	3 General Education Course	3
	16	16

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."

- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.
- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Mechanical Option (2nd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Standard Path: Direct Entry from ENGAE to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
AE 124 (or other First Year Seminar) [†]	1 ARTH 202N (GA) (US/IL) [†]	3
CHEM 110 ^{*#†}	3 EDSGN 100 [#]	3
CHEM 111	1 MATH 141 or 141E (GQ) ^{*†##}	4
ECON 102 or 104 (GS) [†]	3 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 CAS 100A or 100B ^{††}	3
MATH 140 or 140E (GQ) ^{*†##}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
AE 202	3 AE 240	3
AE 221	3 AE 222	3
ARCH 130A	3 ARCH 130B	3
EMCH 211	3 EMCH 213	3
MATH 250	3 PHYS 212 (PHYS 212L and 212R) (GN) [†]	4
PHYS 213	2	
	17	16

Third Year

Fall	Credits Spring	Credits
AE 308 [*]	4 AE 311 [*]	3
AE 309	3 AE 372 [*]	3
AE 310 [*]	3 ARCH 100 or LARCH 60 (GA) [†]	3
MATH 220	2 EMCH 212	3
MATH 231	2 General Education Course (GHW)	3
ME 201	3	
	17	15

Fourth Year

Fall	Credits Spring	Credits
AE 404	3 AE 455	3
AE 441	1 AE 457	3
AE 454	3 AE 458	3
AE 453	3 ME 410	3
ARCH 441	3 STAT 401 or IE 424	3

ME 320	3	
	16	15
Fifth Year		
Fall	Credits Spring	Credits
AE 467	3 AE 482	4
AE 481W	4 General Education Course	3
ENGL 202C (GWS) ^{††}	3 General Education Course	3
Department Elective	3 General Education Course	3
Department Elective	3 Department Elective	3
	16	16

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.

- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Mechanical Option (3rd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Alternative Path: Direct Entry from ENGR to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
AE 124 (or other First Year Seminar) [†]	1 ARTH 202N (GA) (US/IL) [†]	3
CHEM 110 ^{*#†}	3 EDSGN 100 [#]	3
CHEM 111	1 MATH 141 or 141E (GQ) ^{*†##}	4
ECON 102 or 104 (GS) [†]	3 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 CAS 100A or 100B ^{††}	3
MATH 140 or 140E (GQ) ^{*†##}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
ARCH 100 or LARCH 60 (GA) [†]	3 EMCH 212	3
MATH 250	3 EMCH 213	3
PHYS 212 (PHYS 212L and PHYS 212R) (GN) [†]	4 MATH 220	2
ME 201	3 PHYS 213	2
EMCH 211	3 MATH 231	2
	General Education Course (GHW)	1.5
	General Education Course (GHW)	1.5
	16	15

Third Year

Fall	Credits Spring	Credits
AE 202	3 AE 222	3
AE 221	3 AE 240	3
AE 308 [*]	4 AE 310 [*]	3
AE 309	3 AE 311 [*]	3
ARCH 130A	3 AE 372	3
	ARCH 130B	3
	16	18

Fourth Year

Fall	Credits Spring	Credits
AE 404	3 AE 455	3
AE 441	1 AE 457	3
AE 454	3 AE 458	3

AE 453	3 ME 410	3
ARCH 441	3 STAT 401 or IE 424	3
ME 320	3	
	16	15

Fifth Year

Fall	Credits Spring	Credits
AE 467	3 AE 482	4
AE 481W	4 General Education Course	3
ENGL 202C (GWS) ^{††}	3 General Education Course	3
General Education Course	3 Department Elective	3
Department Elective	3 Department Elective	3
	16	16

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."

- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.
- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Structural Option (2nd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Standard Path: Direct Entry from ENGAE to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
AE 124 (or First Year Seminar) [†]	1 ARTH 202N (GA) (US/IL) [†]	3
CHEM 110 ^{*#†}	3 EDSGN 100 [#]	3
CHEM 111	1 MATH 141 or 141E (GQ) ^{*†##}	4
ECON 102 or 104 (GS) [†]	3 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 CAS 100A or 100B ^{††}	3
MATH 140 or 140E (GQ) ^{*†##}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
AE 202	3 AE 222 [*]	3
AE 221	3 AE 240	3
ARCH 130A	3 ARCH 130B	3
EMCH 211	3 EMCH 213	3
MATH 250	3 PHYS 212 (PHYS 212L and 212R) (GN) [†]	4
PHYS 213	2	
	17	16

Third Year

Fall	Credits Spring	Credits
AE 308 [*]	4 AE 311 [*]	3
AE 309	3 AE 372 [*]	3
AE 310 [*]	3 ARCH 100 or LARCH 60 (GA) [†]	3
MATH 220	2 EMCH 212	3
MATH 231	2 General Education Course	3
ME 201	3	
	17	15

Fourth Year

Fall	Credits Spring	Credits
AE 401	3 AE 403	3
AE 402	3 AE 405	4
AE 430	3 AE 431	3
ARCH 441	3 AE 441	1
General Education Course	3 STAT 401 or IE 424	3

	Department Elective	3
	15	17
Fifth Year		
Fall	Credits Spring	Credits
AE 481W	4 AE 482	4
CE 209	2 General Education Course	3
EMCH 315	2 General Education Course	3
EMCH 316	1 Department Elective	3
ENGL 202C (GWS) ^{††}	3 Department Elective	3
Department Elective	3	
	15	16

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."

- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.
- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Structural Option (3rd Year ETM): Architectural Engineering, B.A.E. at University Park Campus

Alternative Path: Direct Entry from ENGR to AE

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
AE 124 (or other First Year Seminar) [†]	1 ARTH 202N (GA) (US/IL) [†]	3
CHEM 110 ^{*#†}	3 EDSGN 100 [#]	3
CHEM 111	1 MATH 141 or 141E (GQ) ^{*†##}	4
ECON 102 or 104 (GS) [†]	3 PHYS 211 (PHYS 211L and 211R) (GN) ^{*#†}	4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 CAS 100A or 100B ^{††}	3
MATH 140 or 140E (GQ) ^{†##}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
ARCH 100 or LARCH 60 (GA) [†]	3 EMCH 212	3
MATH 250	3 EMCH 213	3
ME 201	3 MATH 220	2
EMCH 211	3 MATH 231	2
PHYS 212 (PHYS 212L and 212R) (GN) [†]	4 PHYS 213	2
	General Education Course (GHW)	1.5
	General Education Course (GHW)	1.5
	16	15

Third Year

Fall	Credits Spring	Credits
AE 202	3 AE 222	3
AE 221	3 AE 240	3
AE 308 [*]	4 AE 310 [*]	3
AE 309	3 AE 311 [*]	3
ARCH 130A	3 AE 372 [*]	3
	ARCH 130B	3
	16	18

Fourth Year

Fall	Credits Spring	Credits
AE 401	3 AE 403	3
AE 402	3 AE 405	4
AE 430	3 AE 431	3

ARCH 441	3 AE 441	1
General Education Course	3 STAT 401 or IE 424	3
	Department Elective	3
	15	17

Fifth Year

Fall	Credits Spring	Credits
AE 481W	4 AE 482	4
CE 209	2 General Education Course	3
EMCH 315	2 General Education Course	3
EMCH 316	1 Department Elective	3
ENGL 202C (GWS) ^{††}	3 Department Elective	3
Department Elective	3	
	15	16

Total Credits 160

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Some AE courses are offered every semester. To accommodate class size limitations, specific courses have been paired to permit students to interchange the semesters in which they enroll in these courses. These pairings are as follows: AE 240 and ME 201; AE 308 and AE 372; AE 310 and AE 311; ARCH 441 and (STAT 401 or IE 424).
- Fourth and Fifth-year AE courses are once a year in the semester shown in the above academic plan.
- Department Electives: Any 400-level or 500-level A E course is acceptable, except AE 401, AE 402, AE 404, AE 421, AE 422, and AE 424. For recommended AE and other approved courses for each option, go to www.ae.psu.edu/academics/undergraduate/electives.aspx (<https://www.ae.psu.edu/academics/undergraduate/electives.aspx>) and click on "Department Elective Worksheet."

- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department Elective.
- (ARCH 100 or LARCH 60) and ARTH 202N are required GA courses. Substitution by an advanced course is possible. See an adviser.
- ME 300 may be substituted for ME 201.

Career Paths

The Penn State Architectural Engineering program focuses on developing next-generation leaders with in-depth expertise in their technical discipline, overall breadth of the building industry, and passion about integrated design. Graduates of this program serve in a variety of roles in conceptualizing, designing, constructing, and managing built environments for both the public and private sectors. They accept job offers from companies such as: architectural engineering firms, consulting engineering companies, contractors, specialty contractors, forensic engineering consultants, building technology consultants, real estate developers, building equipment designers and manufacturers, building materials and products designers and producers, facilities engineering and management groups, and building owners.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ARCHITECTURAL ENGINEERING PROGRAM (<http://www.ae.psu.edu/industry/career-fair/>)

Opportunities for Graduate Studies

Students with a bachelor's degree and/or master's degree in Architectural Engineering are well prepared for graduate studies to further develop their depth of knowledge in traditional architectural engineering disciplines, such as structural, mechanical, construction, lighting, acoustical and electrical engineering. Alternatively, students may wish to broaden their expertise by pursuing graduate education in facility engineering, architecture, real estate and development, management, or law.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.ae.psu.edu/academics/graduate/>)

Professional Resources

- Acoustical Society of America (ASA) (<https://acousticalsociety.org/>)
- American Concrete Institute (ACI) (<https://www.concrete.org/>)
- American Institute of Steel Construction (AISC) (<https://www.aisc.org/>)
- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) (<http://ashrae.org/>)
- Architectural Engineering Institute (AEI) (<http://www.asce.org/>)
- Earthquake Engineering Research Institute (EERI) (<https://www.eeri.org/>)
- Illuminating Engineering Society (IES) (<https://www.ies.org/>)
- Institute of Noise Control Engineers (INCE) (<https://www.inceusa.org/>)
- International Association of Lighting Designers (IALD) (<https://www.iald.org/>)
- International Commission on Illumination (CIE) (<http://www.cie.co.at/>)
- International District Energy Association (IDEA) (<https://www.districtenergy.org/home/>)
- International WELL Building Institute (WELL) (<https://www.wellcertified.com/>)
- Mechanical Contractors Association of America (MCAA)

- National Association of Home Builders (NAHB) (<https://www.nahb.org/>)
- National Electrical Contractors Association (NECA) (<https://www.necanet.org/>)
- National Institute of Building Sciences (NIBS) (<https://www.nibs.org/>)
- National Society of Professional Engineers (NSPE) (<https://www.nspe.org/>)
- Portland Cement Association (PCA) (<https://www.cement.org/>)
- Precast Concrete Institute (PCI) (<https://www.pci.org/>)
- Society of Experimental Mechanics (SEM) (<https://sem.org/>)
- Structural Engineers Association of Pennsylvania (SEAoP) (<http://www.seaopa.org/>)
- The Association for Decentralized Energy (ADE) (<https://www.theade.co.uk/>)
- The Masonry Society (TMS) and the Masonry Society Joint Committee (MSJC) (<https://masonrysociety.org/>)
- United States Green Building Council (USGBC) (<https://new.usgbc.org/>)
- Whole Building Design Guide (WBDG) (<http://www.wbdg.org/>)

Accreditation

The B.A.E. in Architectural Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Architectural and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF ARCHITECTURAL ENGINEERING
104 Engineering Unit A
University Park, PA 16802
814-865-6394
upoarc@enr.psu.edu

<http://www.ae.psu.edu>

Biological Engineering, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

This major helps prepare students for careers involving the application of engineering principles to agricultural and biological production systems, processing systems, and conservation of land and water resources. Education in mathematics, physics, and engineering sciences common to all engineering disciplines is provided along with specialized training in biological and agricultural sciences. The curriculum covers all areas of biological engineering, including development of machines for biological processing and agriculture, postharvest handling and processing,

natural resource management and utilization, biological processes, food engineering, and structures and their environmental modifications. A student must select the Agricultural Engineering option, Food and Biological Processing Engineering option, or the Natural Resources Engineering option.

Principles of engineering design experiences are integrated throughout the third-year curriculum by having students solve problems typical of those encountered in the agricultural and biological engineering profession. A year-long major design experience in the fourth year emphasizes that biological engineers must learn not only how to develop engineering solutions to unique, practical problems using the newest technology, but also to assess and integrate the social and ethical implications of their solutions.

Careers for graduates include design, development, and research engineering positions involving biological processes, machinery development, natural resources management, materials handling, biological product development, and structural systems for animals, plants, and crop storage. Biological engineers are employed in industry, consulting firms, and governmental agencies in the United States and abroad. Graduates deal with the various engineering aspects associated with production and processing of food, fiber, and other biological materials, within the constraints of environmental protection and natural resource conservation.

What is Biological Engineering?

Biological Engineering involves the study of engineering fundamentals, very similar to traditional engineering disciplines like chemical, civil, or mechanical engineering. What makes Biological Engineering unique is the integration of these engineering fundamentals with biological, agricultural, and environmental sciences and the holistic approach taken to studying agricultural production, processing of food and other bio-based materials, and natural resource protection. Problem-solving skills are developed and then applied to grand engineering challenges such as sustainably providing safe food and clean water.

You Might Like This Program If...

- You enjoy quantitative problem solving and working with your hands and/or working outdoors.
- You are interested in a career where you address challenges related to fundamental societal needs, like food, water, fiber, and renewable energy.
- You are passionate about sustainability.
- You want to take application-focused classes with interactive labs and hands-on learning opportunities.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- 29-55 cumulative credits (excludes transfer and AP credits)
- completed with a grade of C or better: EDSGN 100, CHEM 110, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 2.60

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and

students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Biological Engineering, a minimum of 128 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	107-108

24 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
BE 404	Engineering Properties of Food and Biological Materials	3
BE 460W	Biological Engineering Design I	2
BE 466W	Biological Engineering Design II	2
CHEM 111	Experimental Chemistry I	1
MATH 231	Calculus of Several Variables	2
PHYS 212	General Physics: Electricity and Magnetism	4
<i>Prescribed Courses: Require a grade of C or better</i>		
BE 301	Mathematical Modeling of Biological and Physical Systems	3
BE 302	Heat and Mass Transfer in Biological Systems	4
BE 305	Agricultural Measurements and Control Systems	3
BE 308	Engineering Elements of Biochemistry and Microbiology	3
BE 391	Communication Skills for BE and ABSM Students	2
BE 392	Leadership and Ethics for BE and ABSM Students	2
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EMCH 211	Statics	3
EMCH 212	Dynamics	3
EMCH 213	Strength of Materials	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
ME 300	Engineering Thermodynamics I	3
PHYS 211	General Physics: Mechanics	4
Additional Courses		
Select one of the following:		3
IE 424	Process Quality Engineering	
STAT 240	Introduction to Biometry	
STAT 250	Introduction to Biostatistics	

STAT/MATH 318	Elementary Probability	
STAT 401	Experimental Methods	
STAT/MATH 418	Introduction to Probability and Stochastic Processes for Engineering	
<i>Additional Courses: Require a grade of C or better</i>		
Select one of the following:		3
CAS 100A	Effective Speech	
CAS 100B	Effective Speech	
CAS 100C	Effective Speech	
CAS/ENGL 138T	Rhetoric and Civic Life II	
Select one of the following:		3
ENGL 15	Rhetoric and Composition	
ENGL 30H	Honors Rhetoric and Composition	
ENGL/CAS 137H	Rhetoric and Civic Life I	
Select one of the following:		4
MATH 251	Ordinary and Partial Differential Equations	
MATH 250 & MATH 252	Ordinary Differential Equations and Partial Differential Equations	
Requirements for the Option		
Select an option		33-34

Requirements for the Option Agricultural Engineering Option (33 credits)

Code	Title	Credits
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
CE 360	Fluid Mechanics	3
or ME 320	Fluid Flow	
Supporting Courses and Related Areas		
Select 3 credits in math/basic science ¹		3
Select 6 credits in engineering science/design ¹		6
Select 3 credits in agricultural/biological science ¹		3
Select 6 credits in biological engineering ¹		6
Select 6 credits in technical elective ^{1,2}		6
<i>Supporting Courses and Related Area: Require a grade of C or better</i>		
Select 6 credits from the following:		6
BE 303	Structural Systems in Agriculture	
BE 306	Machines for Agricultural and Biological Processing	
BE 307	Principles of Soil and Water Engineering	

¹ Courses to be selected from a list approved by the Agricultural and Biological Engineering faculty. These courses must be chosen so that the engineering design and engineering science requirements for the major are met.

² Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHW category upon completion of the ROTC program.

Food and Biological Processing Engineering Option (33-34 credits)

Code	Title	Credits
Prescribed Courses		
BE 465	Food and Biological Process Engineering	3
BE 468	Microbiological Engineering	3
Additional Courses		
CHEM 202	Fundamentals of Organic Chemistry I	3
or CHEM 210	Organic Chemistry I	
Select one of the following:		3-4
BIOL 230W	Biology: Molecules and Cells	
BMB 211	Elementary Biochemistry	
BMB/MICRB 251	Molecular and Cell Biology I	
BME 201	Fundamentals of Cells and Molecules	
<i>Additional Courses: Require a grade of C or better</i>		
CE 360	Fluid Mechanics	3
or ME 320	Fluid Flow	
Supporting Courses and Related Areas		
Select 6 credits in biological/food science ¹		6
Select 6 credits in engineering science/design ¹		6
Select 6 credits in technical elective ^{1,2}		6

¹ Courses to be selected from a list approved by the Agricultural and Biological Engineering faculty. These courses must be chosen so that the engineering design and engineering science requirements for the major are met.

² Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHW category upon completion of the ROTC program.

Natural Resources Engineering Option (33 credits)

Code	Title	Credits
Prescribed Courses		
BE 467	Design of Stormwater and Erosion Control Facilities	3
BE 477	Land-Based Waste Disposal	3
BE 487	Simulation Modeling for Water Resources Management	3
SOILS 101	Introductory Soil Science	3
<i>Prescribed Courses: Require a grade of C or better</i>		
ABSM 309	Measurement & Monitoring of Hydrologic Systems	3
BE 307	Principles of Soil and Water Engineering	3
CE 360	Fluid Mechanics	3
Supporting Courses and Related Areas		
Select 6 credits in engineering science/design ¹		6
Select 3 credits in biological/environmental science ¹		3
Select 3 credits in technical elective ^{1,2}		3

¹ Courses to be selected from a list approved by the Agricultural and Biological Engineering faculty. These courses must be chosen so that the engineering design and engineering science requirements for the major are met.

² Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHW category upon completion of the ROTC program.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

Early career Biological Engineering graduates will be expected to:

1. Demonstrate proficiency in basic and engineering sciences related to biological processing, natural resource, and agricultural engineering fields;
2. Effectively identify, analyze and design sustainable solutions to address issues and opportunities throughout the world;
3. Work in teams and effectively communicate within and outside the profession;
4. Demonstrate strong leadership skills, ethical integrity, and professional engagement

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Biological Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Megan Marshall

Associate Teaching Professor
305 Agricultural Engineering Building
University Park, PA 16802
814-865-3392
mnm11@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Agricultural Engineering Option: Biological Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
BE 1 (or First year Seminar) [†]	1 CHEM 111 (GN)	1
CHEM 110 (GN) ^{*#†}	3 ENGL 15, 30H, or ESL 15 (GWS) ^{*††}	3
EDSGN 100 ^{*#}	3 MATH 141 or 141E (GQ) ^{†#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4 PHYS 211 (GN) ^{*#†}	4
General Education Course [†]	3 General Education Course [†]	3
General Education Course [†]	3	
	17	15

Second Year

Fall	Credits Spring	Credits
CAS 100A, 100B, or 100C (GWS) ^{*††}	3 EMCH 212 [*]	3
EMCH 211 [*]	3 EMCH 213 [*]	3
MATH 251 ^{*1}	4 MATH 231	2
PHYS 212 (GN) [†]	4 ME 300 [*]	3
General Education Course [†]	3 Math/Basic Science Selection	3
	General Education Course [†]	3
	17	17

Third Year

Fall	Credits Spring	Credits
BE 301 [*]	3 BE 302 [*]	4
BE 308 [*]	3 BE 305 [*]	3
BE 391 (GWS) ^{††}	2 BE 392 (GWS) ^{††}	2
CE 360 or ME 320 [*]	3 BE 303, 306, or 307 [*]	3
STAT 240, 250, 318, 401, 418, or IE 424	3 BE 303, 306, or 307 [*]	3
General Education Course [†]	3	
	17	15

Fourth Year

Fall	Credits Spring	Credits
BE 404	3 BE 466W	2
BE 460W	2 BE 4XX-Biological Engineering Selection	3
BE 4XX-Biological Engineering Selection	3 Engineering Science/Design Selection	3
BIO/AG Selection	3 Technical Selection	3
Engineering Science/Design Selection	3 Technical Selection	3
General Education Course (GHW) [†]	1.5 General Education Course (GHW) [†]	1.5
	15.5	15.5

Total Credits 129

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ MATH 250 followed by MATH 252 is an alternate option in place of MATH 251

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number

used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Technical Selection.
- BE 391 & BE 392 fulfill General Writing and Speaking requirements (taken instead of ENGL 202C).
- **See selection lists in BE Advising Manual at <https://abe.psu.edu/files/be-advising-manual.pdf> for the following:**
 - BE 4XX - Biological Engineering Selection
 - BIO/AG Selection
 - Engineering Science/Design Selection
 - Math/Basic Science Selection
 - Technical Selection
- **These courses offered at University Park in fall semester only:**
 - BE 301
 - BE 308
 - BE 391
 - BE 404
 - BE 460W
- **These courses offered at University Park in spring semester only:**
 - BE 302
 - BE 303
 - BE 305
 - BE 306
 - BE 307
 - BE 392
 - BE 466W

Food & Biological Process Engineering Option: Biological Engineering, B.S. Ending at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
BE 1 (or First Year Seminar) [†]	1 CHEM 111 (GN)	1
CHEM 110 (GN) ^{*#†}	3 ENGL 15, 30H, or ESL 15 (GWS) ^{*††}	3
EDSGN 100 ^{*#}	3 MATH 141 or 141E (GQ) ^{*†#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4 PHYS 211 (GN) ^{*#†}	4
General Education Course [†]	3 General Education Course [†]	3
General Education Course [†]	3	
	17	15

Second Year

Fall	Credits Spring	Credits
CAS 100A, 100B, or 100C (GWS) ^{*††}	3 CHEM 202 or 210	3
EMCH 211 [*]	3 EMCH 212 [*]	3
MATH 251 ^{*1}	4 EMCH 213 [*]	3
PHYS 212 (GN) [†]	4 MATH 231	2
General Education Course [†]	3 ME 300 [*]	3
	General Education Course [†]	3
	17	17

Third Year

Fall	Credits Spring	Credits
BE 301 [*]	3 BE 302 [*]	4
BE 308 [*]	3 BE 305 [*]	3
BE 391 (GWS) ^{††}	2 BE 392 (GWS) ^{††}	2
CE 360 or ME 320 [*]	3 BMB 211, 251, BIOL 230W, or BME 201	3-4
STAT 240, 250, 318, 401, 418, or IE 424	3 Engineering Science/Design Selection	3
General Education Course [†]	3	
	17	15-16

Fourth Year

Fall	Credits Spring	Credits
BE 404	3 BE 466W	2
BE 460W	2 BE 468	3
BE 465	3 Engineering Science/Design Selection	3
Technical Selection	3 Technical Selection	3
Technical Selection	3 Technical Selection	3

General Education Course (GHW)	1.5 General Education Course (GHW) [†]	1.5
	15.5	15.5

Total Credits 129-130

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ MATH 250 followed by MATH 252 is an alternate option in place of MATH 251

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- CHEM 210, BMB 251, BIOL 230W, and BME 201 require additional prerequisites that are not prescribed by major but might be used as selections.
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Technical Selection.
- BE 391 & BE 392 will satisfy General Education Writing and Speaking requirements (taken instead of ENGL 202C).
- **See selection lists in BE Advising Manual at <https://abe.psu.edu/files/be-advising-manual.pdf> for the following:**
 - Emphasis Technical Selection
 - Engineering Science/Design Selection
 - Technical Selection
- **These courses offered at University Park in fall semester only:**
 - BE 301
 - BE 308
 - BE 391
 - BE 404
 - BE 460W
 - BE 465

• ***These courses offered at University Park in spring semester only:***

- BE 302
- BE 305
- BE 392
- BE 466W
- BE 468

Natural Resource Engineering Option: Biological Engineering, B.S. Ending at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
BE 1 (or First Year Seminar) [†]	1 CHEM 111 (GN)	1
CHEM 110 (GN) ^{*#†}	3 ENGL 15, 30H, or ESL 15 (GWS) ^{*††}	3
EDSGN 100 ^{*#}	3 MATH 141 or 141E (GQ) ^{*†#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4 PHYS 211 (GN) ^{*#†}	4
General Education Course [†]	3 General Education Course [†]	3
General Education Course [†]	3	
	17	15

Second Year

Fall	Credits Spring	Credits
CAS 100A, 100B, or 100C (GWS) ^{*††}	3 EMCH 212 [*]	3
EMCH 211 [*]	3 EMCH 213 [*]	3
MATH 251 ^{*1}	4 MATH 231	2
PHYS 212 (GN) [†]	4 ME 300 [*]	3
General Education Course [†]	3 SOILS 101	3
	General Education Course [†]	3
	17	17

Third Year

Fall	Credits Spring	Credits
ABSM 309 [*]	3 BE 302 [*]	4
BE 301 [*]	3 BE 305 [*]	3
BE 308 [*]	3 BE 307 [*]	3
BE 391 (GWS) ^{††}	2 BE 392 (GWS) ^{††}	2
CE 360 [*]	3 Engineering Science/Design Selection	3
STAT 240, 250, 318, 401, 418, or IE 424	3	
	17	15

Fourth Year

Fall	Credits Spring	Credits
BE 404	3 BE 466W	2
BE 460W	2 BE 487	3
BE 467	3 Engineering Science/Design Selection	3
BE 477	3 Technical Selection	3
BIO/ENV Selection	3 General Education Course [†]	3

General Education Course (GHW) [†]	1.5 General Education Course (GHW) [†]	1.5
	15.5	15.5

Total Credits 129

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ MATH 250 followed by MATH 252 is an alternate option in place of MATH 251

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a technical selection.
- BE 391 & BE 392 will satisfy General Education Writing and Speaking requirements (instead of taking ENGL 202C).
- **See selection lists in BE Advising Manual at <https://abe.psu.edu/files/be-advising-manual.pdf> for the following:**
 - BIO/ENV Selection
 - Engineering Science/Design Selection
 - Technical Selection
- **These courses offered at University Park in fall semester only:**
 - ABSM 309
 - BE 301
 - BE 308
 - BE 391
 - BE 404
 - BE 460W
 - BE 467
 - BE 477
- **These courses offered at University Park in spring semester only:**

- BE 302
- BE 305
- BE 307
- BE 392
- BE 466W
- BE 487

Career Paths

With a bachelor of science in Biological Engineering, you can gain a broad background in engineering fundamentals and specialized training needed to succeed in industry, government, or graduate education. Specific career paths vary by option within the Biological Engineering major: Agricultural Engineering, Food and Biological Processing Engineering, and Natural Resources Engineering.

Careers

Agricultural Engineering

You can learn power and machinery systems and structural analysis, with a focus on the design of off-road equipment for agricultural production, construction, and food processing. You might work as a design or test engineer for agricultural or construction equipment companies.

Food and Biological Processing Engineering

You can learn to design microbiological systems for production of pharmaceuticals, renewable fuels, and vitamins and to engineer processing systems for production of safe, high-quality food. You might work as a process engineer or project manager for food, pharmaceutical, commodity, or consumer goods companies.

Natural Resources Engineering

You can learn to apply best management practices to minimize non-point source pollution, such as sediment loss or nutrient runoff, and to apply low-impact development strategies for stormwater management. You might work as a design engineer in a government agency or an engineering consulting/design firm.

Opportunities for Graduate Studies

As a Biological Engineering graduate, you may pursue an advanced degree in agricultural and biological engineering or related science and engineering disciplines, such as biomedical engineering, civil and environmental engineering, or food science. You may also pursue licensure as a professional engineer by passing the appropriate examinations and gaining practical engineering experience.

Professional Resources

- American Society of Agricultural and Biological Engineers (<http://www.asabe.org>)

Accreditation

The Bachelor of Science in Biological Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Biological and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the

Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
105 Agricultural Engineering Building
University Park, PA 16802
814-865-7792
abeddept@psu.edu

<https://abe.psu.edu>

Biological Engineering, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

This minor provides students with an opportunity to apply engineering principles to agricultural and biological production and processing systems and to the management of our natural resources. Courses may be selected by students to gain a better understanding of power and machinery, microbiological engineering, soil conservation and water quality, food process engineering, or structures and their environments.

The minor is particularly suitable for students pursuing an undergraduate degree in a different engineering major. Additional prerequisites for courses in the minor may be required including calculus through differential equations, engineering mechanics, fluid dynamics, or thermodynamics. Students interested in pursuing this minor should follow up with the contact provided under Academic Advising to discuss how the minor might integrate with their major and any other questions.

What is Biological Engineering?

Biological Engineering involves the study of engineering fundamentals, very similar to traditional engineering disciplines like chemical, civil, or mechanical engineering. What makes Biological Engineering unique is the integration of these engineering fundamentals with biological, agricultural, and environmental sciences and the holistic approach taken to studying agricultural production, processing of food and other bio-based materials, and natural resource protection. Problem-solving skills are developed and then applied to grand engineering challenges such as sustainably providing safe food and clean water.

You Might Like This Program If...

- You are pursuing an engineering major and want to complement it with an engineering minor that offers a different perspective on the connections between agriculture, food, and environment.
- You want to take application-focused classes with interactive labs and hands-on learning opportunities.
- You are interested in solving problems related to fundamental societal needs, like food, water, fiber, and renewable energy.
- You are passionate about sustainability.

Program Requirements

Requirement	Credits
Requirements for the Minor	18-20

Requirements for the Minor

The minor requires a minimum of 18 credits, at least 6 of which must be at the 400 level.

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select 3-4 credits from the following related science electives:		3-4
AGRO 28	Principles of Crop Management	
ANSC 201	Animal Science	
ASM/ERM 309	Measurement & Monitoring of Hydrologic Systems	
BIOL 110	Biology: Basic Concepts and Biodiversity	
BIOL 127	Introduction to Plant Biology	
BMB 211	Elementary Biochemistry	
BMB/MICRB 251	Molecular and Cell Biology I	
CHEM 202	Fundamentals of Organic Chemistry I	
CHEM 210	Organic Chemistry I	
FDSC 200	Introductory Food Science	
HORT 101	Horticultural Science	
MICRB 201	Introductory Microbiology	
SOILS 101	Introductory Soil Science	
Select 6-7 credits from the following 300-level BE courses:		6-7
BE 301	Mathematical Modeling of Biological and Physical Systems	
BE 302	Heat and Mass Transfer in Biological Systems	
BE 303	Structural Systems in Agriculture	
BE 304		
BE 305	Agricultural Measurements and Control Systems	
BE 306	Machines for Agricultural and Biological Processing	
BE 307	Principles of Soil and Water Engineering	
BE 308	Engineering Elements of Biochemistry and Microbiology	
Select 6 credits from the following 400-level BE courses:		6
BE 461	Design of Fluid Power Systems	
BE 462	Design of Wood Structures	
BE 464	Bioenergy Systems Engineering	
BE 465	Food and Biological Process Engineering	
BE 467	Design of Stormwater and Erosion Control Facilities	
BE 468	Microbiological Engineering	
BE 477	Land-Based Waste Disposal	
BE 487	Simulation Modeling for Water Resources Management	

Supporting Courses and Related Areas

<i>Supporting Courses and Related Areas: Require a grade of C or better</i>	
Select 3 credits of 400-level coursework or independent study in a related science or engineering field in consultation with the minor adviser	3

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Megan Marshall
Associate Teaching Professor
305 Agricultural Engineering Building
University Park, PA 16802
814-865-3392
mnm11@psu.edu

Contact

University Park

DEPARTMENT OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
105 Agricultural Engineering Building
University Park, PA 16802
814-865-7792
abeddept@psu.edu
<https://abe.psu.edu>

Biomedical Engineering Technology, A.ENG.T.

Begin Campus: Wilkes-Barre, Altoona, Berks, DuBois, Erie, Fayette, New Kensington, York

End Campus: New Kensington

Program Description

The medical community has grown to depend on medical devices and systems to diagnose, treat and monitor patients in health care. These medical devices have become very complex systems, as they are becoming microprocessor controlled, PC based, and networked to share information. Biomedical Equipment Technicians (BETs) are specialized individuals who are educated and trained on the methods of: physiological measurement; equipment application and operation; safety, performance and preventive maintenance testing; calibration; problem solving; and troubleshooting. In addition, BETs may be involved

in equipment and technology management programs, selection and installation of medical equipment, manufacturer and FDA recalls of medical devices, quality improvement programs, and training programs for hospital personnel in the safe and proper use of medical equipment. The classroom and laboratory portions of this major focus on electronically and PC based medical devices for patient monitoring and life-support equipment. The student is exposed to a much broader spectrum of medical equipment through a 400-hour (ten-week) practical internship in an approved health care facility.

Students completing the 2BET degree need only complete several additional courses to obtain the Associate in Engineering Technology degree in Electrical Engineering Technology. Graduates of the program may qualify for admission to the baccalaureate degree major in Electrical Engineering Technology offered at Penn State Harrisburg, Electrical and Computer Engineering Technology offered at Penn State Erie, and Electro-Mechanical Engineering Technology offered at Penn State Altoona, Berks, New Kensington and York.

What is Biomedical Engineering Technology?

Technicians in the biomedical engineering technology field are highly skilled, trained professionals who are responsible for functional and safety inspections, preventive maintenance, calibration, troubleshooting, equipment repair, and the training of hospital personnel in the safe and proper use of medical equipment.

You Might Like This Program If...

- You are interested in the healthcare industry.
- You are passionate about technology and electronics.
- You enjoy working both in a team and individually.
- You know you want to work in a setting in which you operate, install, test, maintain and inspect mechanical and electronic equipment.

Entrance to Major

Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

Degree Requirements

For the Associate in Engineering Technology degree in Biomedical Engineering Technology, a minimum of 71 credits is required:

Requirement	Credits
General Education	21
Requirements for the Major	62-65

12 of the 21 credits for General Education are included in the Requirements for the Major. This includes: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
BE_T 101	Introduction to Medical Equipment Maintenance	1
CMPET 117	Digital Electronics	3
CMPET 120	Digital Electronics Laboratory	1
EET 105	Electrical Systems	3
IST 220	Networking and Telecommunications	3
PHYS 150	Technical Physics I	3
RADSC 230	Radiographic Physics	3
SRA 111	Introduction to Security and Risk Analysis	3
<i>Prescribed Courses: Require a grade of C or better</i>		
BE_T 201	Medical Equipment & Systems I	5
BE_T 203	Biomedical Equipment Laboratory (Internship) (must be the last course taken for the degree) ¹	4
BE_T 204W	Medical Equipment and Systems II	5
BE_T 205	Medical Electronics	4
BE_T 206	Medical Computers and Networks	4
CAS 100	Effective Speech	3
ENGL 15	Rhetoric and Composition	3
Additional Courses		
CHEM 110	Chemical Principles I	3
or CHEM 130	Introduction to General, Organic, and Biochemistry	
Select Sequence A or Sequence B:		6-8
<i>Sequence A:</i>		
BIOL 161	Human Anatomy and Physiology I - Lecture	
BIOL 162	Human Anatomy and Physiology I - Laboratory	
BIOL 162	Human Anatomy and Physiology I - Laboratory	
BIOL 163	Human Anatomy and Physiology II - Lecture	
BIOL 164	Human Anatomy and Physiology II - Laboratory	
<i>Sequence B:</i>		
BISC 4	Human Body: Form and Function	
Select 3 credits of technical list:		
BE_T 210	Troubleshooting Medical Equipment	
BE_T 296	Independent Studies	
BE_T 297	Special Topics	
BIOL 129	Mammalian Anatomy	
CMPET 211	Embedded Processors and DSP	
CMPSC 101	Introduction to Programming	
EDSGN 100	Cornerstone Engineering Design	
EET 213W	Fundamentals of Electrical Machines Using Writing Skills	
EET 297	Special Topics	
EGT 201	Advanced Computer Aided Drafting	
MET 111	Mechanics for Technology: Statics	
<i>Additional Courses: Require a grade of C or better</i>		
MATH 22 & MATH 26	College Algebra With Analytic Geometry and Applications II and Plane Trigonometry and Applications of Trigonometry ²	5-6
or MATH 40	Algebra, Trigonometry, and Analytic Geometry	

¹ BE_T 203 must be the last course taken for the degree.

² A grade of C or better is required for either MATH 22 or MATH 26.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all associate degree students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 3 credits
- **Writing and Speaking (GWS):** 3 credits

Knowledge Domains

- **Arts (GA):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Note: Up to six credits of Inter-Domain courses may be used for any Knowledge Domain requirement, but when a course may be used to satisfy more than one requirement, the credits from the course can be counted only once.

Exploration

- **Any General Education course (including GHW and Inter-Domain):** 3 credits

University Degree Requirements

Cultures Requirement

3 credits of United States (US) or International (IL) cultures coursework are required and may satisfy other requirements

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 60 degree credits must be earned for an associate's degree. The requirements for some programs may exceed 60 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more

information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The Biomedical Engineering Technology program is designed to provide a curriculum that prepares students to pursue a career in the evolving healthcare technology management (HTM) field and to develop in their profession. Due to their experience in our program, within few years of graduation, our graduates will have:

1. Demonstrated proficiency in installing, performing acceptance testing and preventive maintenance (PMs) inspections, troubleshooting, repairing, and performing network integration on a wide variety of medical devices using standards, regulations, and quality improvement plans.
2. Shown the ability to adapt to evolving technologies and effectively apply engineering technology knowledge and tools in the healthcare technology management (HTM) field.
3. Engaged in continuous learning through CBET (Certified Biomedical Equipment Technician) certification and/or other professional training programs and independent study.
4. Worked both independently and collaboratively in multi-disciplinary teams, communicating effectively with clinical staff, related healthcare professionals, and administrative staff.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Biomedical Engineering Technology program is designed to enable students to:

1. Apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering and technology to solve well-defined engineering problems appropriate to the discipline.
2. Design solutions for well-defined technical problems and assist with engineering design of systems, components, or processes appropriate to the discipline.
3. Apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. Conduct standard tests, measurements, and experiments and to analyze and interpret the results.
5. Function effectively as member of technical team.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in- and out-of-class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

New Kensington

Joie Marhefka
Assistant Teaching Professor and Program Coordinator
3550 Seventh Street Road
New Kensington, PA 15068
724-334-6712
jnm23@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Biomedical Engineering Technology, A.ENG.T. at New Kensington Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year			
Fall	Credits Spring	Credits	
BE_T 101	1 CMPET 117	3	
EET 105	3 CMPET 120	1	
SRA 111	3 IST 220	3	
MATH 26 (GQ)*	3 MATH 22 (GQ)*	3	
ENGL 15*	3 CHEM 110 or 130 (GN)	3	
General Education Course	3 General Education Course	3	
16		16	
Second Year			
Fall	Credits Spring	Credits Summer	Credits
BE_T 201*	5 BE_T 206*	4 BE_T 203*	4
BE_T 205*	4 BE_T 204W*	5	
BISC 4 (GN) [†]	3 Technical Elective (See Adviser for list)	3	
PHYS 150 (GN)	3 CAS 100A, 100B, or 100C*	3	
RADSC 230	3 General Education Course	3	
18		18	4
Total Credits 72			

* Course requires a grade of C or better for the major
‡ Course requires a grade of C or better for General Education
Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS) requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Career Paths

Students with a degree in biomedical engineering technology are well positioned for careers at hospitals, clinics, medical practice offices, surgical centers, nursing homes, and rehabilitation centers.

Penn State students with an A.S. in Biomedical Engineering Technology have been successful in pursuing various careers within the Healthcare Technology Management field.

Careers

- Biomedical Engineering Technician/Clinical Engineer in a Hospital
- Field Service Technician
- Repair Technician for a Medical Device Company

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE BIOMEDICAL ENGINEERING TECHNOLOGY PROGRAM (<http://career.engr.psu.edu/>)

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.engr.psu.edu/students/grad-prospective/default.aspx>)

Accreditation

The A.S. in Biomedical Engineering Technology at Penn State New Kensington is accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Healthcare Engineering Technology and Similarly Named Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

The BET program fully prepares students for employment as a biomedical engineering technician as well as for CBET certification. A PE license is not required for employment.

Contact University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-865-2952

jnm23@psu.edu

<https://www.sedi.psu.edu/>

New Kensington

3550 Seventh Street Rd.
New Kensington, PA 15068
724-334-6712
jnm23@psu.edu

<http://newkensington.psu.edu/2-year-biomedical-engineering-technology>
(<http://newkensington.psu.edu/2-year-biomedical-engineering-technology/>)

Biomedical Engineering, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

The Biomedical Engineering curriculum emphasizes the continuous integration of classical and modern engineering principles with the life sciences and health care. Biomedical Engineers apply these skills to innovation in the health care industry, basic biological sciences, and the underpinning of medical practice.

Consistent with the mission of Penn State University and the College of Engineering, the Penn State Bachelor of Science program in Biomedical Engineering aims to create world-class engineers who will, after graduation, contribute to social and economic development through the application of engineering to the solution of problems in medicine and biology.

What is Biomedical Engineering?

Biomedical engineering is the application of the life sciences, mathematics, and engineering principals to define and solve problems in biology, medicine, healthcare, and other related fields. Biomedical engineers work to design, create, and improve medical devices such as prosthetics, artificial organs and medical imaging devices. They also develop instrumentation, medical information systems, and health management and care delivery systems to improve health care organizations. Many graduates of the biomedical engineering Bachelor of Science program also go on to pursue advanced degrees in medicine, engineering and related fields such as biostatistics, public health, and health administration.

You Might Like This Program If...

- You like applying traditional engineering skills and analysis to understand biological systems.
- You want to emphasize the integration of classical and modern engineering principles with the life sciences and healthcare.
- You are passionate about bridging the gap between medical professionals and the engineering community.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out.

- Completed 29-55 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
- Completed with a C or better the following courses: EDSGN 100, CHEM 110, MATH 140, MATH 141, and PHYS 211
- Attained at least a 2.6 cumulative grade point average

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Biomedical Engineering, a minimum of 130-131 credits are required:

Requirement	Credits
General Education	45
Requirements for the Major	111-113

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Students in residence at the Commonwealth campuses may satisfy the course requirements for semesters 1-3. They should then transfer to University Park to begin studies in their major beginning with semester 4.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
BME 303	Bio-continuum Mechanics	3
BME 403	Biomedical Instrumentation Laboratory	1
BME 429	Biomedical Mechanics and Techniques Laboratory	2
BME 440	Biomedical Engineering Professional Seminar	1
BME 450W	Biomedical Senior Design	3
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
EMCH 210	Statics and Strength of Materials	5
MATH 230	Calculus and Vector Analysis	4
<i>Prescribed Courses: Require a grade of C or better</i>		
BME 201	Fundamentals of Cells and Molecules	3
BME 301	Analysis of Physiological Systems	4
BME 313	Thermodynamics for Biomedical Engineering	3
BME 401	Numerical Simulations in Biomedical Engineering	3
BME 402	Biomedical Instrumentation and Measurements	3
CHEM 110	Chemical Principles I	3
CMPSC 200	Programming for Engineers with MATLAB	3
EDSGN 100	Cornerstone Engineering Design	3
ENGL 202C	Effective Writing: Technical Writing	3

MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 251	Ordinary and Partial Differential Equations	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4

Additional Courses

Select 1 credit of First-Year Seminar		1
ECON 102	Introductory Microeconomic Analysis and Policy	3
or ECON 104	Introductory Macroeconomic Analysis and Policy	

Additional Courses: Require a grade of C or better

CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	

Select one of the following: 4

BIOL 141 & BIOL 142	Introduction to Human Physiology and Physiology Laboratory	
BIOL 141 & BIOL 162	Introduction to Human Physiology and Human Anatomy and Physiology I - Laboratory	
BIOL 141 & BIOL 164	Introduction to Human Physiology and Human Anatomy and Physiology II - Laboratory	
BIOL 240W	Biology: Function and Development of Organisms	

Supporting Courses and Related Areas

Select 3 credits of Science or Engineering Elective courses from departmental list 3

Requirements for the Option

Select an option 23-24

Requirements for the Option**Biochemical Option (24 credits)**

Code	Title	Credits
Prescribed Courses		
BME 409	Biofluid Mechanics	3
BME 413	Mass Transport in Biological Systems	3
BME 423	Reaction Kinetics of Biological Systems	3

Additional Courses

CHEM 202	Fundamentals of Organic Chemistry I	3
or CHEM 210	Organic Chemistry I	

Supporting Courses and Related Areas

Select 9 credits from Biochemical Option department list 9

Select 3 credits from Related Electives department list 3

Medical Imaging and Devices Option (23 credits)

Code	Title	Credits
Prescribed Courses		
BME 406	Medical Imaging	3
EE 210	Circuits and Devices	4

Additional Courses

Select 4 credits from the following:		4
CMPEN 270	Digital Design: Theory and Practice	
CMPEN 271 & CMPEN 275	Introduction to Digital Systems and Digital Design Laboratory	
EE 310	Electronic Circuit Design I	

EE 330	Engineering Electromagnetics	
--------	------------------------------	--

Supporting Courses and Related Areas

Select 6 credits from the Related Electives department list 6

Select 6 credits from Medical Imaging and Device Option department list 6

Biomaterials Option (24 credits)

Code	Title	Credits
Prescribed Courses		
BME 443	Biomedical Materials	3
BME 446	Polymers in Biomedical Engineering	3
MATSE 201	Introduction to Materials Science	3

Additional Courses

BME 408	Solid Mechanics of Biological Materials	3
or BME 409	Biofluid Mechanics	
or BME 413	Mass Transport in Biological Systems	
CHEM 202	Fundamentals of Organic Chemistry I	3
or CHEM 210	Organic Chemistry I	

Supporting Courses and Related Areas

Select 3 credits from Related Electives department list 3

Select 6 credits from Biomaterials Option department list 6

Biomechanics Option (24 credits)

Code	Title	Credits
Prescribed Courses		
BME 408	Solid Mechanics of Biological Materials	3
BME 409	Biofluid Mechanics	3
EMCH 212	Dynamics	3
EMCH 315	Mechanical Response of Engineering Materials	2
EMCH 316	Experimental Determination of Mechanical Response of Materials	1

Supporting Courses and Related Areas

Select 9 credits from Biomechanics Option department list 9

Select 3 credits from Related Electives department list 3

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

Three to five years after graduation, we expect our graduates to be:

- employed in industry and government positions which include, but are not limited to, research and development, regulation, manufacturing, quality assurance and sales and marketing, or,
- enrolled in graduate school, continuing education, or other professional development programs related to biomedical sciences and engineering, or,
- enrolled in medical school, dental school, or other health-related professional training programs.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Biomedical Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Ariel Christine

Undergraduate Program Assistant
122H Chemical and Biomedical Engineering Building
University Park, PA 16802
814-863-6614

ajr311@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Biochemical Option: Biomedical Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year			
Fall	Credits	Spring	Credits
CHEM 110 (GN) ^{*#†}	3	CHEM 112 (GN)	3
CHEM 111 (GN)	1	CHEM 113 (GN)	1
EDSGN 100 ^{*#}	3	MATH 141 or 141E (GQ) ^{*†#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4	PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*#†}	4
BME 100 (or First Year Seminar) [†]	1	ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3
ECON 102 or 104 (GS) [†]	3	General Education Course [†]	3
15		18	

Second Year			
Fall	Credits	Spring	Credits
BIOL 141 [*]	3	BME 201 [*]	3
BIOL 142, 162, or 164 [*]	1	CHEM 202 or 210	3
EMCH 210	5	CMPSC 200	3
MATH 251 [*]	4	MATH 230	4
PHYS 212 (PHYSICS 212L & PHYSICS 212R) [*]	4	General Education Course [†]	3
17		16	

Third Year			
Fall	Credits	Spring	Credits
BME 301 [*]	4	BME 401 [*]	3
BME 303	3	BME 402 [*]	3
BME 313 [*]	3	BME 403	1
Related Technical Elective	3	BME 409	3
General Education Course [†]	3	BME 413	3
		ENGL 202C (GWS) ^{††}	3
16		16	

Fourth Year			
Fall	Credits	Spring	Credits
BME 429	2	BME 423	3
BME 440	1	BME 450W	3

Biochemical Elective	3	Biochemical Elective	3
Science or Engineering Elective	3	Biochemical Elective	3
CAS 100A or 100B (GWS) ^{††}	3	General Education Course [†]	3
General Education Course [†]	3	General Education Course (GHW) [†]	1.5
General Education Course (GHW) [†]	1.5		
	16.5		16.5
Total Credits 131			

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Students who are interested in medical school should substitute BIOL 240W (4) for BIOL 141 (3) & BIOL 142 (1).
- CHEM 210 is required for students who are interested in medical school or who plan to take advanced organic chemistry.
- CMPSC 200 is required because 300- and 400-level BME courses use MATLAB programming.
- The department website lists courses acceptable as Biochemical Electives, Medical Imaging and Device Electives, Biomaterials Electives, Biomechanics Electives, Related Electives, and Science or Engineering Electives.
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Science or Engineering Elective.
- **These courses offered at University Park in Fall semester ONLY:**
 - BME 301
 - BME 303

- BME 313
- BME 440
- ***These courses offered at University Park in Spring semester ONLY:***
 - BME 201
 - BME 401
 - BME 402
 - BME 403
 - BME 409
 - BME 413
 - BME 423

Biomaterials Option: Biomedical Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{*#†}	3 CHEM 112 (GN)	3
CHEM 111 (GN)	1 CHEM 113 (GN)	1
EDSGN 100 ^{*#}	3 MATH 141 or 141E (GQ) ^{*†#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4 PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*#†}	4
BME 100 (or First Year Seminar) [†]	1 ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3
ECON 102 or 104 (GS) [†]	3 General Education Course [†]	3
	15	18

Second Year

Fall	Credits Spring	Credits
BIOL 141 [*]	3 BME 201 [*]	3
BIOL 142, 162, or 164 [*]	1 CHEM 202 or 210	3
EMCH 210	5 CMPSC 200	3
MATH 251 [*]	4 MATH 230	4
PHYS 212 (PHYSICS 212L & PHYSICS 212R) [*]	4 General Education Course [†]	3
	17	16

Third Year

Fall	Credits Spring	Credits
BME 301 [*]	4 BME 401 [*]	3
BME 303	3 BME 402 [*]	3
BME 313 [*]	3 BME 403	1
BME 443	3 BME 409 or 413 (or Biomaterials Elective)	3
MATSE 201	3 ENGL 202C (GWS) ^{††}	3
	General Education Course [†]	3
	16	16

Fourth Year

Fall	Credits Spring	Credits
BME 429	2 BME 450W	3
BME 440	1 Biomaterials Elective	3
BME 446	3 Related Technical Elective	3
CAS 100A or 100B (GWS) ^{††}	3 Science or Engineering Elective	3
BME 408 (or Biomaterials Elective)	3 General Education Course [†]	3
General Education Course [†]	3 General Education Course (GHW) [†]	1.5

General Education Course (GHW)[†] 1.5

16.5

16.5

Total Credits 131

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Students who are interested in medical school should substitute BIOL 240 (4) for BIOL 141 (3) & BIOL 142 (1).
- CHEM 210 is required for students who are interested in medical school or who plan to take advanced organic chemistry.
- CMPSC 200 is required because 300- and 400-level BME courses use MATLAB programming.
- The department website lists courses acceptable as Biochemical Electives, Medical Imaging and Device Electives, Biomaterials Electives, Biomechanics Electives, Related Electives, and Science or Engineering Electives.
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Science or Engineering Elective.
- **These courses offered at University Park in fall semester only:**
 - BME 301
 - BME 303
 - BME 313
 - BME 429
 - BME 440
 - BME 443
 - BME 446
- **These courses offered at University Park in spring semester only:**

- BME 201
- BME 401
- BME 402
- BME 403
- BME 409
- BME 450W

Biomechanics Option: Biomedical Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
BME 100 (or First Year Seminar) [†]	1 CHEM 112 (GN)	3
CHEM 110 (GN) ^{*#†}	3 CHEM 113 (GN)	1
CHEM 111 (GN)	1 ENGL 15, 30H, or ESL 15 ^{††}	3
ECON 102 or 104 (GS) [†]	3 MATH 141 or 141E (GQ) ^{*†#†}	4
EDSGN 100 ^{*#}	3 PHYS 211 (GN, PHYS 211L & PHYS 211R) ^{*#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4 General Education Course [†]	3
	15	18

Second Year

Fall	Credits Spring	Credits
BIOL 141 [*]	3 BME 201 [*]	3
BIOL 142, 162, or 164 [*]	1 CMPSC 200	3
EMCH 210	5 EMCH 212	3
MATH 251 [*]	4 MATH 230	4
PHYS 212 (PHYS 212L & PHYS 212R) [*]	4 General Education Course [†]	3
	17	16

Third Year

Fall	Credits Spring	Credits
BME 301 [*]	4 BME 401 [*]	3
BME 303	3 BME 402 [*]	3
BME 313 [*]	3 BME 403	1
EMCH 315	2 BME 409	3
EMCH 316	1 ENGL 202C (GWS) ^{††}	3
General Education Course [†]	3 Biomechanics Elective	3
	16	16

Fourth Year

Fall	Credits Spring	Credits
BME 408	3 BME 450W	3
BME 429	2 Biomechanics Elective	3
BME 440	1 Related Technical Elective	3
CAS 100A or 100B (GWS) ^{††}	3 Science or Engineering Elective	3
Related Technical Elective	3 General Education Course [†]	3
General Education Course [†]	3 General Education Course (GHW) [†]	1.5

General Education Course (GHW)[†] 1.5

16.5

16.5

Total Credits 131

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes

- Students who are interested in medical school should substitute BIOL 240W (4) for BIOL 141 (3) & BIOL 142 (1).
- CHEM 210 is required for students who are interested in medical school or who plan to take advanced organic chemistry.
- CMPSC 200 is required because 300- and 400-level BME courses use MATLAB programming.
- The department website lists courses acceptable as Biochemical Electives, Medical Imaging and Device Electives, Biomaterials Electives, Biomechanics Electives, Related Electives, and Science or Engineering Electives.
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Science or Engineering Elective.
- **These courses offered at University Park in fall semester only:**
 - BME 301
 - BME 303
 - BME 313
 - BME 440
- **These courses offered at University Park in spring semester only:**
 - BME 201
 - BME 401
 - BME 402

- BME 403
- BME 409

Medical Imaging & Devices Option: Biomedical Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
BME 100 (or First Year Seminar) [†]	1 CHEM 112 (GN)	3
CHEM 110 (GN) ^{*#†}	3 CHEM 113 (GN)	1
CHEM 111 (GN)	1 ENGL 15, 30H, or ESL 15 ^{††}	3
ECON 102 or 104 (GS) [†]	3 MATH 141 or 141E (GQ) ^{*†#†}	4
EDSGN 100 ^{*#}	3 PHYS 211 (GN, PHYS 211L and PHYS 211R) ^{*#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4	
	15	15

Second Year

Fall	Credits Spring	Credits
BIOL 141 [*]	3 BME 201 [*]	3
BIOL 142, 162, or 164 [*]	1 CMPSC 200	3
EMCH 210	5 EE 210	4
MATH 251 [*]	4 MATH 230	4
PHYS 212 (PHYS 212L and PHYS 212R) [*]	4 General Education Course [†]	3
	17	17

Third Year

Fall	Credits Spring	Credits
BME 301 [*]	4 BME 401 [*]	3
BME 303	3 BME 402 [*]	3
BME 313 [*]	3 BME 403	1
BME 406	3 ENGL 202C (GWS) ^{††}	3
EE 310, 330, or CMPEN 270	4 Medical Imaging and Devices Elective	3
	Related Technical Elective	3
	17	16

Fourth Year

Fall	Credits Spring	Credits
BME 429	2 BME 450W	3
BME 440	1 Medical Imaging and Devices Elective	3
CAS 100A or 100B (GWS) ^{††}	3 Related Technical Elective	3
Science or Engineering Elective	3 General Education Course [†]	3
General Education Course [†]	3 General Education Course [†]	3
General Education Course [†]	3 General Education Course (GHW) [†]	1.5

General Education Course (GHW)[†] 1.5

16.5

16.5

Total Credits 130

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Students who are interested in medical school should substitute BIOL 240W (4) for BIOL 141 (3) & BIOL 142 (1).
- CHEM 210 is required for students who are interested in medical school or who plan to take advanced organic chemistry.
- CMPSC 200 is required because 300- and 400-level BME courses use MATLAB programming.
- The department website lists courses acceptable as Biochemical Electives, Medical Imaging and Device Electives, Biomaterials Electives, Biomechanics Electives, Related Electives, and Science or Engineering Electives.
- Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Science or Engineering Elective.
- **These courses offered at University Park in Fall semester ONLY:**
 - BME 301
 - BME 303
 - BME 313
 - BME 406
 - BME 440
- **These courses offered at University Park in Spring semester ONLY:**
 - BME 201
 - BME 401

- BME 402
- BME 403

Career Paths

Careers

Medical device development; diagnostic and therapeutic tool design; physiological system modeling for the healthcare and pharmaceutical industries; medical school.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE BIOMEDICAL ENGINEERING PROGRAM (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

The biomedical engineering graduate program is a part of the Penn State Intercollege Graduate Degree Program in Bioengineering. The highly flexible, mentored curriculum includes fundamental coursework in bioengineering and a number of ancillary areas including physics, chemistry, biology, materials research, esthesiology, orthopedics and rehabilitation, and more. Our students enjoy state-of-the-art research facilities and an exclusive partnership with the Penn State Hershey Medical Center. The unique landscape of the bioengineering graduate program fosters learning and collaboration among students, engineers, clinicians, and professionals in the biomedical industry.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.bme.psu.edu/students/graduate/>)

Professional Resources

- Biomedical Engineering Society (<http://www.bme.psu.edu/students/resources/student-groups.aspx>)
- Biomedical Sciences Club

Accreditation

The Bachelor of Science in Biomedical Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Bioengineering and Biomedical and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF BIOMEDICAL ENGINEERING
122H Chemical and Biomedical Engineering Building
University Park, PA 16802
814-863-6614
ajr311@psu.edu

<https://www.bme.psu.edu/index.aspx> (<https://www.bme.psu.edu/>)

Biomedical Engineering, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

This interdisciplinary minor is designed for students interested in the application of engineering principles to medical and biological problems. The minor is particularly suitable for students pursuing an undergraduate degree in a different engineering major, physics, or other applied science who are seeking careers in health-related professions. Students interested in pursuing this minor should contact the Department of Biomedical Engineering with any questions or for more information.

What is Biomedical Engineering?

Biomedical engineering is the application of the life sciences, mathematics, and engineering principals to define and solve problems in biology, medicine, healthcare, and other related fields. Biomedical engineers work to design, create, and improve medical devices such as prosthetics, artificial organs and medical imaging devices. They also develop instrumentation, medical information systems, and health management and care delivery systems to improve health care organizations. Many graduates of the biomedical engineering Bachelor of Science program also go on to pursue advanced degrees in medicine, engineering and related fields such as biostatistics, public health, and health administration.

You Might Like This Program If...

- You like applying traditional engineering skills and analysis to understand biological systems.
- You want to emphasize the integration of classical and modern engineering principles with the life sciences and healthcare.
- You are passionate about bridging the gap between medical professionals and the engineering community.
- You're interested in medical research, teaching, industrial and government healthcare and medical practice.

Entrance to Minor

PHYS 211, PHYS 212, and calculus through differential equations (MATH 250 or MATH 251) are required for entrance to the minor. Additional prerequisites for prescribed and supporting courses may be required and should be researched prior to applying for the minor (e.g. CHEM 112 and CMPSC 200).

Program Requirements

Requirement	Credits
Requirements for the Minor	18-20

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
<i>Physiology</i>		
Select 3-4 credits of the following:		3-4
BIOL 141	Introduction to Human Physiology	
BIOL 240W	Biology: Function and Development of Organisms	
BIOL 472	Human Physiology	
<i>Molecular/Cell Biology</i>		
Select 3-4 credits of the following:		3-4
BIOL 230W	Biology: Molecules and Cells	
BMB 251	Molecular and Cell Biology I	
BME 201	Fundamentals of Cells and Molecules	
Supporting Courses and Related Areas		
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 9-12 credits of Biomedical Engineering (BME) coursework from 3-credit courses at the 400, or 500 level ¹		9-12
Select 0-3 credits of electives from Biomedical Engineering-related courses (department list)		0-3

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Ariel Christine

Undergraduate Program Assistant
122H Chemical and Biomedical Engineering Building
University Park, PA 16802
814-863-6614
ajr311@psu.edu

Erie

Elisa Wu, Ph.D.

Program Chair and Professor, Mechanical Engineering
227 AMIC
Erie, PA 16563
814-898-6559
yxw22@psu.edu

Career Paths

Careers

Medical device development; diagnostic and therapeutic tool design; physiological system modeling for the healthcare and pharmaceutical industries; medical school.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN BIOMEDICAL ENGINEERING (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

The biomedical engineering graduate program is a part of the Penn State Intercollege Graduate Degree Program in Bioengineering. The highly flexible, mentored curriculum includes fundamental coursework in bioengineering and a number of ancillary areas including physics, chemistry, biology, materials research, esthesiology, orthopedics and rehabilitation, and more. Our students enjoy state-of-the-art research facilities and an exclusive partnership with the Penn State Hershey Medical Center. The unique landscape of the bioengineering graduate program fosters learning and collaboration among students, engineers, clinicians, and professionals in the biomedical industry.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.bme.psu.edu/students/graduate/>)

Contact

University Park

DEPARTMENT OF BIOMEDICAL ENGINEERING
122 Chemical and Biomedical Engineering Building
University Park, PA 16802
814-863-6614
bmeminor@engr.psu.edu

<https://www.bme.psu.edu/index.aspx> (<https://www.bme.psu.edu/>)

Erie

SCHOOL OF ENGINEERING
242 Jack Burke Research and Economic Development Center
5101 Jordan Road
Erie, PA 16563
814-898-6153
engineering@psu.edu

<https://behrend.psu.edu/school-of-engineering> (<https://behrend.psu.edu/school-of-engineering/>)

Chemical Engineering, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

Chemical Engineering is one of the most versatile professions—you'll find Chemical Engineers employed in a broad array of industries ranging from pharmaceutical and biotechnical companies to semiconductor manufacturing to start-up companies converting the latest laboratory discoveries to large-scale commercial production. Chemical Engineers work with catalysts to develop new ways to manufacture medicines and plastics; they develop control systems that enable the safe production of products from semiconductors to household soap; they design chemical

and petroleum plants; they research the effects of artificial organs on blood flow; and they develop the equipment and processes necessary for advances in biotechnology. While chemistry emphasizes the facts and principles of science, chemical engineering emphasizes its practical application for the development of new products and processes.

The undergraduate program in Chemical Engineering provides students with fundamental skills in problem solving, analysis, and design, along with hands-on experience in practical applications. The curriculum builds upon the traditional foundation in the chemical and energy-related industries and introduces new material in the life sciences, polymers, and environmental fields.

What is Chemical Engineering?

Chemical engineers draw extensively on a strong foundation in the chemical, physical, and biological sciences. They focus on the processes involved in making new products or treating the environment, such as pharmaceuticals, plastics, alternative fuels, therapeutic proteins, and artificial organs. Chemical engineering is a broad discipline that encompasses many different scientific principles in engineering and technology. Chemical engineers apply the principles of chemistry, biology, and physics to solve problems involving the production of chemicals, fuel, drugs, food and energy solutions.

You Might Like This Program If...

- You like to problem solve using chemistry and mathematics in critical global challenges in a variety of areas including pharmaceuticals, food, energy, environmental sustainability, medicine, law, and finance.
- You like to work with others to design processes and equipment to create chemical products safely and economically.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out.

- Completed 29-55 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
 - Completed with a C or better the following courses: EDSGN 100, CHEM 110, MATH 140, MATH 141, and PHYS 211
 - Attained at least a 2.6 cumulative grade point average
- * In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Chemical Engineering, a minimum of 133 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	115

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
BMB 251	Molecular and Cell Biology I	3
CHE 230	Computational Tools for Chemical Engineering	1
CHE 300	Professional Development Seminar	1
CHE 340	Introduction to Biomolecular Engineering	3
CHE 452	Chemical Process Safety	3
CHE 470	Design of Chemical Plants	3
CHE 480W	Chemical Engineering Laboratory	3
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
CHEM 210	Organic Chemistry I	3
CHEM 212	Organic Chemistry II	3
CHEM 213	Laboratory in Organic Chemistry	2
CHEM 457	Experimental Physical Chemistry	2
MATH 231	Calculus of Several Variables	2
MATH 251	Ordinary and Partial Differential Equations	4
PHYS 212	General Physics: Electricity and Magnetism	4
<i>Prescribed Courses: Require a grade of C or better</i>		
CHE 210	Introduction to Material Balances	3
CHE 220	Introduction to Chemical Engineering Thermodynamics	3
CHE 320	Phase and Chemical Equilibria	3
CHE 330	Process Fluid Mechanics	3
CHE 350	Process Heat Transfer	3
CHE 410	Mass Transfer Operations	3
CHE 430	Chemical Reaction Engineering	3
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4

Additional Courses

Select 1 credit of First-Year Seminar	1
Select one of the following:	3
ECON 14	Principles of Economics
ECON 102	Introductory Microeconomic Analysis and Policy
ECON 104	Introductory Macroeconomic Analysis and Policy

Additional Courses: Require a grade of C or better

CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	

Supporting Courses and Related Areas

Select 3 credits of physical chemistry from departmental list	3
Select 3 credits of materials elective from departmental list	3
Select 6 credits in 400-level chemical engineering electives from departmental list	6
Select 3 credits of approved engineering electives from departmental list	3
Select 6 credits of professional electives from department list ¹	6

¹ Students may substitute 6 credits of ROTC for part of this requirement in consultation with department.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The undergraduate program in chemical engineering at Penn State has been designed so that students can identify and pursue their personal and professional goals while obtaining a strong foundation in the principles and practice of chemical engineering. The program aims to produce graduates who will attain one or more of the following:

- Careers as practicing chemical engineers in traditional chemical and energy-related industries as well as in expanding areas of materials, environmental, pharmaceutical, and biotechnology industries.
- Advanced degrees in chemical engineering (or a related technical discipline), medicine, law, or business.
- Positions that provide the technical, educational, business, and / or political leadership needed in today's rapidly changing, increasingly technological, global society.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Chemical Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences

- Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Stephanie Velegol

Acting Associate Department Head for Undergraduates, Teaching Professor
224 Chemical & Biomedical Engineering Building
University Park, PA 16802
814-865-4907
sbv1@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Chemical Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHE 100 (or First Year Seminar) [†]	1 CHEM 112 (GN)	3
CHEM 110 (GN) ^{*#†}	3 CHEM 113 (GN)	1
CHEM 111 (GN)	1 ENGL 15, 30H, or ESL 15 (GWS)	3
ECON 102 or 104 (GS) [†]	3 MATH 141 or 141E (GQ) ^{*†#†}	4
EDSGN 100 ^{*#}	3 PHYS 211 (PHYS 211L and PHYS 211R (GN)) ^{*#†}	4
MATH 140 or 140E (GQ) ^{*†#†}	4 General Education Course [†]	3
	15	18

Second Year

Fall	Credits Spring	Credits
CHE 210 [*]	3 CHE 220 [*]	3
CHEM 210	3 CHE 230	1
MATH 251	4 CHEM 212	3
PHYS 212 (PHYS 212L & PHYS 212R (GN)) [†]	4 CHEM 213	2
General Education Course [†]	3 MATH 231	2
	General Education Course [†]	3
	General Education Course (GHW) [†]	1.5
	17	15.5

Third Year

Fall	Credits Spring	Credits
BMB 251 or MICRB 251	3 CAS 100A or 100B (GWS) ^{††}	3
CHE 320 [*]	3 CHE 300	1
CHE 330 [*]	3 CHE 340	3
Professional Elective	3 CHE 350 [*]	3
General Education Course [†]	3 CHEM 457	2
General Education Course [†]	3 Physical Chemistry Elective	3
	General Education Course (GHW) [†]	1.5
	18	16.5

Fourth Year

Fall	Credits Spring	Credits
CHE 410	3 CHE 470	3
CHE 430	3 CHE 480W	3
CHE 452	3 Chemical Engineering Elective	3
ENGL 202C (GWS) ^{††}	3 Engineering Elective	3
Chemical Engineering Elective	3 Professional Elective	3
Materials Elective	3	
	18	15

Total Credits 133

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Please see the Chemical Engineering Advising Handbook (<https://www.che.psu.edu/academics/undergraduate/handbook.aspx>) for lists of courses for the CHE Elective, Engineering Elective, Professional Elective, Physical Chemistry Elective, and Materials Elective.
- Health and Physical Activity Elective: Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a professional elective.
- This course offered at University Park in spring semester only. CHE 300.

Career Paths

Our chemical engineering graduates work in various industries such as pharmaceuticals, food, cosmetics, specialty chemicals, and oil and gas. They also serve as consultants for various engineering applications including challenges in the environment. Chemical Engineers can go to graduate school to obtain a Ph.D. Some chemical engineers also chose to go to medical school or law school.

Careers

A chemical engineer might work on a team to improve a process for making a pharmaceutical drug to increase the supply and decrease the cost.

A chemical engineer might design a new material that will make our clothing more comfortable and functional.

A chemical engineer might develop a solution to pressing environmental problems like an oil spill or global climate change.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE CHEMICAL ENGINEERING PROGRAM (<https://www.che.psu.edu/academics/undergraduate/what-is-chemical-engineering.aspx>)

Opportunities for Graduate Studies

Our students go on to graduate school and conduct research in topics including materials, energy, water treatment, biotechnology, and catalysis. Application of this research include: energy production and storage, large scale production of pharmaceuticals and vaccines, treatment of water and air, large scale production of affordable consumer products, and reduction of CO₂.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.che.psu.edu/academics/graduate/phd.aspx>)

Professional Resources

- American Institute of Chemical Engineering (<https://www.aiche.org>)

Accreditation

The Bachelor of Science in Chemical Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Chemical, Biochemical, Biomolecular, and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact**University Park**

DEPARTMENT OF CHEMICAL ENGINEERING
121 Chemical & Biomedical Engineering Building
University Park, PA 16802
814-865-2574
cheundergrad@psu.edu

<https://www.che.psu.edu>

Civil Engineering, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

The program in Civil and Environmental Engineering is designed to provide the basic undergraduate education required for private practice and public service in civil engineering and/or continue formal education. Emphasis is placed on the fundamentals of civil engineering principles and design techniques. Students utilize basic engineering science concepts in several of the different specialty areas (e.g., construction/management, environmental, materials/pavement design/geotechnical, structures, transportation, and water resources). Finally the students are able to choose an area of specialization for professional practice or graduate studies.

The program is broadened by courses in communication, arts, humanities, social and behavioral sciences, as well as other engineering disciplines. Students gain experience in working as members of a team and using interdisciplinary approaches to solve problems. These

experiences, as well as those related to engineering principles and design, are provided through exercises in the classroom, laboratory, and field. The program culmination is a capstone design course wherein the students' knowledge and skills are applied to actual engineering problems.

What is Civil Engineering?

Civil engineering is one of the oldest and most socially-relevant engineering disciplines. Grounded in mathematics and science, civil engineers make a lasting impact as they plan, design, construct, operate, and maintain the everyday, yet critical, infrastructure systems needed in our daily lives. In this challenging and diverse field, civil engineers also find solutions for critical environmental issues, including slowing the progress and mitigating the effects of climate change, eliminating the causes and treating the effects of environmental pollutants, and providing access to clean water. In recent years, the rapid application of new technologies has fostered the development of autonomous vehicles, 3D printing, smart structures, advanced materials, and new forms of renewable energy.

You Might Like This Program If...

- You want to design and build large-scale projects that last a long time.
- You care about the quality of the water that comes out of the faucet.
- You are interested in the operations and safety of future transportation systems.
- You try to find sustainable solutions for every challenge, big or small.
- You would like to use your technical skills in an exciting, people-serving profession.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out.

- Completed 29-55 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
- Completed with a C or better the following courses: EDSGN 100, CHEM 110, MATH 140, MATH 141, and PHYS 211
- Attained at least a 2.6 cumulative grade point average

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Civil Engineering, a minimum of 127 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	109

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CHEM 111	Experimental Chemistry I	1
GEOSC 1	Physical Geology	3
MATH 220	Matrices	2
STAT 401	Experimental Methods	3
<i>Prescribed Courses: Require a grade of C or better</i>		
CE 310	Surveying	3
CE 321	Highway Engineering	3
CE 332	Professionalism, Economics & Construction Project Delivery	3
CE 335	Engineering Mechanics of Soils	3
CE 336	Materials Science for Civil Engineers	3
CE 340	Structural Analysis	3
CE 360	Fluid Mechanics	3
CE 370	Introduction to Environmental Engineering	3
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EMCH 211	Statics	3
EMCH 212	Dynamics	3
EMCH 213	Strength of Materials	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 251	Ordinary and Partial Differential Equations	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
Additional Courses		
CE 337 or CE 475	Civil Engineering Materials Laboratory ¹ Water Quality Chemistry	1
CHE 220 or ME 201	Introduction to Chemical Engineering Thermodynamics ² Introduction to Thermal Science	3
CMPSC 200 or CMPSC 201	Programming for Engineers with MATLAB Programming for Engineers with C++	3
Select one of the following:		1
CE 100S	Topics and Contemporary Issues in Civil and Environmental Engineering: First-Year Seminar	
1 credit of First-Year Seminar or Elective		
Select one of the following:		3
ECON 14	Principles of Economics	
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	
Select 6 credits of the following: ³		6
CE 341	Design of Concrete Structures	
CE 342	Design of Steel Structures	
CE 371	Water and Wastewater Treatment	

CE 441	Structural Design of Foundations	
CE 447	Structural Analysis by Matrix Methods	
CE 461	Water-resource Engineering	
CE 462	Open Channel Hydraulics	
CE 475	Water Quality Chemistry	
CE 476	Solid and Hazardous Wastes	
CE 479	Environmental Microbiology for Engineers	

Select 3 credits of CE 400 level "W" courses 3

Additional Courses: Require a grade of C or better

CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	

ENGL 15	Rhetoric and Composition	3
---------	--------------------------	---

or ENGL 30H Honors Rhetoric and Composition

Supporting Courses and Related Areas

Select 12 credits of technical elective from CE 300-level courses, CE 400-level courses, or department list 12

¹ If CE 475 is taken, one credit goes toward lab requirement and remaining three go towards CE or general technical electives.

² Students may substitute 6 credits of ROTC for 3 credits of GHW courses and 3 credits of ME.

³ Two of those courses must be selected from at least 2 of the 3 remaining technical areas in the Civil Engineering program-- structures (x40), hydrosystems (x60), and environmental (x70).

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The educational objectives of our undergraduate program will prepare our graduates to:

- begin and sustain a career in consulting, industry, or state and federal government agencies, such as the departments of transportation and departments of environmental protection;
- lead and work in interdisciplinary teams needed to design sustainable and resilient infrastructure through knowledge and application of environmental, geotechnical, materials, structural, transportation, and water resources engineering;

- engage in life-long learning opportunities, including graduate school; and
- obtain and maintain professional licensure

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Civil Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Thomas J. Skibinski, PE
Undergraduate Program Director
212 Sackett Building
University Park, PA 16802
814-863-0026
tjs36@psu.edu

Brenton Hockenberry

Undergraduate Program Assistant
218 Sackett Building
University Park, PA 16802
814-867-0470
blh5621@psu.edu

Harrisburg

Shashi S. Marikunte, Ph.D., P.E.

Acting Program Chair
Olmsted Building, W236f
Middletown, PA 17057
717-948-6127
sec16@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Civil Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CE 100S (or other First Year Seminar) [†]	1 CHEM 111	1
CHEM 110 (GN) ^{*#†}	3 ECON 102 or 104 (GS) [†]	3
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 MATH 141 or 141E (GQ) ^{†#†}	4
EDSGN 100 ^{*#}	3 PHYS 211 (PHYS 211L and PHYS 211R (GN)) ^{*#†}	4
MATH 140 or 140E (GQ) ^{†#†}	4 General Education Course [†]	3
General Education Course [†]	3 General Education Course (GHW) [†]	1.5
	17	16.5

Second Year

Fall	Credits Spring	Credits
CAS 100A or 100B (GWS) ^{††}	3 CMPSC 200 or 201	3
EMCH 211 [*]	3 EMCH 212 [*]	3
GEOSC 1	3 EMCH 213 or 213D [*]	3
MATH 251 [*]	4 IE 424 or STAT 401	3
PHYS 212 (PHYS 212L and PHYS 212R (GN)) ^{*†}	4 MATH 220	2
	General Education Course [†]	3
	17	17

Third Year

Fall	Credits Spring	Credits
CE 310 [*]	3 CE 321 [*]	3
CE 332 [*]	3 CE 335 [*]	3
CE 336 [*]	3 CE 337	1
CE 340 [*]	3 CE 370 [*]	3

CE 360*	3 ME 201	3
General Education Course (GHW) [†]	1.5	
	16.5	13
Fourth Year		
Fall	Credits Spring	Credits
ENGL 202C (GWS) ^{††}	3 Civil Engineering Capstone Design	3
Civil Engineering Elective	3 Civil Engineering Elective	3
Civil Engineering Elective	3 Technical Elective	3
Technical Elective	3 Technical Elective	3
General Education Course [†]	3 General Education Course [†]	3
	15	15
Total Credits 127		

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **CE Elective:** CE Electives must be selected from two of these specific technical areas in the program: Structures (X40); Water Resources Engineering (X60); Environmental Engineering (X70).
- **Health and Physical Activity Elective:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for M E 201.
- **Technical Elective:** Select from department list. Students who complete the Cooperative Education Program may substitute the 3-credit sequence of ENGR 295, ENGR 395, and ENGR 495 for a Technical Elective.

- ** If a student is pursuing the Structural sub-discipline in Civil Engineering, if CE 340 is not taken in the 5th semester it may delay graduation.

Career Paths

Civil engineers are responsible for designing, building, and maintaining the critical systems that support society and protect the environment. Graduates of the civil engineering program are prepared to be innovative leaders in a diverse range of industries. Students are routinely recruited for positions in the public sector with government agencies or in the private sector at consulting firms or construction companies. Students may also choose to continue their formal education by pursuing advanced degrees, and many remain in academia upon graduation.

Careers

Our graduates work in a variety of fields to develop solutions for challenges in design, construction, research, and education. Civil engineering graduates work in the public sector for government agencies or in the private sector at consulting or construction firms. Some civil engineers hold supervisory or administrative positions, while others pursue careers in design, construction, or education.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE CIVIL ENGINEERING PROGRAM (<https://www.asce.org/career-growth/>)

CAREER RESOURCES FOR CIVIL ENGINEERING STUDENTS (<https://www.cee.psu.edu/academics/resources/career-resources.aspx>)

Opportunities for Graduate Studies

In our graduate programs, students learn in the classroom and the laboratory, finding a broad network of mentors and collaborators. After graduation, many career options await.

- The one-year Master of Engineering (M.Eng.) (<https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx#MEng>) program gives you a strong foundation and leads to advanced professional practice.
- The Master of Science (M.S.) (<https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx#MS>) program blends advanced coursework and research, producing highly sought-after graduates.
- The Doctor of Philosophy (Ph.D.) (<https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx#PhD>) program provides a comprehensive educational and research opportunity, challenging students to be leaders of their fields.

What could you achieve with an advanced degree from the Department of Civil and Environmental Engineering at Penn State?

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.cee.psu.edu/academics/graduate/>)
GRADUATE DEGREES AND REQUIREMENTS (<https://www.cee.psu.edu/academics/graduate/degrees-and-requirements.aspx>)

Professional Resources

- American Concrete Institute (<https://www.concrete.org/>)
- American Society of Civil Engineers (<https://www.asce.org>)
- PSU Civil and Environmental Engineering Professional Organization Student Chapter List (<https://www.cee.psu.edu/academics/resources/student-organizations.aspx>)

Accreditation

The Bachelor of Science in Civil Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Civil and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
212 Sackett Building
University Park, PA 16802
814-863-3084
tjs36@psu.edu

<https://www.cee.psu.edu/>

Harrisburg

CIVIL, CONSTRUCTION, AND ENVIRONMENTAL ENGINEERING
SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY
Olmsted Building, W236
Middletown, PA 17057
717-948-4350
hpl5273@psu.edu

<https://harrisburg.psu.edu/science-engineering-technology/civil-engineering-bs> (<https://harrisburg.psu.edu/science-engineering-technology/civil-engineering-bs/>)

Computational Sciences, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The Computational Sciences minor provides the necessary skills to use computers to study and solve scientific, engineering and data-centric problems across a wide range of disciplines. The minor complements the areas of theory and experimentation found in traditional scientific and engineering studies through the use of computational modeling, algorithm design, and event-driven programming. Students will customize the minor by selecting two advanced courses in their discipline or related areas that build upon the computational foundations provided in prescribed courses. The minor will prepare students with the skills necessary to apply computational methods in a variety of scientific and engineering disciplines.

What is Computational Sciences?

Computational Sciences is the study and application of computational methods to understand, analyze and solve complex problems. It includes the design, development and evaluation of models and simulations of

natural systems and complements traditional methods of theory and laboratory experiments. It seeks to provide a deeper understanding of scientific and engineering problems through the mathematical modeling of complex systems. A core topic is the design, implementation and evaluation of algorithms, both numerical and non-numerical, that address problems across a broad range of science and engineering disciplines.

You Might Like This Program If...

- You like to analyze and solve complex problems.
- You excel in mathematics.
- You want to apply computational methods to your discipline.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPSC 204	Introduction to Computational Sciences Programming	3
CMPSC 205	Intermediate Computational Sciences Programming	3
CMPSC 301	Event Driven Programming for Computational Sciences	3
CMPSC 348	Data Science and Machine Learning for Computational Sciences	3

Supporting Courses and Related Areas

<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 6 credits of 400-level courses from the approved list of supporting courses		6

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

CSE Advising

W209 Westgate Building
University Park, PA 16802
cseadvising@engr.psu.edu

Career Paths

The Computational Sciences minor prepares graduates with the skills to use computational methods to simulate and model natural systems and processes. These skills allow the graduates to enhance their understanding of complex problems.

Careers

Careers in a broad range of sciences, engineering and business increasingly rely on understanding and applying computational tools. Graduates with a minor in Computational Sciences can pursue careers within their discipline that allow them to apply the latest computational tools used to analyze, understand and solve complex problems.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN COMPUTATIONAL SCIENCES (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Graduates of this minor can pursue graduate studies in fields that require the design and development of models and simulations of complex problems.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.eecs.psu.edu/students/graduate/EECS-Graduate-Prospective.aspx>)

Contact

University Park

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
W209 Westgate Building
University Park, PA 16802
814-865-9505
cseadvising@engr.psu.edu

<https://www.eecs.psu.edu>

Computer Engineering, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

The mission of the faculty of the undergraduate computer engineering program at Penn State is to provide students with the knowledge and experience needed to pursue a productive lifelong career in industry or to engage in further study at the graduate level. Students participate in a balanced program of instruction covering the basic principles of the design and application of computer systems. The program includes coverage in breadth and depth of basic science, engineering, and abstract concepts of information handling. Students specialize in and are prepared for careers in the design, analysis and use of hardware, software and systems. The program is structured to ensure that graduates have a clear understanding of the design and the applications of computers, as

well as the ability to apply this knowledge throughout their professional careers.

What is Computer Engineering?

Computer engineering is the study of the design, analysis, and implementation of computer systems including processors, memory, embedded devices, and data communication systems for a wide range of application domains. It includes the study of digital systems, computer architecture, and computer networks. It encompasses many design activities spanning from designing individual logic components to designing complete computer systems composed of hardware, software, and hardware-software co-design. Computer engineering drives the development of new computing systems that enable the latest technologies impacting our everyday lives.

You Might Like This Program If...

- You excel in math and physics and have an interest in designing and constructing computer hardware
- You want to build and analyze physical computing devices that go beyond traditional computers
- You want to understand how current computer hardware and software work and how to design the next generation hardware and its supporting software
- You want to design computing systems that impact and improve everyday lives

Entrance to Major

This program currently has administrative enrollment controls. Administrative Enrollment Controls are initiated when limitations of space, faculty, or other resources in a major prevent accommodating all students who request them. Students must follow the administrative enrollment controls that are in effect for the semester that they enter the university.

First-Year Students Entering Summer 2024, Fall 2024, Spring 2025

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- be enrolled in the College of Engineering or the Division of Undergraduate Studies
- 29-55 graded Penn State credits (excludes transfer and AP credits)
- completed with a grade of C or better: CMPSC 121 or CMPSC 131, CHEM 110, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 3.20

Students Who Entered Prior to Summer 2024

Students who entered the University from Summer 2018 through Spring 2024 should view the administrative enrollment controls in the appropriate Undergraduate Bulletin archive (<https://bulletins.psu.edu/undergraduate/archive/>). Students who entered the University prior to the summer 2018 semester should consult with their academic adviser about the administrative enrollment controls in effect for the semester they entered the university.

Degree Requirements

For the Bachelor of Science degree in Computer Engineering, a minimum of 128 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	110

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CMPEN 362	Communication Networks	3
CMPEN 482W	Computer Engineering Project Design	3
CMPSC 473	Operating Systems Design & Construction	3
MATH 220	Matrices	2-3
MATH 231	Calculus of Several Variables	2
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
STAT/MATH 418	Introduction to Probability and Stochastic Processes for Engineering	3
<i>Prescribed Courses: Require a grade of C or better</i>		
CHEM 110	Chemical Principles I	3
CMPEN 331	Computer Organization And Design	3
CMPEN 431	Introduction to Computer Architecture	3
CMPSC 221	Object Oriented Programming with Web-Based Applications	3
CMPSC 311	Introduction to Systems Programming	3
CMPSC 360	Discrete Mathematics for Computer Science	3
CMPSC 465	Data Structures and Algorithms	3
EE 210	Circuits and Devices	4
EE 310	Electronic Circuit Design I	4
EE 353	Signals and Systems: Continuous and Discrete-Time	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 250	Ordinary Differential Equations	3
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
Additional Courses		
Select 1 credit of First-Year Seminar		1
Select 3 credits of the following:		3
ECON 14	Principles of Economics	
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	
Select 6 credits from the following:		6
CMPEN 411	VLSI Digital Circuits	
CMPEN 416	Digital Integrated Circuits	
CMPEN 417	Digital Design Using Field Programmable Devices	

CMPEN 454	Fundamentals of Computer Vision	
CMPEN 455	An Introduction to Digital Image Processing	
CMPEN 471		
CMPEN 472	Microprocessors and Embedded Systems	
CMPEN 473	Microcomputer Laboratory	
CMPEN 475	Functional Verification	
EE 453	Fundamentals of Digital Signal Processing	
EE 456	Introduction to Neural Networks	
Select 6 credits from any 400-level CMPEN or CMPSC course		6
<i>Additional Courses: Require a grade of C or better</i>		
CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
CMPSC 121	Introduction to Programming Techniques	3
or CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 122	Intermediate Programming ¹	3
or CMPSC 132	Programming and Computation II: Data Structures	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
Select 4 credits from the following:		4
CMPEN 270	Digital Design: Theory and Practice	
CMPEN 271	Introduction to Digital Systems	
& CMPEN 275	and Digital Design Laboratory ²	
Supporting Courses and Related Areas		
Select 6 credits from department list ³		6

¹ CMPSC 122 does not require a grade of C or better.

² CMPEN 275 does not require a grade of C or better.

³ Students may apply up to 3 credits of Co-op. Students who complete ROTC may apply up to 3 credits of ROTC as department list credits and 3 credits of ROTC as GHW credits.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits

- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Computer Engineering and M.I.A. in International Affairs

Requirements for the Integrated B.S. in Computer Engineering and M.I.A. in International Affairs can be found in the Graduate Bulletin ([https://](https://bulletins.psu.edu/graduate/programs/majors/international-affairs/#integratedundergradgradprogramtext)

bulletins.psu.edu/graduate/programs/majors/international-affairs/#integratedundergradgradprogramtext).

Program Educational Objectives

In particular, within a few years after graduation, graduates in computer engineering should be able to:

1. Work in industry or government producing or evaluating components of computer hardware and/or software systems.
2. Work in teams to design, implement, and/or maintain components of computer hardware and/or software systems.
3. Stay current through professional conferences, certificate programs, post-baccalaureate degree programs, or other professional educational activities.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Computer Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

CSE Advising

W209 Westgate Building
University Park, PA 16802

cseadvising@engr.psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Computer Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
MATH 140 (GQ) ^{*†‡}	4 CMPSC 121 or 131 (GQ) ^{*#}	3
PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*†‡}	4 MATH 141 (GQ) ^{*†‡}	4
CHEM 110 (GN) ^{*#†}	3 PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R) ^{*†}	4
General Education Course	3 ENGL 15 (GWS) ^{*†}	3
First Year Seminar	1 General Education Course	3
	15	17

Second Year

Fall	Credits Spring	Credits
CMPEN 270 ^{*1}	4 CMPEN 331 [*]	3
CMPSC 122 or 132 [*]	3 CMPSC 221 [*]	3
MATH 250 [*]	3 EE 210 [*]	4
MATH 220	2-3 MATH 231	2
PHYS 214	2 ECON 102 or 104 (GS) [†]	3
General Education Course	3	
	17-18	15

Third Year

Fall	Credits Spring	Credits
CMPEN 431 [*]	3 CMPEN 362	3
CMPSC 311 [*]	3 CMPSC 465 [*]	3
EE 310 [*]	4 CMPSC 473	3
STAT 418	3 EE 353 ^{*2}	3
CMPSC 360 [*]	3 ENGL 202C (GWS) ^{*†‡}	3
	16	15

Fourth Year

Fall	Credits Spring	Credits
CMPEN 482W (Capstone Design)	3 CMPEN Elective ⁴	3
CMPEN Elective ⁴	3 CMPSC/CMPEN Elective ³	3
CAS 100A or 100B ^{*†‡}	3 CMPSC/CMPEN Elective ³	3

Department List (General Elective)	3 Department List (General Elective)	3
General Education Course	3 General Education Course	3
General Education Course (GHW)	1.5 General Education Course (GHW)	1.5
	16.5	16.5

Total Credits 128-129

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ This course is the equivalent of the combination of CMPEN 271 and CMPEN 275.

² EE 353 is only offered in the spring semester.

³ Select from any 400-489 CMPSC or CMPEN course that does not duplicate material already taken or required. No CMPSC/CMPEN 494H or CMPSC/CMPEN 496 may be substituted. CMPSC/CMPEN 497 must be petitioned prior to taking the course.

⁴ Select from department list. Restrictions may apply. Computer Engineering Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

Career Paths

Computer engineering graduates understand all aspects of computing hardware, are well-studied in the use of modern tools used to design and analyze hardware, are able to think at multiple levels of abstraction when working with system-level design, and have a solid foundation in software development. This background prepares graduates for a wide range of exciting careers in the technology industry and almost all other industry sectors as computer/hardware/embedded system designers. It also prepares them for pursuing academic careers. Computer engineers apply their skills and knowledge to solve challenging problems related to computer hardware. They work collaboratively in teams to design and

build complex systems with many integrated parts. They research, study, and develop the new technologies that drive the advances in computing that impact our everyday lives.

Careers

Computer engineering graduates typically find positions as computer/hardware/embedded system designers in major technology companies like IBM, Intel, Cisco, and Qualcomm. Graduates are also highly recruited by major companies in areas such as aerospace, communication, transportation, and defense. Most graduates will find themselves a part of a team of engineers and after a few years possibly leading a design team. With the rapid changes and advances in the field of computing, graduates must continually keep up with the latest technology as their careers adapt and evolve to meet the new opportunities and challenges of computing.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE COMPUTER ENGINEERING PROGRAM (<https://career.engr.psu.edu>)

Opportunities for Graduate Studies

Graduates of this program can pursue graduate studies in computer engineering, computer science, and related disciplines, concentrating in specialized areas such as multicore architectures, low-power architectures, application-specific hardware architectures, and computer networking. A master's degree allows one to specialize beyond the broad foundations offered by a bachelor's degree. A doctoral degree prepares one for a career in research and academia.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.eecs.psu.edu/students/graduate/EECS-Graduate-Prospective.aspx>)

Professional Resources

- ACM (<https://acm.psu.edu>)
- Association of Women in Computing (<https://awc.cse.psu.edu>)
- IEEE (<https://sites.psu.edu/psuieee/>)

Accreditation

The Bachelor of Science in Computer Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs the Computer Engineering Program Criteria.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
W209 Westgate Building
University Park, PA 16802
814-865-9505
trk149@psu.edu

bam136@psu.edu

<https://www.eecs.psu.edu>

Computer Engineering, Minor (Engineering)

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The Computer Engineering Minor provides students with the fundamental topics of computer hardware design, including digital logic design, computer organization, computer communication networks and computer architecture. Complimenting these core topics are elective courses in areas including embedded systems, digital integrated circuits, field programmable devices, and functional verification. This minor complements disciplines related to computing and that make use of specialized computing hardware. Students in majors related to computer engineering will already have the mathematics and physics background to pursue this major without taking additional foundational courses.

What is Computer Engineering?

Computer engineering is the study of the design, analysis, and implementation of computer systems including processors, memory, embedded devices, and data communication systems for a wide range of application domains. It includes the study of digital systems, computer architecture, and computer networks. It encompasses many design activities spanning from designing individual logic components to designing complete computer systems composed of hardware, software, and hardware-software co-design. Computer engineering drives the development of new computing systems that enable the latest technologies impacting our everyday lives.

You Might Like This Program If...

- You excel in math and physics and have an interest in working with computer hardware.
- You want to understand how current computer hardware and software work together.
- You want to work with computing systems that impact and improve everyday lives.

Program Requirements

Requirement	Credits
Requirements for the Minor	19

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPEN 331	Computer Organization And Design	3

CMPEN 431	Introduction to Computer Architecture	3
CMPEN/EE 362	Communication Networks	3

Additional Courses

Additional Courses: Require a grade of C or better

CMPEN 270	Digital Design: Theory and Practice	4
or CMPEN 271	Introduction to Digital Systems and Digital Design Laboratory	
& CMPEN 275		

Supporting Courses and Related Areas

Supporting Courses and Related Areas: Require a grade of C or better

Select 6 credits of additional 400-level CMPEN courses, excluding independent studies and honors thesis credits. 6

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

CSE Advising

W209 Westgate Building
University Park, PA 16802
cseadvising@engr.psu.edu

Career Paths

The Computer Engineering minor provides graduates with the foundations of computer hardware design, including topics such as FPGA, embedded systems, digital integrated circuits, computer vision systems, which complements their studies, whether in software, electronics, or another discipline. This minor prepares them for a wide range of opportunities in which computers and related hardware systems play an important role.

Careers

Graduates with a minor in computer engineering can find positions where they will apply their knowledge of hardware systems and skills with technology companies and with companies in a broader range of fields such as aerospace, communication, entertainment, finance, healthcare, transportation, and defense. Most graduates will find themselves a part of a team to design and build complex systems with many integrated parts. With the rapid changes and advances in the field of computing, graduates must continually keep up with the latest technology as their careers adapt and evolve to meet the new opportunities and challenges of computing.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN COMPUTER ENGINEERING (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Graduates of this minor can pursue graduate studies in computer engineering, and related disciplines, concentrating in specialized areas such as multicore architectures, low-power architectures, application-specific hardware architectures, and computer networking. They research, study, and develop the new technologies that apply the advances in computing to impact our everyday lives. A master's degree allows one to specialize beyond the broad foundations offered an undergraduate degree. A doctoral degree prepares one for a career in research and academia.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.eecs.psu.edu/students/graduate/EECS-Graduate-Prospective.aspx>)

Contact

University Park

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
W209 Westgate Building
University Park, PA 16802
814-865-9505
trk149@psu.edu, bam136@psu.edu

<https://www.eecs.psu.edu>

Computer Science, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: Beaver, Brandywine, Hazleton, University Park

Program Description

Computer Science is the study of computation, including its principles and foundations, its efficient implementation, its analysis, and its practical use in a wide range of different application areas. Computer Science is far more than just programming and no other science or engineering discipline has had a greater impact in such diverse areas as commerce, communication, entertainment, finance, medicine, the social sciences, the physical sciences and the life sciences. Computer Science impacts our daily lives in a multitude of ways and computer scientists are instrumental in driving these changes. Computer Science transforms the way we look at and live in our world.

The mission of our undergraduate program is to prepare our students for a wide range of careers as computer scientists, software engineers, software developers, and related positions in the field of computing. Our curriculum covers fundamental programming techniques and skills, broad knowledge of computer hardware, operating systems, programming languages, the mathematical foundations of computing, and advanced topics in software design and application development. Recurrent themes in the program include security, algorithmic complexity, cooperating systems, performance evaluation, and software correctness. This curriculum provides students with the skills needed to design, develop, evaluate, and analyze software solutions to a wide spectrum of computational problems and prepares them to be leaders in the rapidly changing field of computing throughout their careers.

What is Computer Science?

Computer science is the study of computational methods, including their principles and foundations, their efficient implementation, their analyses, and their practical application in wide-ranging areas. It includes the foundations of software development, computational problem solving, the principles of system software, and the fundamental principles and limits of computing. It is much more than just programming. It includes the mathematical foundations that support analyzing, evaluating, and proving the correctness of computational solutions. It includes specializations such as artificial intelligence, machine learning, cybersecurity, data mining, high-performance computing, computer networks, computer graphics, computer vision, quantum computing, and others. It is continually evolving with the development of new and faster forms of computation and with the identification of new problems that require computational solutions.

You Might Like This Program If...

- You are interested in creating solutions to challenging problems involving computers
- You want to understand how to build and analyze complex software solutions
- You want to understand how computer hardware and software work and how to make them better
- You want to design software that impacts and improves people's everyday lives

Entrance to Major University Park (CMPSC_BS)

This program currently has administrative enrollment controls. Administrative Enrollment Controls are initiated when limitations of space, faculty, or other resources in a major prevent accommodating all students who request them. Students must follow the administrative enrollment controls that are in effect for the semester that they enter the university.

First-Year Students Entering Summer 2024, Fall 2024, Spring 2025

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- be enrolled in the College of Engineering or the Division of Undergraduate Studies
- 29-55 graded Penn State credits (excludes transfer and AP credits)
- completed with a grade of C or better: CMPSC 121 or CMPSC 131, CMPSC 122 or CMPSC 132, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 3.20

Students Who Entered Prior to Summer 2024

Students who entered the University from Summer 2018 through Spring 2024 should view the administrative enrollment controls in the appropriate Undergraduate Bulletin archive (<https://bulletins.psu.edu/undergraduate/archive/>). Students who entered the University prior to the summer 2018 semester should consult with their academic adviser about the administrative enrollment controls in effect for the semester they entered the university.

Beaver, Brandywine, Hazleton (CSENG_BS)

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out:

- 29-55 cumulative credits (excludes transfer and AP credits)
 - completed with a grade of C or better: CMPSC 121 or CMPSC 131, CMPSC 122 or CMPSC 132, MATH 140, MATH 141, and PHYS 211
 - earned a minimum cumulative grade-point average (GPA) of 2.60
- * In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Computer Science, a minimum of 127 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	106-108

24 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CMPSC 464	Introduction to the Theory of Computation	3
MATH 220	Matrices	2-3
MATH 230	Calculus and Vector Analysis	4
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPEN 331	Computer Organization And Design	3
CMPSC 221	Object Oriented Programming with Web-Based Applications	3
CMPSC 311	Introduction to Systems Programming	3
CMPSC 360	Discrete Mathematics for Computer Science	3
CMPSC 461	Programming Language Concepts	3
CMPSC 465	Data Structures and Algorithms	3
CMPSC 473	Operating Systems Design & Construction	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
Additional Courses		
Select 1 credit of First-Year Seminar		1
Select one of the following:		3
STAT/MATH 318	Elementary Probability	
STAT/MATH 414	Introduction to Probability Theory	

STAT/MATH 418	Introduction to Probability and Stochastic Processes for Engineering	
Select 6 credits from the following:		6
CMPEN 362	Communication Networks	
CMPEN 431	Introduction to Computer Architecture	
CMPEN 454	Fundamentals of Computer Vision	
CMPSC 442	Artificial Intelligence	
CMPSC 443	Introduction to Computer and Network Security	
CMPSC 444	Secure Programming	
CMPSC 450	Concurrent Scientific Programming	
CMPSC 451	Numerical Computations	
CMPSC 455	Introduction to Numerical Analysis I	
CMPSC 456	Introduction to Numerical Analysis II	
CMPSC 458	Fundamentals of Computer Graphics	
CMPSC 467	Factorization and Primality Testing	
CMPSC 471	Introduction to Compiler Construction	
CMPSC 475	Applications Programming	
EE 456	Introduction to Neural Networks	
Select 3 credits from any CMPEN or CMPSC course numbered 400-489		3
CMPSC 431W	Database Management Systems	3
or CMPSC 483W	Software Design Methods	
STAT/MATH 319	Elementary Mathematical Statistics	3
or STAT/MATH 415	Introduction to Mathematical Statistics	
<i>Additional Courses: Require a grade of C or better:</i>		
CMPSC 121	Introduction to Programming Techniques	3
or CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 122	Intermediate Programming	3
or CMPSC 132	Programming and Computation II: Data Structures	
CMPEN 270	Digital Design: Theory and Practice	4
or CMPEN 271	Introduction to Digital Systems and Digital Design Laboratory	
& CMPEN 275		
ENGL 15	Rhetoric and Composition	3
or ENGL 137H	Rhetoric and Civic Life I	
ENGL 138T	Rhetoric and Civic Life II	3
or CAS 100A	Effective Speech	
or CAS 100B	Effective Speech	
Supporting Courses and Related Areas		
Select 2-3 credits from the following:		2-3
PHYS 213	General Physics: Fluids and Thermal Physics	
PHYS 214	General Physics: Wave Motion and Quantum Physics	
3 credits from the approved list of natural sciences courses		
Select 0-4 credits in a foreign language (second-semester proficiency)		0-4
Select 10-14 credits from department list. Students may apply up to 10-14 3 credits of ROTC as department list credits and 3 credits of ROTC as GHW credits.		
Select 6 credits in non-CMPEN or CMPSC courses numbered 400-489 in consultation with adviser		6

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- **United States Cultures:** 3 credits
- **International Cultures:** 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Computer Science and M.I.A. in International Affairs

Requirements for the Integrated B.S. in Computer Science and M.I.A. in International Affairs can be found in the Graduate Bulletin (<https://bulletins.psu.edu/graduate/programs/majors/international-affairs/#integratedundergradgradprogramtext>).

Program Educational Objectives

Graduates of our Computer Science degree will be prepared with technical knowledge and professional skills for the practice and future development in their profession along different career paths. We expect them to engage in continuous learning activities, to continue to communicate effectively and work collaboratively with internal and external stakeholders in multidisciplinary and multicultural work environments, and to maintain a strong commitment to ethical practices in their profession. Due to their experience in our program, within few years of their graduation we expect our graduates to have the following career and professional accomplishments:

1. Those employed in industry and focused on technical accomplishments will demonstrate professional advancement by their promotion or other recognition of their technical skills.
2. Those who pursue additional formal education related to their technical skills, either directly or soon after graduation, will have completed or be near completion of a graduate degree or other technical certification.
3. Those who pursue career paths or formal education unrelated or tangential to their degree program will have applied their broad educational skills, including analytical problem solving, communication and independent learning, towards a new discipline.
4. Those employed by government or industry and focused on leadership will demonstrate professional advancement through expanded leadership responsibility based on their acquired technical knowledge and experience.
5. Those employed by government or industry and focused on management will demonstrate professional advancement through expanded management responsibilities based on their acquired management training and experience.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Computer Science program is designed to enable students to:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

CSE Advising

W209 Westgate Building
University Park, PA 16802
cseadvising@enr.psu.edu

Beaver

Richard Lomotey

Assistant Professor, Information Sciences and Technology
100 University Dr.
Monaca, PA 15061
724-773-3814
rkl5137@psu.edu

Brandywine

Robin Stokes

Director, Advising and Career Services
25 Yearsley Mill Road
Media, PA 19063
610-892-1200
ras322@psu.edu

Hazleton

Bhanu Babaiahgari

Assistant Professor of Engineering
Kostos Building, 103
76 University Drive
Hazleton, PA 18202
570-450-3081
bpb5682@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Computer Science, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <https://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CMPSC 121 or 131 ^{*†#}	3 CMPSC 122 or 132 ^{*#}	3
MATH 140 (GQ) ^{*†#†}	4 MATH 141 (GQ) ^{*†#†}	4
ENGL 15 (GWS) [†]	3 PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*#†}	4
General Education Course	3 General Education Course	3
General Education Course	3 First Year Seminar	1
	16	15

Second Year

Fall	Credits Spring	Credits
CMPSC 221 [*]	3 CMPSC 360 [*]	3
MATH 230	4 CMPEN 270 [*]	4
MATH 220	2-3 CMPSC 311 [*]	3
PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R) ^{*†}	4 Natural Science Elective (GN, See College Note below for options that DO NOT count)	2-3
CAS 100A or 100B (GWS) ^{††}	3 General Education Course	3
	16-17	15-16

Third Year

Fall	Credits Spring	Credits
CMPSC 465 [*]	3 CMPSC 464	3
CMPEN 331 [*]	3 CMPSC 473 [*]	3
STAT 318	3 STAT 319	3
CMPSC 461 [*]	3 ENGL 202C (GWS) ^{††}	3
World Language	4 General Education Course	3
	16	15

Fourth Year

Fall	Credits Spring	Credits
CMPSC 483W or 431W	3 CMPSC/CMPEN 400-level ²	3
CMPSC Elective ¹	3 CMPSC Elective ¹	3
Supporting Course	3 Supporting Course	3
Department List (General Elective)	3 General Education Course	3
Department List (General Elective)	4 Department List (General Elective)	3
General Education Course (GHW)	1.5 General Education Course (GHW)	1.5
	17.5	16.5

Total Credits 127-129

- * Course requires a grade of C or better for the major
 ‡ Course requires a grade of C or better for General Education
 # Course is an Entrance to Major requirement
 † Course satisfies General Education and degree requirement

- ¹ Select from department list. Restrictions may apply. Computer Science Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.
² Select 3 credits from any 400-489 CMPSC or CMPEN course that does not duplicate material already taken or required. No CMPSC/CMPEN 494H or CMPSC/CMPEN 496 may be substituted. CMPSC/CMPEN 497 must be petitioned prior to taking the course.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- NATURAL SCIENCES ELECTIVE:** Choose any GN-designated course EXCEPT the following: ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.

- **CMPSC/CMPEN 4XX:** Select any 400-489 CMPSC or CMPEN course offered at University Park.
- **Computer Science Elective:** Select from department list. Restrictions may apply. Computer Science Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.
- **Department List Elective:** Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course:** Select from department list. Restrictions may apply.

Computer Science, B.S. at Beaver Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
CMPSC 121 or 131 ^{*†‡}	3 CMPSC 122 or 132 ^{*#}	3
MATH 140 ^{*†‡†}	4 MATH 141 ^{*†‡†}	4
ENGL 15 (GWS) ^{††}	3 PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*#†}	4
General Education Course	3 General Education Course	3
First-Year Seminar	1 General Education Course	3
	14	17

Second Year

Fall	Credits Spring	Credits
CMPSC 221 [*]	3 CMPSC 360 [*]	3
MATH 230	4 CMPEN 270 [*]	4
MATH 220	3 CMPSC 311 [*]	3
PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R) ^{††}	4 Natural Science Elective (GN, See College Note below for options that DO NOT count)	3
CAS 100A (GWS) ^{††}	3 General Education Course	3
	17	16

Third Year

Fall	Credits Spring	Credits
CMPSC 465 [*]	3 CMPSC 464	3
CMPEN 331 [*]	3 CMPSC 473 [*]	3
STAT 318	3 STAT 319	3
CMPSC 461 [*]	3 ENGL 202C (GWS) ^{††}	3
World Language	4 General Education Course	3
	16	15

Fourth Year

Fall	Credits Spring	Credits
CMPSC 483W or 431W	3 CMPSC Elective ²	3
CMPSC Elective ¹	3 CMPSC Elective ¹	3
Supporting Course	3 Supporting Course	3
Department List (General Elective)	3 Department List (General Elective)	3
Department List (General Elective)	4 General Education Course (GHW)	1.5
General Education Course (GHW)	1.5 General Education Course	3
	17.5	16.5

Total Credits 129

* Course requires a grade of C or better for the major

† Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ Select from department list. Restrictions may apply. Computer Science Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.

² Select 3 credits from any 400-489 CMPSC or CMPEN course that does not duplicate material already taken or required. No CMPSC/CMPEN 494H or CMPSC/CMPEN 496 may be substituted. CMPSC/CMPEN 497 must be petitioned prior to taking the course.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

Program Notes:

- **NATURAL SCIENCES ELECTIVE:** Choose any GN-designated course EXCEPT the following: ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.
- **CMPSC/CMPEN 4XX:** Select any 400-489 CMPSC or CMPEN course offered at University Park.
- **Computer Science Elective:** Select from department list. Restrictions may apply. Computer Science Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.
- **Department List Elective:** Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course:** Select from department list. Restrictions may apply.

Computer Science, B.S. at Brandywine Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
MATH 140 ^{*#†}	4 MATH 141 ^{*#†}	4
CMPSC 131 ^{*#}	3 CMPSC 132 ^{*#}	3
ENGL 15 or 30H ^{††}	3 PHYS 211 ^{*#†}	4
PSU 12 [†]	1 CAS 100 ^{††}	3
General Education Course (suggested IST 110 or SRA 111) [†]	3 General Education Course [†]	3
General Education Course [†]	3	
	17	17

Second Year

Fall	Credits Spring	Credits
CMPSC 221 [*]	3 CMPSC 360 ^{*2}	3
MATH 230 ¹	4 CMPSC 311 ^{*2}	3
PHYS 212 ^{*†}	4 MATH 220 ²	3
CMPEN 271 ^{*1} & CMPEN 275 ^{*1} or CMPEN 270 [*]	4 ENGL 202C ^{††}	3
General Education Course (GHW) [†]	1.5 Natural Science Elective (GN, See College Note below for options that DO NOT count) [†]	3
General Education Course (GHW) [†]	1.5	
	18	15

Third Year

Fall	Credits Spring	Credits
CMPSC 465 ^{*1}	3 CMPSC 464 ²	3
CMPEN 331 ^{*1}	3 CMPSC 473 ^{*2}	3
STAT 318 ¹	3 STAT 319 ²	3
CMPSC 461 ^{*1}	3 General Education Course [†]	3
World Language	4 General Education Course [†]	3
	16	15

Fourth Year

Fall	Credits Spring	Credits
CMPSC 431W ¹ or CMPSC 483W ²	3 CMPSC/CMPEN 400-level	3
CMPSC Elective	3 CMPSC Elective	3
Supporting Course	3 Supporting Course	3
Department List (General Elective)	3 General Education Course [†]	3
Department List (General Elective)	4 Department List (General Elective)	3
	16	15

Total Credits 129

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ Course is Fall only

² Course is Spring only

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **NATURAL SCIENCES ELECTIVE:** Choose any GN-designated course EXCEPT the following: ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.
- **CMPSC/CMPEN 4XX:** Select any 400-489 CMPSC or CMPEN course offered at University Park.
- **Computer Science Elective:** Select from department list. Restrictions may apply. Computer Science Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.
- **Department List Elective:** Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course:** Select from department list. Restrictions may apply.

Computer Science, B.S. at Hazleton Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
ENGL 15 or 30H ^{††}	3 CAS 100A ^{††}	3
CMPSC 131 ^{*#}	3 MATH 141 ^{*#†}	4
MATH 140 ^{*#†}	4 PHYS 211 ^{*#†}	4
PSU 8 [†]	1 CMPSC 132 ^{*#}	3
General Education Course [†]	3 General Education Course [†]	3
General Education Course (GN) [†]	3	
	17	17

Second Year

Fall	Credits Spring	Credits
CMPEN 271 ^{*1} and CMPEN 275 ^{*1} or CMPEN 270 [*]	4 CMPSC 311 ^{*2}	3
CMPSC 221 [*]	3 CMPSC 360 [*]	3
MATH 220	3 MATH 230	4
PHYS 212 ^{*†}	4 ENGL 202C ^{††}	3
General Education GHW [†]	1.5 Natural Science Elective (GN, See College Note below for options that DO NOT count) [†]	3
General Education GHW [†]	1.5	
	17	16

Third Year

Fall	Credits Spring	Credits
CMPEN 331 [*]	3 CMPSC 473 [*]	3
CMPSC 465 [*]	3 CMPSC 464 ²	3
STAT 318 ¹	3 STAT 319 ²	3
CMPSC 461 ^{*1}	3 General Education Course [†]	3
World Language	4 General Education Course [†]	3
	16	15

Fourth Year

Fall	Credits Spring	Credits
CMPSC 431W ¹ or CMPSC 483W ²	3 CMPEN/CMPSC 4XX	3
CMPSC Elective	3 CMPSC Elective	3
Supporting Course	3 Supporting Course	3
Department List (General Elective)	4 Department List (General Elective)	3
Department List (General Elective)	3 General Education Course [†]	3
	16	15

Total Credits 129

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ Course is Fall only

² Course is Spring Only

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

Program Notes:

- **NATURAL SCIENCES ELECTIVE:** Choose any GN-designated course EXCEPT the following- ASTRO 1, 7N, 10, 11, 120, or 140; all below CHEM 110 (except 3 credits of CHEM 106); all below PHYS 211; PHYS 250 or 251; all BI SC; and GEOSC 20.
- **CMPSC/CMPEN 400-Level:** Select any 400-489 CMPSC or CMPEN course.
- **Computer Science Elective:** Select from department list. Restrictions may apply. Computer Science Electives are NOT offered every semester or even every year. Contact the department for information on which classes are scheduled to be offered during a given semester.
- **Department List Elective:** Select from department list. Restrictions may apply. Students who complete the ROTC Program may substitute 3 ROTC credits for a Department List Elective. Students who complete the Cooperative Education Program may substitute 3 co-op credits for a Department List Elective.
- **Health and Wellness:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Department List Elective.
- **Supporting Course:** Select from department list. Restrictions may apply.

Career Paths

Computer science has had major impacts in such diverse areas as commerce, communication, engineering, entertainment, finance, health sciences, social sciences, physical sciences, and life sciences. Computer scientists do far more than just construct software. They apply their skills and knowledge to solve challenging problems using sound computational

methods. They work collaboratively in teams to build complex systems with many integrated parts. They research, study, and develop new technologies, new applications of computing, and new ways to compute.

Careers

Computer science graduates typically find positions as software engineers and software developers in major companies like Google, Apple, Microsoft, IBM, Facebook, and Intel. Graduates are also highly recruited by major companies in the areas of finance, health care, aerospace, and defense. Most graduates will find themselves a part of a team of software developers and after a few years possibly leading a software team. With the rapid changes and advances in the field of computing, graduates must continually keep up with the latest technology as their careers adapt and evolve to meet the new opportunities and challenges of computing.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE COMPUTER SCIENCE PROGRAM (<https://career.engr.psu.edu>)

Opportunities for Graduate Studies

Graduates of this program can pursue graduate studies in computer science and related disciplines, concentrating in specialized areas such as computer security, artificial intelligence, machine learning, data sciences, computer networks, computer vision, bioinformatics, and high-performance computing. A master's degree allows one to specialize beyond the broad foundations offered by a bachelor's degree. A doctoral degree prepares one for a career in research and academia.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.eecs.psu.edu/students/graduate/EECS-Graduate-Prospective.aspx>)

Professional Resources

- ACM (<https://acm.psu.edu>)
- Association of Women in Computing (<https://awc.cse.psu.edu/>)
- IEEE (<https://sites.psu.edu/psuieee/>)

Accreditation

The Bachelor of Science in Computer Science at University Park, Penn State Beaver, Penn State Brandywine, and Penn State Hazleton is accredited by the Computing Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Computer Science and Similarly Named Computing Programs.

Contact

University Park

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
W209 Westgate Building
University Park, PA 16802
814-865-9505
trk149@psu.edu
bam136@psu.edu

<https://www.eecs.psu.edu>

Beaver

100 University Dr.
Monaca, PA 15061
724-773-3814

rkl5137@psu.edu

<https://beaver.psu.edu/academics/majors/compsci> (<https://beaver.psu.edu/academics/majors/compsci/>)

Brandywine

25 Yearsley Mill Road
Media, PA 19063
610-892-1200
ras322@psu.edu

<https://www.brandywine.psu.edu/academics/bachelors-degrees/computer-science> (<https://www.brandywine.psu.edu/academics/bachelors-degrees/computer-science/>)

Hazleton

Kostos Building, 103
76 University Drive
Hazleton, PA 18202
570-450-3081
bpb5682@psu.edu

<https://hazleton.psu.edu/computer-science> (<https://hazleton.psu.edu/computer-science/>)

Cybersecurity Computational Foundations, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The Cybersecurity Minor offered by the Department of Computer Science and Engineering is designed for students in computational majors who wish to acquire the technical depth to design and construct secure cyber systems. Building upon a core computer science foundation the minor includes courses in computer security, mobile and wireless security, software security and networking. Additional courses in the minor provide areas of application such as operating systems, database systems, and computer architecture, in which issues of security arise. The minor prepares students for careers as technical professionals working with secure cyber systems and for graduate study in computer, network and systems security.

Entrance to Minor

Any student wishing entrance to the minor should have successfully completed all the prerequisite courses: CMPSC 121 or CMPSC 131, CMPSC 122 or CMPSC 132, CMPSC 221, CMPSC 311, CMPSC 360, CMPEN 270/CMPEN 271, CMPEN 331, and STAT 318 or STAT 414 or STAT 418.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules->

for-undergraduate-students/59-00-minors-and-certificates/#59-10). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPEN/EE 362	Communication Networks	3
CMPSC 443	Introduction to Computer and Network Security	3
CMPSC 473	Operating Systems Design & Construction	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select 3-6 credits from the following:		3-6
CMPEN 462	Wireless Communications Systems and Security	
CMPSC 447	Software Security	
Supporting Courses and Related Areas		
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 3-6 credits from the following:		3-6
CMPEN 431	Introduction to Computer Architecture	
CMPSC 431W	Database Management Systems	
CMPSC 461	Programming Language Concepts	
CMPSC 464	Introduction to the Theory of Computation	
CMPSC 475	Applications Programming	

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

CSE Advising

W209 Westgate Building
University Park, PA 16802
cseadvising@engr.psu.edu

Contact

University Park

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
W209 Westgate Building
University Park, PA 16802
814-865-9505
arc88@psu.edu

<https://www.eecs.psu.edu>

Data Sciences, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

Data Sciences is a field of study concerned with developing, applying, and validating methods, processes, systems, and tools for drawing useful knowledge, justifiable conclusions, and actionable insights from large, complex and diverse data through exploration, prediction, and inference. Data Sciences integrate aspects of Computer Science, Informatics, and Statistics to yield powerful data science methods, systems, tools, and best practices that find applications across a broad range of application domains. The curriculum for the major is designed to equip students with the knowledge and the skills needed to elicit, formulate, and solve data sciences problems using modern data science methods, tools, and best practices for data management, data exploration, data integration, predictive modeling (using machine learning), and effectively communicate their findings to, and collaborate with a broad range of stakeholders. The students will gain the critical analytical skills needed to assess the feasibility, benefits, effectiveness, limitations, risks, and ethical implications of applying data sciences methods in different settings. Experiences such as the capstone project prepare students to function effectively as members of interdisciplinary data science teams to harness the potential of data to enable discovery, optimize products and processes, and inform decisions. As distinct from majors that focus primarily on developing data science knowledge and skills to support inquiry in other domains, the primary focus of the Data Sciences major is on the development, evaluation, application, and validation of the data science tools themselves. All students in the major receive in-depth training in data sciences through a set of core courses. Additionally, data sciences students specialize in one of the following options: applied, computational, or statistical modeling data sciences, as described below.

Applied Data Sciences (DATSC_BS)

Only available through the College of Information Sciences and Technology

The students in the Applied DS option will receive exposure to an application domain so they are equipped to formulate and solve data science problems drawn from the chosen domain, e.g., life and health sciences, business, behavioral and cognitive sciences, physical sciences, agricultural sciences, among others.

Computational Data Sciences (DTSCE_BS)

Only available through the College of Engineering

The students in the Computational DS option will receive additional training in Computer Science to be able to design, analyze, implement, and deploy advanced algorithms, hardware and software architectures, and systems for data management and analyses.

Statistical Modeling Data Sciences (DTSCS_BS)

Only available through the Eberly College of Science

The students in the Statistical modeling DS option will receive additional training in Statistics to be able to formulate, develop, and apply the proper statistical models and methods for data analyses, e.g., experiment design, sampling, hypotheses testing, and limiting false discovery.

What is Data Sciences?

Data Sciences is a field that explores the methods, systems, and processes used to extract knowledge from data and turn these insights into discoveries, decisions, and actions. The emergence of massive amounts of data – also known as “big data” – found in our world through healthcare records, human sensors, digital media, and a number of other sources has increased the need for individuals who can obtain useful knowledge from big data and apply it to address major societal challenges across a variety of fields. Students pursuing this degree will develop the knowledge and skills needed to manage and analyze large-scale, unstructured data to address an expanding range of problems in industry, government, and academia.

MORE INFORMATION ABOUT DATA SCIENCES (<https://ist.psu.edu/prospective/undergraduate/academics/data-sciences/>)

You Might Like This Program If...

- You are curious about analyzing information to discover new insights.
- You want to apply data analytics to make strategic decisions.
- You want to understand how data can be used to visualize phenomena using AI and data science techniques.
- You are interested in statistics, mathematics, and the social sciences, and want to combine these disciplines to understand what data is really telling us.

MORE INFORMATION ABOUT WHY STUDENTS CHOOSE TO STUDY DATA SCIENCES (<https://ist.psu.edu/prospective/undergraduate/academics/data-sciences/>)

Entrance to Major

To be eligible for entrance into the Data Sciences major, a degree candidate must satisfy requirements for entrance to the major.

Specific entrance requirements include:

1. The degree candidate must be taking, or have taken, a program appropriate for entry to the major as shown in the bulletin.
2. The degree candidate must complete the following entrance-to-major requirements: CMPSC 121* or CMPSC 131*, CMPSC 122* or CMPSC 132*, MATH 140*, MATH 141*, STAT 200* or DS 200*. These courses must be completed by the end of the semester during which the entrance to major process is carried out.

* Course requires a grade of C or better.

Degree Requirements

For the Bachelor of Science degree in Data Sciences, a minimum of 123 credits is required:

Requirement	Credits
General Education	45
Electives	3-12
Requirements for the Major	72-81

6 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 6 credits of GQ courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
DS 220	Data Management for Data Sciences	3
DS 340W	Applied Data Sciences	3
DS 435	Ethical Issues in Data Science Practice	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 220	Matrices	2
STAT 184	Introduction to R	2
STAT 380	Data Science Through Statistical Reasoning and Computation	3

Additional Courses

<i>Additional Courses: Require a grade of C or better</i>		
1 credit of First-Year Seminar		1
CMPSC 121	Introduction to Programming Techniques	3
or CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 122	Intermediate Programming	3
or CMPSC 132	Programming and Computation II: Data Structures	
DS 440	Data Sciences Capstone Course	3
or DS 440W	Data Science Capstone	

Requirements for the Option

Select an option	38-47
------------------	-------

Requirements for the Option

Applied Data Sciences (DATSC_BS): 47 credits

Only Available through the College of Information Sciences and Technology

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
DS 200	Introduction to Data Sciences	4
DS 300	Privacy and Security for Data Sciences	3
DS 305	Algorithmic Methods and Tools	3
DS 310	Machine Learning for Data Analytics	3
DS 320	Data Integration	3
DS 330	Visual Analytics for Data Sciences	3
DS/CMPSC 410	Programming Models for Big Data	3
IST 495	Internship	1

Additional Courses

Select 6 credits from any combination:		6
DS 402	Emerging Trends in the Data Sciences	
DS 420	Network Analytics	
DS/CMPSC 442	Artificial Intelligence	
DS 494	Research Project	
IST 441	Information Retrieval and Organization	
IST 442	Information Technology in an International Context	

SODA 308	Research Design for Social Data Analytics	
<i>Additional Courses: Require a grade of C or better</i>		
Select 3 credits from the following:		3
CMPSC 360	Discrete Mathematics for Computer Science	
IST 230	Language, Logic, and Discrete Mathematics	
MATH 311W	Concepts of Discrete Mathematics	
Select 3 credits from the following:		3
STAT/MATH 318	Elementary Probability	
STAT/MATH 414	Introduction to Probability Theory	
STAT/MATH 418	Introduction to Probability and Stochastic Processes for Engineering	
Supporting Courses and Related Areas ¹		
Select 12 credits from the lists of Application Focus courses; 6 credits must at the 300- or 400-levels.		12

¹ Students may apply up to 3 credits of ROTC as option Application Focus list credits and 3 credits of ROTC as GHW credits.

LIST OF APPLIED DATA SCIENCES COURSES (p. 1052)

Computational Data Sciences (DTSCE_BS): 47 credits Only Available through the College of Engineering

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPSC 221	Object Oriented Programming with Web-Based Applications	3
CMPSC 360	Discrete Mathematics for Computer Science	3
CMPSC 442	Artificial Intelligence	3
CMPSC 448	Machine Learning and Algorithmic AI	3
CMPSC 461	Programming Language Concepts	3
CMPSC 465	Data Structures and Algorithms	3
DS/CMPSC 410	Programming Models for Big Data	3
MATH 230	Calculus and Vector Analysis	4
STAT/MATH 414	Introduction to Probability Theory	3
STAT/MATH 415	Introduction to Mathematical Statistics	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
DS 200	Introduction to Data Sciences	4
or STAT 200	Elementary Statistics	
Supporting Courses and Related Areas ¹		
Select 6 credits from Computational Option List A in Appendix C		6
Select 6 credits from Computational Option List B in Appendix C		6

¹ Students may apply up to 3 credits of ROTC as option list credits and 3 credits of ROTC as GHW credits.

LIST OF COMPUTATIONAL DATA SCIENCES COURSES (<http://www.eecs.psu.edu/students/undergraduate/Data-Sciences.aspx>)

Statistical Modeling Data Sciences (DTSCS_BS): 38 credits Only Available through the Eberly College of Science

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
MATH 230	Calculus and Vector Analysis	4
STAT/MATH 414	Introduction to Probability Theory	3
STAT/MATH 415	Introduction to Mathematical Statistics	3
STAT 440	Computational Statistics	3
STAT 462	Applied Regression Analysis	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
DS 200	Introduction to Data Sciences	4
or STAT 200	Elementary Statistics	
DS 310	Machine Learning for Data Analytics	3
or CMPSC 448	Machine Learning and Algorithmic AI	
MATH 311W	Concepts of Discrete Mathematics	3
or CMPSC 360	Discrete Mathematics for Computer Science	
Supporting Courses and Related Areas ¹		
Select 6 credits from Statistical Modeling Option List A courses, see Appendix D		6
Select 6 credits from Statistical Modeling Option List B courses, see Appendix D		6

¹ Students may apply up to 3 credits of ROTC as option list credits and 3 credits of ROTC as GHW credits.

LIST OF STATISTICAL MODELING DATA SCIENCES COURSES (p. 563)

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Learning Objectives

1. **Knowledge:** Understand the technical fundamentals of data sciences with a focus on developing the knowledge and skills needed to manage and analyze data to solve problems in our world.
 - a. Integrate statistical concepts/methods and computational/machine learning methods to discover the structure of data and build predictive models.

- b. Apply the principles of data management to organize and use different types of data, both structured and unstructured.
2. **Problem-Solving and Evaluation:** Identify, formulate and solve data science problems that arise in various applications.
 - a. Identify and incorporate relevant abstraction and domain knowledge to formulate data science problems in different application contexts.
 - b. Design or adapt appropriate statistical, machine learning, and other data science methods for solving specific problems.
 - c. Compare, contrast, and evaluate competing data science methods appropriate to the context of the problem.
 - d. Employ modern computing infrastructure to scale up data science methods for massive and complex data.
 - e. Integrate data from multiple sources while considering the best practices, challenges, and pitfalls of using heterogeneous data to solve problems.
 3. **Communication:** Articulate the benefits, risks, formulation, solution, and results of data science projects to diverse stakeholders, including fellow data scientists, collaborators with subject matter expertise, and the general public, using written, verbal, and visual forms.
 4. **Teamwork:** Participate effectively on teams in order to accomplish the goals of a project containing data science components.
 5. **Data Ethics:** Critically evaluate and conscientiously respond to the ethical and societal implications of data science practice.
 - a. Analyze the potential human impacts of data-driven technologies, especially for marginalized communities.
 - b. Develop strategies to solve data science problems that reflect shared social and ethical values, such as privacy, security, fairness, and accountability.
 - c. Interpret and apply the ethical responsibilities of computing professionals.
 - d. Ensure reproducibility of data science analyses.
 6. **Lifelong Learning:** Recognize the importance of continued learning beyond graduation.
 - a. Demonstrate readiness to join an evolving professional community by participating in professional development, such as reading trade journals and engaging with appropriate professional organizations.
 - b. Demonstrate readiness for independent learning by performing literature reviews and staying abreast of current trends within the field of data science.
 7. **Option Objectives:**
 - a. **Applied Data Sciences Option:** Gain in-depth knowledge in a chosen application focus area and demonstrate skills to formulate and solve data science problems in the context of applications in that area.
 - b. **Computational Data Sciences Option:** Design, development, and analysis of software (computational solutions) for data science problems.
 - c. **Statistical Modeling Data Sciences Option:** Demonstrate facility with common regression-based inferential modeling techniques including analysis of variance, generalized linear models, multiple regression, and logistic regression, as well as proficiency in basic statistical optimization and simulation techniques.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their

intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park College of Engineering

CSE Advising

W209 Westgate Building
University Park, PA 16802
cseadvising@engr.psu.edu

College of Information Sciences and Technology

Undergraduate Academic Advising Center

E103 Westgate Building
University Park, PA 16802
814-865-8947
advising@ist.psu.edu

Eberly College of Science

Undergraduate Statistics Office

Academic Advising
323 Thomas Building
University Park, PA 16802
814-865-1348
stat-advising@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Computational Data Sciences Option: Data Sciences, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CMPSC 121 or 131 (GQ) ^{*#†}	3 CMPSC 122 or 132 ^{*#}	3
MATH 140 (GQ) ^{*†##}	4 MATH 141 (GQ) ^{*†#}	4
DS 200 or STAT 200 ^{*#}	4 DS 220 [*]	3
General Education Course	3 ENGL 15 (GWS) [†]	3
First-Year Seminar	1 General Education Course	3
	15	16

Second Year

Fall	Credits Spring	Credits
CMPSC 221 [*]	3 CMPSC 360 [*]	3
STAT 184 [*]	2 STAT 380 [*]	3
MATH 230 [*]	4 STAT 414 [*]	3
MATH 220 [*]	2 General Education Course	3
CAS 100A or 100B (GWS) ^{††}	3 General Education Course	3
General Education Course	3	
	17	15

Third Year

Fall	Credits Spring	Credits
CMPSC 442 or DS 442 [*]	3 CMPSC 410 or DS 410 [*]	3
CMPSC 465 [*]	3 CMPSC 448	3
DS 435 [*]	3 CMPSC 461 [*]	3
STAT 415 [*]	3 General Education Course	3
General Education Course	3 General Education Course	3
	15	15

Fourth Year

Fall	Credits Spring	Credits
DS 340W [*]	3 DS 440W [*]	3
List A Course	3 List A Course	3
List B Course	3 List B Course	3
ENGL 202C (GWS) ^{††}	3 General Education Course	3
Department List (General Elective)	3 General Education Course (GHW)	1.5
General Education Course (GHW)	1.5	
	16.5	13.5

Total Credits 123

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number

used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **Health and Wellness Elective:** Students who complete the ROTC program may substitute 3 ROTC credits for the GHW requirement.
- **Natural Sciences Elective:** Nine credits of Natural Science (GN) are required. Any GN courses except the following may be used: ASTRO 1, 7N, 10, 11, 120, 140; all BI SC courses; All courses below CHEM 110 (except 3 credits of CHEM 106 may be used); PHYS 250, 251, and any course below PHYS 211; GEOSC 20
- **OPTION A:** CMPEN 454, CMPSC 450, CMPSC 455, CMPSC 456, MATH 484, or MATH 452
- **OPTION B:** CMPSC 431W, EE 456, IST 441, MATH 486, MATH 448, STAT 416, STAT 440, STAT 460, STAT 461, or STAT 462
- **Department List Course (General Elective):** See handbook at [eecs.psu.edu](https://www.eecs.psu.edu) (<https://www.eecs.psu.edu>)

Career Paths

Data Sciences blends the technical expertise needed to analyze, interpret, and manage big data with the interpersonal skills needed to communicate insights to a variety of audiences. The program prepares students to meet the growing need for professionals who have the analytical and problem-solving skills to address a wide range of societal and technical challenges. Many companies participate in career fairs in Engineering, IST and Science with an express interest in hiring data science interns or graduates. A growing number of M.S. and Ph.D. programs await those who wish to pursue more advanced studies.

Careers

Because our courses blend technical knowledge with skills in communication and business, a Data Sciences degree allows students to compete for leading-edge analytics positions across many different industry sectors. Possible careers include: Data Science and AI Engineers, Data Scientist, Data Analyst, Data Specialist, Data Visualization Specialist, IT Analyst, Machine Learning Engineer, Data Engineer, Business Systems Analyst/Consultant.

MORE INFORMATION FOR THE APPLIED DATA SCIENCES OPTION (<https://www.ist.psu.edu/current/careers/development/process/path/>)

MORE INFORMATION FOR THE COMPUTATIONAL DATA SCIENCES OPTION (<https://www.eecs.psu.edu/students/undergraduate/Data-Sciences.aspx>)

MORE INFORMATION FOR THE STATISTICAL MODELING DATA SCIENCES OPTION (<https://science.psu.edu/stat/undergraduate-programs/>)

Professional Resources

- Association for Computing Machinery (<https://acm.psu.edu>)
- Association for Information Science and Technology (<https://www.asist.org>)

Contact

University Park

College of Engineering

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

W209 Westgate Building

University Park, PA 16802

814-865-9505

trk149@psu.edu

bam136@psu.edu

<https://www.eecs.psu.edu>

College of Information Sciences and Technology

COLLEGE OF INFORMATION SCIENCES AND TECHNOLOGY

411 Eric J. Barron Innovation Hub Building

State College, PA 16801

814-865-3528

Eberly College of Science

DEPARTMENT OF STATISTICS

326 Thomas Building

University Park, PA 16802

814-865-1348

stat-advising@psu.edu

<https://science.psu.edu/stat/contact-us> (<https://science.psu.edu/stat/contact-us/>)

Electrical Engineering Technology, A.ENG.T. (Engineering)

Begin Campus: Fayette, York

End Campus: Fayette, York

Program Description

The Electrical Engineering Technology (2EET) major helps prepare graduates for technical positions in the expanding fields of electronics, computers and microprocessors, instrumentation, and electrical equipment. The primary objective is to provide a broad foundation of theoretical and practical knowledge in the areas of electrical and electronic circuits, digital circuits, computers, electrical machinery, and programmable logic controls.

Graduates of the Electrical Engineering Technology major may qualify for admission to the baccalaureate degree majors in Electrical Engineering Technology offered at Penn State Harrisburg, Capital College; the baccalaureate degree major in Electrical and Computer Engineering Technology at Penn State Erie, The Behrend College; or the baccalaureate degree major in Electro-Mechanical Engineering Technology offered at Penn State Altoona, Penn State Berks, Penn State New Kensington or Penn State York. Two baccalaureate tracks are available to streamline the transition to these degree programs. Students interested in pursuing the baccalaureate degree major of Electrical Engineering Technology at Penn State Harrisburg should follow track c. A general track is also provided

for students who decide not to continue their engineering technology education at the baccalaureate level.

What is Electrical Engineering Technology?

Electrical engineering technology focuses on the planning, designing, installing, operating, and maintaining electrical power systems and electronic devices. Electrical engineering technicians assist engineers with the manufacture, installation, operation, design, and repair of a wide range of electronic products.

You Might Like This Program If...

You are interested in science and technology but prefer spending time applying your skills in a laboratory or field setting as opposed to studying the theory behind these subjects in a classroom setting. If you like to know how things that are controlled by electronics work, from computers to robotics, this may be for you. While theory is covered in this major, there is a greater emphasis on the application of theory with much of what you learn in the classroom being built as lab experiments.

Entrance to Major

Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

Degree Requirements

For the Associate in Engineering Technology degree in Electrical Engineering Technology, a minimum of 65 credits is required:

Requirement	Credits
General Education	21
Requirements for the Major	56-62

12-15 of the 21 credits for General Education are included in the Requirements for the Major. This includes: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses, 0-3 credits of GH or GS.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CAS 100	Effective Speech	3
COMPET 211	Embedded Processors and DSP	3
EET 212W	Op Amp and Integrated Circuit Electronics	4
EET 214	Electric Machines and Energy Conversion	3
EET 215	Electric Machines and Energy Conversion Laboratory	1
<i>Prescribed Courses: Require a grade of C or better</i>		
COMPET 117	Digital Electronics	3
COMPET 120	Digital Electronics Laboratory	1
EET 114	Electrical Circuits II	4
EET 118	Electrical Circuits Laboratory	1
Additional Courses		

ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
PHYS 150	Technical Physics I	3-4
or PHYS 211	General Physics: Mechanics	
or PHYS 250	Introductory Physics I	
Select 5-6 credits of the following:		5-6
MATH 22 & MATH 26	College Algebra With Analytic Geometry and Applications II and Plane Trigonometry and Applications of Trigonometry ¹	
MATH 40	Algebra, Trigonometry, and Analytic Geometry ¹	
MATH 81 & MATH 82	Technical Mathematics I and Technical Mathematics II ¹	
Select at least 22-26 credits from one of the following three tracks: 22-26		
A. General Track ²		
EDSGN 100	Cornerstone Engineering Design	
EET 105	Electrical Systems	
EET 275	Introduction to Programmable Logic Controls or EMET 230Computerized I/O Systems	
IET 101	Manufacturing Materials, Processes, and Laboratory	
MET 111	Mechanics for Technology: Statics	
PHYS 151	Technical Physics II	
or PHYS 212	General Physics: Electricity and Magnetism	
or PHYS 251	Introductory Physics II	
or CHEM 111	Chemical Principles I and Experimental Chemistry I	
& CHEM 111		
STS 200	Critical Issues in Science, Technology, and Society	
or STS/PHIL 233	Ethics and the Design of Technology	
or STS 245		
Select 3-4 credits in consultation with your adviser from the approved program list		
B. Baccalaureate Electrical and Computer Engineering Technology (ECET) Track:		
CHEM 110	Chemical Principles I	
CHEM 111	Experimental Chemistry I	
COMPET 5	Engineering Methods in Engineering Technology	
EET 2	Introduction to Engineering Technology	
EET 101	Electrical Circuits I	
EET 109	Electrical Circuits Laboratory I	
EET 275	Introduction to Programmable Logic Controls	
EGT 119	Introduction to CAD for Electrical and Computer Engineering	
MATH 83	Technical Calculus	
or MATH 141	Calculus With Analytic Geometry I	
MATH 210	Calculus with Engineering Technology Applications (or 3 credits of General Education natural science GN)	
C. Baccalaureate Electro-Mechanical Engineering Technology (EMET) Track ^{2,3}		
EDSGN 100	Cornerstone Engineering Design	
EET 105	Electrical Systems	

EET 275	Introduction to Programmable Logic Controls or EMET 230 Computerized I/O Systems
IET 101	Manufacturing Materials, Processes, and Laboratory
MET 111	Mechanics for Technology: Statics
MATH 83	Technical Calculus or MATH 14 (Calculus With Analytic Geometry I
PHYS 151	Technical Physics II or PHYS 212 General Physics: Electricity and Magnetism or PHYS 251 Introductory Physics II or CHEM 110 Chemical Principles I and Experimental Chemistry I & CHEM 111
STS 200	Critical Issues in Science, Technology, and Society or STS/ PHIL 233 or STS 245

¹ A student planning to re-enroll into the baccalaureate degree major of Electro-Mechanical Engineering Technology (EMET), after graduation from the 2 EET program, must receive a grade of C or better in order to meet requirements of the EMET degree.

² This includes 3 credits of General Education courses: 3 credits of GH or GS.

³ A student planning to re-enroll into the baccalaureate degree major of Electrical Engineering Technology at Penn State Harrisburg, after graduation from the 2EET program, should follow Track C. They should select MATH 140 instead of MATH 83.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all associate degree students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 3 credits
- **Writing and Speaking (GWS):** 3 credits

Knowledge Domains

- **Arts (GA):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Note: Up to six credits of Inter-Domain courses may be used for any Knowledge Domain requirement, but when a course may be used to

satisfy more than one requirement, the credits from the course can be counted only once.

Exploration

- **Any General Education course (including GHW and Inter-Domain):** 3 credits

University Degree Requirements

Cultures Requirement

3 credits of United States (US) or International (IL) cultures coursework are required and may satisfy other requirements

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 60 degree credits must be earned for a associates degree. The requirements for some programs may exceed 60 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The Associate Electrical Engineering Technology program is designed to provide a curriculum that prepares students to pursue a career in the industry and to develop in their profession. Due to their experience in the Associate Electrical Engineering Technology program, within few years of graduation, we expect our graduates to have the ability to:

1. Apply analytical and empirical skills in the operation, testing, or maintenance of electrical systems.
2. Collaborate effectively in project team activities through recognizing the global, societal, and ethical contexts of their work.
3. Communicate effectively through preparation and delivery of technical and non-technical documentation and communications.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Associate Electrical Engineering Technology program is designed to enable students to:

1. Apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve well-defined engineering problems appropriate to the discipline.
2. Design solutions for well-defined technical problems and assist with engineering design of systems, components, or processes appropriate to the discipline.

3. Apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. Conduct standard tests, measurements, and experiments and to analyze and interpret the results.
5. Function effectively as a member of a technical team.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

Fayette

Andrzej Gapinski

Associate Professor and Program Coordinator
2201 University Drive
Lemont Furnace, PA 15456
724-430-4239
ajg2@psu.edu

York

Patrick Hein

Lecturer in Engineering and Program Coordinator
1031 Edgecomb Ave.
York, PA 17403
717-718-6787
pdh7@psu.edu

Erie

David Loker

Associate Professor of Engineering and Program Chair
250 Burke
Erie, PA 16563
814-898-6478
dlr3@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Electrical Engineering Technology, A.ENG.T. - General Track at Fayette Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes

in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
MATH 26 (GQ) ^{††}	3 EET 114 [*]	4
ENGL 15 (GWS) ^{††}	3 EET 118 [*]	1
EET 105	3 CMPET 117 [*]	3
IET 101	3 CMPET 120	1
EDSGN 100	3 MET 111	3
PSU 8	1 MATH 22 (GQ) ^{††}	3
	CAS 100 (GWS) ^{††}	3
	16	18

Second Year

Fall	Credits Spring	Credits
EET 214	3 EET 212W	4
EET 215	1 EET 275	3
CMPET 211	3 PHYS 251	4
PHYS 250 [†]	4 General Education Course (GS or GA)	3
STS 233	3 General Education (GS or GA) or Technical Elective	3-4
General Education (GS or GA) or Technical Elective	3-4	
	17-18	17-18

Total Credits 68-70

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS) requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Advising Notes:

- Technical Elective choose from: MATH 140 (<https://bulletins.psu.edu/search/?P=MATH%20140>), BISC 3 (<https://bulletins.psu.edu/search/?P=BISC%203>), CHEM 110 (<https://bulletins.psu.edu/search/?P=CHEM%20110>).
- Students need one of each: GA, GH, GS, Technical Elective. Students also need either an IL-designated or US-designated course.
- STS 233 will satisfy the GH requirement and is not a US/IL. Therefore, either the GA or GS course must also be designated US or IL.

- Suggested Technical Electives: MATH 140 (<https://bulletins.psu.edu/search/?P=MATH%20140>) (typically offered spring and fall), BISC 3 (<https://bulletins.psu.edu/search/?P=BISC%203>) (typically offered spring and fall), CHEM 110 (<https://bulletins.psu.edu/search/?P=CHEM%20110>) (spring and fall).
- Students should consult their adviser for other possible technical electives.

Electrical Engineering Technology, A.ENG.T. at York Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
EDSGN 100	3 CMPET 117*	3
IET 101	3 CMPET 120*	1
EET 105	3 MET 111	3
MATH 26 (GQ) ^{†‡}	3 PHYS 150 or 250 (GN)	3-4
ENGL 15, 30H, or ESL 15 (GWS) ^{†‡}	3 MATH 22 ^{†‡}	3
	CAS 100A, 100B, or 100C (GWS) [†]	3
	15	16-17

Second Year

Fall	Credits Spring	Credits
EET 114*	4 CMPET 211	3
EET 118*	1 EET 214	3
EET 212W*	4 EET 215	1
EET 275 or EMET 230	3 Technical Elective	3
PHYS 151 or 251 (or CHEM 110 and CHEM 111 (GN))	3-4 Social and Behavioral Sciences (GS)	3
Arts (GA)	3 STS 233Z (GH)	3
	18-19	16

Total Credits 65-67

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS) requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

College Notes:

- **Scheduling patterns for courses not taught each semester** : Some major/option courses are offered only Fall or Spring semester, as listed on guide.

- The courses in this major are sequential. If taken out of sequence, scheduling conflicts may arise.

Program Notes:

- Track Selections - see audit.

Academic Advising Notes

- Academic planning guides should always be used in conjunction with a degree audit and consultation with an adviser.

US, IL, and US;IL are codes used to designate courses that satisfy University United States/International Cultures requirements. All students are required to take one IL or one US course before graduation. A course designated as US;IL may be used as a US or an IL, not both.

Career Paths

For students that do not continue on for a Bachelor of Engineering Technology Degree, there are various opportunities in the field for Electrical Engineering Technology. In many industrial settings, an Engineer works on the design of an electronic device, such as an electronic sensor, or system, such as a robotic arm, and the technician helps to build and test it. The technician might also be responsible for building test equipment to test the device or system once it is manufactured. In addition, the Electronic Technician might also be involved in servicing equipment in the field or be involved in sales.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ELECTRICAL ENGINEERING TECHNOLOGY PROGRAM (<https://career.engr.psu.edu/>)

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.engr.psu.edu/graduate-programs/>)

Accreditation

The A.ENG.T. in Electrical Engineering Technology at Penn State Fayette and Penn State York is Accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electrical/Electronic(s) Engineering Technology and Similarly Named Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-865-2952

<https://www.sedi.psu.edu/>

Fayette

2201 University Drive
Lemont Furnace, PA 15456
724-430-4239

ajg2@psu.edu

<https://fayette.psu.edu/academics/associate/electrical-engineering-technology> (<https://fayette.psu.edu/academics/associate/electrical-engineering-technology/>)

York

1031 Edgecomb Ave.
York, PA 17403
717-718-6787
pdh7@psu.edu

<https://www.york.psu.edu/academics/associate/electrical-engineering-technology> (<https://www.york.psu.edu/academics/associate/electrical-engineering-technology/>)

Erie

SCHOOL OF ENGINEERING
242 Jack Burke Research and Economic Development Center
5101 Jordan Road
Erie, PA 16563
814-898-6125
engineering@psu.edu

<https://behrend.psu.edu/school-of-engineering> (<https://behrend.psu.edu/school-of-engineering/>)

Electrical Engineering Technology, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: Wilkes-Barre

Program Description

The Bachelor of Science graduate with a major in Electrical Engineering Technology (EET) is an engineering technologist who can bridge the gap between scientific advancement and practical electrical devices and systems. Research in all fields of electrical engineering has produced an abundance of new knowledge in recent years. Many of these advanced scientific achievements have been unused due to the shortage of engineering technologists specifically educated to convert scientific information into practical devices and systems.

The EET major helps equip students with the various skills necessary to adapt new scientific knowledge to new products. Technical selections are offered in the senior year to provide some degree of specialization, but all graduates receive a well-rounded basic education in electrical and electronic design principles. The strengths of the program include: an applied hands-on program; extensive laboratory experience; promising job placement; and accreditation by the Engineering Technology Accreditation Commission of the Accreditation Board for Engineering and Technology, 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone 410-347-7700, Web at <https://www.abet.org>.

EET graduates who wish to continue their professional development can take the Fundamentals of Engineering examination in Pennsylvania, a prerequisite for taking the Professional Engineering examination.

What is Electrical Engineering Technology?

Electrical engineering technology (EET) is an engineering technology field that implements and applies the principles of electrical engineering. Like electrical engineering, EET deals with the design, application, installation, manufacturing, operation or maintenance of electrical/electronic systems. However, EET is a specialized discipline that has more focus on application, theory, and applied design, and implementation, while electrical engineering may have more of a generalized emphasis on theory and conceptual design.

You Might Like This Program If...

- You enjoy problem-solving and math.
- You prefer practical rather than theoretical solutions, and application and implementation over conceptual modeling.
- You enjoy working on multidisciplinary teams on complex problems.
- You want to acquire knowledge to get a good job in industry.
- You want to pursue a career as a technologist in sectors such as manufacturing, product design, testing, or technical services and sales.

Direct Admission to the Major

Incoming first-year students who meet the program admission requirements are admitted directly into the major. Admission restrictions may apply for change-of-major and/or change-of-campus students.

For more information about the admission process for this major, please send a request to the college, campus, or program contact (listed in the Contact tab).

Degree Requirements

For the Bachelor of Science degree in Electrical Engineering Technology, a minimum of 128 credits is required:

Requirement	Credits
General Education	45
Electives	5-18
Requirements for the Major	86-96

18-21 of the 45 credits for General Education are included in the Requirements for the Major. For the General Electrical Engineering Technology Option, this includes: 3 credits of GWS courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS. For the Power and Automation Option, this includes: 3 credits of GWS courses; 9 credits of GN courses; 6 credits of GQ courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
CHEM 110	Chemical Principles I	3
CHEM 111	Experimental Chemistry I	1

EET 419	Capstone Proposal Preparation	1
<i>Prescribed Courses: Require a grade of C or better</i>		
EET 312	Electric Transients	4
EET 331	Electronic Design	4
EET 420W	Electrical Engineering Technology Capstone Design	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
Additional Courses		
CMPEH 472	Microprocessors	3-4
or CMPET 211	Embedded Processors and DSP	
EE 310	Electronic Circuit Design I	4
or EET 212W	Op Amp and Integrated Circuit Electronics	
Select 2-3 credits from the following:		2-3
EDSGN 100	Cornerstone Engineering Design	
EDSGN 100S	Introduction to Engineering Design	
EGT 119	Introduction to CAD for Electrical and Computer Engineering	
Select 3 credits from the following:		3
CMPSC 101	Introduction to Programming	
CMPSC 121	Introduction to Programming Techniques	
CMPSC 131	Programming and Computation I: Fundamentals	
CMPSC 201	Programming for Engineers with C++	
Select 3-4 credits from the following:		3-4
PHYS 150	Technical Physics I	
PHYS 211	General Physics: Mechanics	
PHYS 250	Introductory Physics I	
Select 3-4 credits from the following:		3-4
PHYS 151	Technical Physics II	
PHYS 212	General Physics: Electricity and Magnetism	
PHYS 251	Introductory Physics II	
Select 3-4 credits from the following:		3-4
IE 424	Process Quality Engineering	
MATH 220	Matrices	
MATH 230	Calculus and Vector Analysis	
MATH 250	Ordinary Differential Equations	
MATH/STAT 414	Introduction to Probability Theory	
MATH/STAT 418	Introduction to Probability and Stochastic Processes for Engineering	
STAT 200	Elementary Statistics	
STAT 401	Experimental Methods	
Select 4 credits from the following:		4
CMPEN 270	Digital Design: Theory and Practice	
CMPEN 271	Introduction to Digital Systems	
& CMPEN 275	and Digital Design Laboratory	
CMPET 117	Digital Electronics	
& CMPET 120	and Digital Electronics Laboratory	
Select 3-5 credits from the following:		3-5
EE 485	Energy Systems and Conversion	
EET 213W	Fundamentals of Electrical Machines Using Writing Skills	

EET 214	Electric Machines and Energy Conversion	
& EET 215	and Electric Machines and Energy Conversion Laboratory	
<i>Additional Courses: Require a grade of C or better</i>		
Select 5-8 credits from the following:		5-8
EE 210	Circuits and Devices	
& EE 317	and Circuits II and Data Acquisition	
EET 310	Direct and Alternating Current Circuits	
EET 311	Alternating Current Circuits	
& EET 114	and Electrical Circuits II ¹	
Requirements for the Option		
Select an option		26

¹ EET 114 does not require a grade of C or better.

Requirements for the Option
General Electrical Engineering Technology Option (26 credits)
Available at the following campuses: Harrisburg, Wilkes-Barre

Code	Title	Credits
Prescribed Courses		
ENGR 320Y	Design for Global Society	3
Additional Courses		
<i>System Elective</i>		
Select 8 credits of technical electives from the following:		8
EET 408	Communication System Design	
EET 409	Power System Analysis I	
EET 433	Control System Analysis and Design	
<i>Electronics Elective</i>		
Select 4 credits from the following:		4
EE 413	Power Electronics	
EET 402	High-Frequency Circuit Design	
EET 431	Advanced Electronic Design	
EET 461	Power Electronics	
EET 496	Independent Studies	
<i>GEET Technical Electives</i>		
Select 8 credits of GEET technical electives from the following:		8
CMPEN 431	Introduction to Computer Architecture	
CMPET 401	Data Communication and Networking	
CMPET 402	Data Communication and Networking Laboratory	
CMPET 403	Switching Circuit Design	
CMPET 412	Microcomputers	
EE 413	Power Electronics	
EE 442	Solid State Devices	
EE 453	Fundamentals of Digital Signal Processing	
EE/EGEE/ESC 456	Introduction to Neural Networks	
EE 458	Digital Image Processing and Computer Vision	
EET 402	High-Frequency Circuit Design	
EET 408	Communication System Design	
EET 409	Power System Analysis I	
EET 410	Power System Analysis II	
EET 413	Optoelectronics	
EET 414	Biomedical Instrumentation	

EET 431	Advanced Electronic Design
EET 433	Control System Analysis and Design
EET 456	Automation and Robotics
EET 461	Power Electronics
EET 478	Digital Communication Systems
EET 496	Independent Studies
<i>Science, Engineering, and Technology (SET Electives)</i>	
Select 3 credits from the following:	
BIOL 141	Introduction to Human Physiology
CHEM 112	Chemical Principles II
CHEM 113	Experimental Chemistry II
CMPSC 122	Intermediate Programming
CMPSC 132	Programming and Computation II: Data Structures
CMPSC 200	Programming for Engineers with MATLAB
CMPSC 201	Programming for Engineers with C++
CMPSC 312	Computer Organization and Architecture
EE 330	Engineering Electromagnetics
EE 341	Semiconductor Device Principles
EMCH 211	Statics
EMCH 212	Dynamics
EMCH 213	Strength of Materials
MATH 220	Matrices
MATH 230	Calculus and Vector Analysis
MATH 231	Calculus of Several Variables
MATH 232	Integral Vector Calculus
MATH 250	Ordinary Differential Equations
MATH 251	Ordinary and Partial Differential Equations
MATH 252	Partial Differential Equations
MATH 430	Linear Algebra and Discrete Models I
ME 201	Introduction to Thermal Science
ME 300	Engineering Thermodynamics I
PHYS 213	General Physics: Fluids and Thermal Physics
PHYS 214	General Physics: Wave Motion and Quantum Physics
PHYS 237	Introduction to Modern Physics
PHYS 462	Applications of Physics in Medicine
SSET 495	Internship
STAT 200	Elementary Statistics

Power and Automation Option (26 credits)*Available at the following campuses: Harrisburg, Wilkes-Barre*

Code	Title	Credits
Additional Courses		
System Electives		
Select 12 credits from the following:		12
EET 409	Power System Analysis I	
EET 410	Power System Analysis II	
EET 433	Control System Analysis and Design	
EET 461	Power Electronics	
EET 475	Intermediate Programmable Logic Controllers	
Additional Electives		
Select 14 credits from the following:		14

CMPET 401	Data Communication and Networking
CMPET 402	Data Communication and Networking Laboratory
CMPET 403	Switching Circuit Design
EET 341	Measurements and Instrumentation
EET 402	High-Frequency Circuit Design
EET 408	Communication System Design
EET 409	Power System Analysis I
EET 410	Power System Analysis II
EET 413	Optoelectronics
EET 414	Biomedical Instrumentation
EET 431	Advanced Electronic Design
EET 433	Control System Analysis and Design
EET 456	Automation and Robotics
EET 461	Power Electronics
EET 475	Intermediate Programmable Logic Controllers
EET 478	Digital Communication Systems
EET 495	Internship
EET 496	Independent Studies
EET 497	Special Topics
EMCH 211	Statics
EMCH 212	Dynamics
ME 201	Introduction to Thermal Science

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

Integrative Studies

- Inter-Domain Courses (Inter-Domain): 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses**. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The BS EET program educational objectives are to produce graduates who, during the first few years of professional practice, will be able to perform the following functions or activities at a level appropriate to their baccalaureate degree:

1. Accomplish mastery in electronics, electrical circuit analysis, electrical machines, and microcontrollers. Accomplish mastery in the design and implementation of at least two of these systems: control systems; communication systems; power systems.

2. Apply creativity using project-based work to design systems of processes for broadly defined and complex engineering problems.
3. Produce lucid documents, deliver effective oral presentations with professional quality graphics. Communicate effectively in a professional manner. Include the use of appropriate technical literature.
4. Design and conduct open-ended experiments for broadly defined and complex engineering problems. Analyze and interpret their results. This includes the use of appropriate instruments and simulation tools and the development of appropriate software code.
5. Effectively work in technical groups including functioning as their leader.

Student Outcomes

Graduates of the Electrical Engineering Technology program should demonstrate:

1. An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline.
2. An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline.
3. An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.
5. An ability to function effectively as a member as well as a leader on technical teams.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

Wilkes-Barre

Timothy Sichler

Assistant Teaching Professor
44 University Drive
Dallas, PA 18612
570-675-9135
tjs37@psu.edu

Harrisburg

AB Shafaye, M.S.
Program Chair

Olmsted Building, W256a
Middletown, PA 17057
717-948-6349
mes121@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

General Option: Electrical Engineering Technology, B.S. at Wilkes-Barre Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
CMPSC 101	3 CMPET 117	3
EDSGN 100	3 CMPET 120	1
EET 105	3 EET 114	4
ENGL 15 [‡]	3 EET 118	1
MATH 22 or higher placement on ALEKS	3 MATH 140 [†]	4
MATH 26 or higher placement on ALEKS	3 PHYS 150, 250, or 211 [†]	3-4
PSU 8	1	
19		16-17

Second Year

Fall	Credits Spring	Credits
MATH 141 [‡]	4 CHEM 110 [†]	3
PHYS 151, 251, or 212 [†]	3-4 CHEM 111 [†]	1
CMPET 211 (odd years)	0-3 EET 311 [*]	4
EET 212W (odd years)	0-4 ENGL 202C [‡]	3
EET 213W (even years)	0-5 General Education Course (GH)	3
General Education Course (GA)	3 General Education Course (Inter-Domain)	3
15-18		17

Third Year

Fall	Credits Spring	Credits
CAS 100A [‡]	3 EET 331 [*]	4
EET 312 [*]	4 GEET Technical Elective CMPET 401 (odd years) ³	0-3
CMPET 211 (odd years)	0-3 GEET Technical Elective CMPET 402 (odd years) ³	0-1
EET 212W (odd years)	0-4 System Elective EET 433 (odd years) ¹	0-4
EET 213W (even years)	0-5 Electronics Elective EET 413 (even years) ²	0-4

ENGR 320Y (even years) [†]	0-3 GEET Technical Elective EET 409 (even years) ³	0-4
SET Elective ⁴	3 General Education Course (GHW)	3

17-18 15

Fourth Year

Fall	Credits Spring	Credits
EET 419	1 EET 420W [†]	3
ENGR 320Y (even years) [†]	0-3 GEET Technical Elective CMPET 401 (odd years) ³	0-3
EET 400-Level Elective	4 GEET Technical Elective CMPET 402 (odd years) ³	0-1
System Elective ¹	4 System Elective EET 433 (odd years) ¹	0-4
MATH Requirement ⁵	3-4 Electronics Elective EET 413 (even years) ²	0-4
General Education Course (Inter-Domain)	3 GEET Technical Elective EET 409 (even years) ³	0-4
	General Education Course (Exploration/IL/US)	3

15-19 14

Total Credits 128-137

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ System Elective Course List (8 credits required): EET 408, EET 409, EET 433

² Electronics Elective Course List (4 credits required): EE 413, EET 402, EET 431, EET 461, EET 496

³ GEET Elective Course List (8 credits required): CMPEN 431, CMPET 401, CMPET 402, CMPET 403, CMPET 412, EE 413, EE 442, EE 453, EE 456, EE 458, EET 402, EET 408, EET 409, EET 410, EET 413, EET 414, EET 431, EET 433, EET 456, EET 461, EET 478, EET 496, EGEE 456, ESC 456

⁴ SET Elective Course List (3 credits required): BIOL 141, CHEM 112, CHEM 113, CMPSC 122, CMPSC 132, CMPSC 200, CMPSC 201, CMPSC 312, EE 330, EE 341, EMCH 211, EMCH 212, EMCH 213, MATH 220, MATH 230, MATH 231, MATH 232, MATH 250, MATH 251, MATH 252, MATH 430, ME 201, ME 300, PHYS 213, PHYS 214, PHYS 237, PHYS 462, SSET 495, STAT 200

⁵ MATH Requirement Course List (3 credits required): IE 424, MATH 230, MATH 250, MATH 414, MATH 418, STAT 200, STAT 401, STAT 414, STAT 418, MATH 220

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain)

requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Career Paths

According to the U.S. Bureau of Labor Statistics, electrical engineering technologists work closely with electrical and electronics engineers and computer hardware engineers in the computer systems design services industry. Opportunities can be found in a variety of firms engaged in electronic manufacturing, industrial control, applications engineering, and in power utilities. EET graduates are encouraged to continue their professional development by taking the Fundamentals of Engineering Examination at the end of their senior year; the FE exam is a prerequisite for taking the Professional Engineering Examination.

Careers

- Design, maintain, troubleshoot electronic circuits and systems. These range from power electronics, fiber optics, control systems, networking technologies, electronic systems, etc.
- Strong focus on power generation and distribution.
- Strong introduction to embedded systems.
- Automation of facilities: From distribution centers to manufacturing plants.
- Experience in the use of hardware used in instrumentation laboratories.
- This program trains students in the same software as currently used by industry.

Opportunities for Graduate Studies

Graduates of the EET program are eligible to pursue graduate studies in a variety of programs such as Electrical Engineering, Systems Engineering, Engineering Management, etc. In some cases prior to being accepted to these programs, graduates of the EET program may be required to take additional math courses.

Accreditation

The Bachelor of Science in Electrical Engineering Technology at Penn State Wilkes-Barre is accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electrical/Electronic(s) Engineering Technology and Similarly Named Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

Wilkes-Barre

ENGINEERING TECHNOLOGY AND COMMONWEALTH ENGINEERING
44 University Drive
Dallas, PA 18612
570-675-9135
tjs37@psu.edu

<https://wilkesbarre.psu.edu/academics/eet> (<https://wilkesbarre.psu.edu/academics/eet/>)

Harrisburg

SCHOOL OF SCIENCE, ENGINEERING, AND TECHNOLOGY
Olmsted Building W256
Middletown, PA 17057
717-948-4349
klb68@psu.edu

<https://harrisburg.psu.edu/science-engineering-technology/electrical-engineering-technology-bs> (<https://harrisburg.psu.edu/science-engineering-technology/electrical-engineering-technology-bs/>)

Electrical Engineering, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

Electrical Engineering (EE) is one of the broadest of all engineering majors and is much more than just building electrical circuits. Electrical engineering is the application of electronics, electrical science and technology, and computer systems to the needs of society. An electrical engineer is responsible for designing and integrating electronic/electrical systems in diverse industries such as defense, communications, transportation, manufacturing, health care, construction, and entertainment.

The mission of our undergraduate program is to provide a high-quality education in electrical engineering for our students and to instill in them the attitudes, values, and vision that will prepare them for lifetimes of success, continued learning, and leadership in their chosen careers. A combination of required and elective courses ensures that students acquire a broad knowledge base in electrical circuits, digital systems, electronic devices, electromagnetics, and linear systems, as well as expertise in one or more areas of specialization. Additional problem-solving skills and practical experience are developed through design projects and laboratory assignments, which also provide opportunities for developing team-building and technical communication skills.

What is Electrical Engineering?

Electrical engineering is a broad discipline of study that includes circuit design, analog and digital electronics, electromagnetics, electro-optics, control systems, power systems, communications, and signal/image processing. Electrical engineers study and apply physics and mathematics to design electrical and electronic systems and their components for a wide range of applications such as mobile phones, wireless communications, consumer electronics, computers, computer networks, power generation, machine learning, robotics, nanoelectronics, nanophotonics, bioelectronics, autonomous transportation, wearable electronics, and metamaterials.

You Might Like This Program If...

- You are good in math, physics and computer programming and want to use technical skills in these areas to solve real-world problems.
- You are intrigued by the many applications of electronics and electrical systems in our world.

- You want a degree that is very broad and can be applied to a wide range of career opportunities.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- 29-55 cumulative credits (excludes transfer and AP credits)
- completed with a grade of C or better: CMPSC 121 or CMPSC 131 or EDSGN 100; CHEM 110, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 2.60

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Electrical Engineering, a minimum of 127 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	109-111

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
EE 200	Design Tools	3
EE 300W	Design Process	3
EE 403W	Capstone Design	3
MATH 220	Matrices	2-3
PHYS 214	General Physics: Wave Motion and Quantum Physics	2

Prescribed Courses: Require a grade of C or better

CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EE 210	Circuits and Devices	4
EE 310	Electronic Circuit Design I	4
EE 330	Engineering Electromagnetics	4
EE 340	Introduction to Nanoelectronics	4
EE 350	Continuous-Time Linear Systems	4
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4

PHYS 212	General Physics: Electricity and Magnetism	4
----------	--	---

Additional Courses

Select 1 credit of First-Year Seminar	1
---------------------------------------	---

CMPSC 122	Intermediate Programming	3
-----------	--------------------------	---

or CMPSC 132	Programming and Computation II: Data Structures	
--------------	---	--

ECON 102	Introductory Microeconomic Analysis and Policy	3
----------	--	---

or ECON 104	Introductory Macroeconomic Analysis and Policy	
-------------	--	--

MATH 231	Calculus of Several Variables	4
----------	-------------------------------	---

& MATH 232	and Integral Vector Calculus	
------------	------------------------------	--

or MATH 230	Calculus and Vector Analysis	
-------------	------------------------------	--

Select 3 credits of the following:	3
------------------------------------	---

IE 424	Process Quality Engineering	
--------	-----------------------------	--

STAT 401	Experimental Methods	
----------	----------------------	--

STAT/MATH 414	Introduction to Probability Theory	
---------------	------------------------------------	--

STAT/MATH 418	Introduction to Probability and Stochastic Processes for Engineering	
---------------	--	--

Additional Courses: Require a grade of C or better

CAS 100A	Effective Speech	3
----------	------------------	---

or CAS 100B	Effective Speech	
-------------	------------------	--

or ENGL 138T	Rhetoric and Civic Life II	
--------------	----------------------------	--

CMPEN 271	Introduction to Digital Systems	4
-----------	---------------------------------	---

& CMPEN 275	and Digital Design Laboratory ¹	
-------------	--	--

or CMPEN 270	Digital Design: Theory and Practice	
--------------	-------------------------------------	--

CMPSC 121	Introduction to Programming Techniques	3
-----------	--	---

or CMPSC 131	Programming and Computation I: Fundamentals	
--------------	---	--

ENGL 15	Rhetoric and Composition	3
---------	--------------------------	---

or ENGL 30H	Honors Rhetoric and Composition	
-------------	---------------------------------	--

or ENGL 137H	Rhetoric and Civic Life I	
--------------	---------------------------	--

MATH 250	Ordinary Differential Equations	3-4
----------	---------------------------------	-----

or MATH 251	Ordinary and Partial Differential Equations	
-------------	---	--

Supporting Courses and Related Areas

Select 6 credits from program-approved list of 300-level courses	6
--	---

Select 3 credits from program-approved lists of 300-level or 400-level courses	3
--	---

Select 6 credits from program-approved list of 400-level courses	6
--	---

Select 6 additional credits, which may include up to 6 credits of ROTC, up to 6 co-op credits, and others from a program-approved list	6
--	---

¹ CMPEN 275 does not require a grade of C or better.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- **United States Cultures:** 3 credits
- **International Cultures:** 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Electrical Engineering and M.I.A. in International Affairs

Requirements for the Integrated B.S. in Electrical Engineering and M.I.A. in International Affairs can be found in the Graduate Bulletin (<https://bulletins.psu.edu/graduate/programs/majors/international-affairs/#integratedundergradgradprogramstext>).

Program Educational Objectives

The BSEE Program provides undergraduates with a broad technical education important for employment in the private or public sector, and it teaches them the fundamentals, current issues, and creative problem solving skills essential for future years of learning. At three to five years after graduation, we foresee our graduates able to accomplish the following:

1. Electrical engineering practice in technical assignments such as design, product development, research, manufacturing, consulting, testing, sales, and management;
2. Participation and leadership on teams comprised of individuals with diverse professional and cultural backgrounds;
3. Continued learning and professional development through such activities as graduate school, distance education, professional training, and membership in professional societies.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Electrical Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

David Salvia

Director of Academic Affairs

114 EE East

University Park, PA 16802

814-865-7227

dsalvia@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Electrical Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{**†}	3 CMPSC 121 or 131 ¹	3
EE 8 or 9 (or First Year Seminar) [†]	1 ECON 102 or 104 (GS) [†]	3
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 EDSGN 100 ^{*1}	3
MATH 140 or 140E (GQ) ^{*†#†}	4 MATH 141 or 141E (GQ) ^{*†#†}	4
PHYS 211 (PHYS 211L and PHYS 211R (GN)) ^{**†}	4 PHYS 212 (PHYS 212L and PHYS 212R (GN)) ^{*†}	4
	15	17

Second Year

Fall	Credits Spring	Credits
CMPEN 270 or 271 and 275 [*]	4 CAS 100A or 100B (GWS) ^{††}	3
CMPSC 122 or 132	3 EE 200	3
EE 210 [*]	4 EE 310 [*]	4
MATH 220	2-3 MATH 230	4
MATH 250 [*]	3 PHYS 214	2
	16-17	16

Third Year

Fall	Credits Spring	Credits
EE 330 [*]	4 EE 300W (Writing Intensive) [†]	3
EE 340 [*]	4 ENGL 202C (GWS) ^{††}	3
EE 350 [*]	4 EE/CMPEN 300-Level Elective	3
General Education Course [†]	3 EE/CMPEN 300-Level Elective	3
General Education Course (GHW) [†]	1.5 General Education Course [†]	3
	16.5	15

Fourth Year

Fall	Credits Spring	Credits
EE 403W	3 EE/CMPEN 400-Level Elective	3
EE/CMPEN 300/400-Level Elective	3 EE/CMPEN 400-Level Elective	3
Related Elective	3 Related Elective	3
Statistics Elective	3 General Education Course [†]	3
General Education Course [†]	3 General Education Course [†]	3
	General Education Course (GHW) [†]	1.5
	15	16.5

Total Credits 127-128

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ Completing one of EDSGN 100 or CMPSC 121 or CMPSC 131 is required for Entrance to Major.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain

attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **EE/CMPEN 300-Level Elective:** Select from department list.
- **EE/CMPEN 300/400-Level Elective:** Select from department list.
- **EE/CMPEN 400-Level Elective:** Select from department list.
- **Health and Physical Activity Elective:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Related Elective.
- **Related Elective:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for a Related Elective. Students who complete the Cooperative Education Program may substitute up to 6 co-op credits for the Related Electives.
- **Statistics Elective:** Select from department list.

Career Paths

CAREERS

An electrical engineer is responsible for designing and integrating electronic/electrical systems in diverse industries such as defense, communications, transportation, manufacturing, healthcare, construction, power/energy, and entertainment. Some graduates work as design engineers in research labs where they help design state-of-the-art electronic circuits, devices, and systems. Others work in a manufacturing environment where they help improve the manufacturing of existing products. Still others may work in post-production jobs where they deal with technical sales, field testing, or trouble shooting. Some graduates even serve as consultants who are hired by companies to help solve their technical problems.

Some examples of career opportunities include: circuit design for consumer electronics; design of power systems and industrial automation for manufacturing; design of communications systems; signal processing software and hardware development for audio and video applications; image processing and computer vision for medical imaging; software design and algorithm development for artificial intelligence, cyber security, and other big data analytics.

The average entry-level salary for electrical engineers is \$73,000.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ELECTRICAL ENGINEERING PROGRAM (<http://www.eecs.psu.edu/students/undergraduate/EECS-Students-Undergrad-EE-Specialization.aspx>)

Opportunities for Graduate Studies

A graduate degree can broaden your educational credentials and improve your marketability in the global workplace. Students who graduate with a Bachelor of Science Degree in Electrical Engineering are well-prepared to continue their technical education with a Master's or PhD degree in electrical engineering or related fields such as physics or computer

science and engineering. These technical graduate degrees prepare students for employment in research labs or higher education.

Penn State offers M.S. and Ph.D. degrees in Electrical Engineering and in Computer Science and Engineering. All of these graduate programs are highly recognized for producing graduates with strong academic credentials who can perform both theoretical and experimental research.

In addition to traditional technical degrees, some of our graduates opt to get professional degrees in medicine, law or business administration so that they can pursue careers in fields such as medical imaging, patent law, and engineering management.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.eecs.psu.edu/students/graduate/EECS-How-to-apply-EE.aspx>)

Professional Resources

- Penn State IEEE (<http://sites.psu.edu/psuieee/>)
- Eta Kappa Nu (<http://sites.psu.edu/hkneecs/>)
- Association of Women in Computing (<http://awc.cse.psu.edu/>)
- Penn State SPIE/OSA (<http://spie.ee.psu.edu/about.html>)
- Association for Computing Machinery (<https://acm.psu.edu/>)

Accreditation

The Bachelor of Science in Electrical Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electrical, Computer, Communications, Telecommunication(s), and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE
121 Electrical Engineering East
814-865-7667
gbr6@psu.edu

<http://eecs.psu.edu>

Electro-Mechanical Engineering Technology, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: Fayette, New Kensington, York

Program Description

The Electro-Mechanical Engineering Technology (B.S. EMET) degree program provides the basic undergraduate education required for a career as an electro-mechanical engineer. The program emphasizes a breadth of knowledge in all fields of engineering technology related to

typical, highly-automated manufacturing, production, or assembly plant processes. Basic coverage is provided in all major areas to technology involved in the operation and control of manufacturing and production processes, including instrumentation and monitoring methods, principles of machine design, automated control techniques, thermal and fluid sciences, computerized manufacturing systems, principles of electrical and electronic circuit operation, computer-aided drafting and design, economics of production, and statistical analysis and quality control.

The primary aim of the EMET program is to provide graduates with the knowledge and skills necessary to apply current methods and technology to the development, design, operation, and management of electro-mechanical systems, particularly in those industries where automated systems are prevalent.

The major is organized as a four-year baccalaureate program with the corresponding Penn State admission requirements. Graduates of an associate degree in either electrical or mechanical engineering technology from Penn State may re-enroll in the EMET program. The College of Engineering ENGR students may enroll through "Change of Major" procedures. Students from an engineering technology program at another institution or community college accredited by TAC of ABET may transfer into the program with advanced standing.

What is Electro-Mechanical Engineering?

The Bachelor of Science degree in Electro-Mechanical Engineering Technology responds to a growing demand for engineers with a broad range of technical skills. The program emphasizes knowledge in the field of technology related to the design, maintenance, and operation of electromechanical systems, essentially automation and robotics. These systems incorporate electronic, mechanical, instrumentation and control elements. The program provides students with hands-on experience with these elements, technical knowledge, and the soft skills needed to be successful in the field of engineering. In this curriculum, students receive early exposure to technology by scheduling technical courses in the major. A laboratory component that promotes the understanding of the subject matter through the experiential application of theory accompanies most technical courses. This program culminates with a senior capstone project in which students work together in a team to design and implement an engineering project from initial proposal through product demonstration.

You Might Like This Program If...

You are interested in math and science but prefer spending time applying your skills in a laboratory or field setting as opposed to studying the theory behind these subjects in a classroom setting. If you like to take things apart, to see how they work, this may be for you. There is a greater emphasis on engineering applications while building an understanding of scientific theory.

Direct Admission to the Major

Incoming first-year students who meet the program admission requirements are admitted directly into the major. Admission restrictions may apply for change-of-major and/or change-of-campus students.

For more information about the admission process for this major, please send a request to the college, campus, or program contact (listed in the Contact tab).

Degree Requirements

For the Bachelor of Science degree in Electro-Mechanical Engineering Technology, a minimum of 130 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	109-116

24 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 3 credits of GH courses; 9 credits of GN courses; 6 credits of GQ courses; 6 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CMPET 211	Embedded Processors and DSP	3
EDSGN 100	Cornerstone Engineering Design	3
EET 105	Electrical Systems	3
EET 275	Introduction to Programmable Logic Controls	3
EGT 114	Spatial Analysis and Computer-Aided Drafting	2
EMET 100	Computation Tools for Engineering Synthesis	1
EMET 215	Manufacturing Engineering	3
EMET 225	Applied Dynamics	2
EMET 325	Electric Drives	3
EMET 326	Mechanical Drives	3
EMET 405	Introduction to Thermal Science Systems	3
EMET 410	Automated Control Systems	4
IET 101	Manufacturing Materials, Processes, and Laboratory	3
IET 333	Engineering Economics for Technologists	2
STS/PHIL 233	Ethics and the Design of Technology	3
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPET 117	Digital Electronics	3
CMPET 120	Digital Electronics Laboratory	1
EET 114	Electrical Circuits II	4
EET 118	Electrical Circuits Laboratory	1
EET 212W	Op Amp and Integrated Circuit Electronics	4
EMET 222	Applied Mechanics	3
EMET 230	Computerized I/O Systems	3
EMET 330	Measurement Theory and Instrumentation	3
ENGL 202C	Effective Writing: Technical Writing	3
MET 111	Mechanics for Technology: Statics	3
Additional Courses		
EMET 350 or EMET 351	Quality Control, Inspection, and Design	2-3
EMET 403 & EMET 440 or EMET 441 & EMET 442	Electromechanical Design Project Preparation and Electro-Mechanical Project Design Mechatronics Project Design and Mechatronics Project Implementation	4

Select 3 credits from the following: 3

CMPSC 121	Introduction to Programming Techniques
CMPSC 131	Programming and Computation I: Fundamentals
CMPSC 200	Programming for Engineers with MATLAB
CMPSC 201	Programming for Engineers with C++

Select 6-8 credits of GN courses from two of the following groups: 6-8

Group 1

CHEM 110 & CHEM 111	Chemical Principles I and Experimental Chemistry I
------------------------	---

Group 2

PHYS 150	Technical Physics I
PHYS 211	General Physics: Mechanics
PHYS 250	Introductory Physics I

Group 3

PHYS 151	Technical Physics II
PHYS 212	General Physics: Electricity and Magnetism
PHYS 251	Introductory Physics II

Additional Courses: Require a grade of C or better

MATH 83	Technical Calculus ¹	4
or MATH 140	Calculus With Analytic Geometry I	
MATH 210	Calculus with Engineering Technology Applications	3-4
or MATH 141	Calculus with Analytic Geometry II	
MATH 250	Ordinary Differential Equations ²	3
or MATH 211	Intermediate Calculus and Differential Equations with Applications	

Select 3 credits from the following: 3

CAS 100	Effective Speech
CAS 100A	Effective Speech
CAS 100B	Effective Speech

Select 3-5 credits from the following: 3-5

MATH 26	Plane Trigonometry and Applications of Trigonometry
MATH 40	Algebra, Trigonometry, and Analytic Geometry
MATH 82	Technical Mathematics II ³

Supporting Courses and Related Areas

Select 3-4 credits of science courses, in consultation with an adviser, 3-4 from the approved department list

Select 6 credits of General Technical Elective courses, in consultation 6 with an adviser, from the approved department list

¹ Students taking MATH 83 must take MATH 210 and MATH 211.

² Note that MATH 250 does not carry a C-requirement.

³ Students taking MATH 81 and MATH 82 must take MATH 83.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education

Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

Integrative Studies

- Inter-Domain Courses (Inter-Domain): 6 credits

Exploration

- GN, may be completed with Inter-Domain courses: 3 credits
- GA, GH, GN, GS, Inter-Domain courses. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The educational objectives of the Electro-Mechanical Engineering Technology program are designed to prepare graduates who, within a few years after graduation, will:

1. Continue to develop and synthesize analytical skills in the specification, procurement, or integration of electromechanical systems.
2. Apply empirical skills in the safe operation, testing, or maintenance of electromechanical systems.
3. Collaborate effectively acting with the highest standards of professional integrity in project team activities through recognizing the global, societal, economical, and ethical contexts of their work.
4. Communicate persuasively ensuring a focus on technical excellence through the preparation and delivery of technical and non-technical documentation and communications.

Student Outcomes

Graduates of the Electro-Mechanical Engineering Technology program should demonstrate:

1. An ability to apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline.
2. An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline.
3. An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.
4. An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.
5. An ability to function effectively as a member as well as a leader on technical teams.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the

habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

Fayette

Nathaniel Bohna, Ph.D.

Program Coordinator, Associate Teaching Professor in Engineering
2201 University Drive
301A Eberly Building
Lemont Furnace, PA 15456
724-430-4109
nab141@psu.edu

New Kensington

Joseph Cuiffi, Ph.D.

Program Coordinator, Assistant Teaching Professor in Engineering
3550 Seventh Street Rd.
13 Tech. Bldg.
New Kensington, PA 15068
724-334-6730
jdc167@psu.edu

York

Harley H. Hartman, P.E.

Program Coordinator, Assistant Teaching Professor in Engineering
Main Classroom Building, Room 35
York, PA 17403
717-771-4097
hkh2@psu.edu

Altoona

Jordan Bittner

Program Coordinator, Instructor of Engineering
Learning Resources Center 145
3000 Ivyside Park
Altoona, PA 16601
814-949-5304
jls5991@psu.edu

Berks

Marietta Scanlon

Program Coordinator, Assistant Teaching Professor
Gaige 219
Reading, PA 19610
610-396-6126
BKElecMechEng@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Electro-Mechanical Engineering Technology, B.S. at Fayette Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year		
Fall	Credits Spring	Credits
EET 105	3 CMPET 117*	3
IET 101	3 CMPET 120*	1
EDSGN 100	3 MET 111*	3
EMET 100	1 EET 114*	4
MATH 26 ^{††}	3 EET 118*	1
ENGL 15 [†]	3 EGT 114	2
PSU 8	1 MATH 140*	4
	17	18

Second Year		
Fall	Credits Spring	Credits
EMET 222*	3 CMPSC 121	3
CMPET 211	3 EET 275	3
CAS 100A or 100B ^{††}	3 EET 212W*	4
MATH 210*	3 MATH 211*	3
General Education Course (GN)	3-4 General Education Course (GN)	3-4
General Education Course (GHW)	1.5 General Education (GHW)	1.5
	16.5-17.5	17.5-18.5

Third Year		
Fall	Credits Spring	Credits
EMET 215	3 EMET 230*	3
EMET 225	2 EMET 326	3
EMET 325	3 ENGL 202C ^{††}	3
EET 215 or IET 333	1-2 EMET 351 (or General Education Course)	2
General Education Course (GN)	3-4 Technical Elective	3-4
General Education Course	3 General Education Course	3
	15-17	17-18

Fourth Year		
Fall	Credits Spring	Credits
EMET 330*	3 EMET 405	3
EMET 403	1 EMET 440	3
EMET 410	4 Technical Elective	3
STS 233 [†]	3 General Education Course	3
General Education Course	3 EMET 351 (or General Education Course)	2
	14	14

Total Credits 129-134

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Program Notes:

- Approved Supporting Science courses (3-4 credits required): BIOL 110, CHEM 110 & 111, CHEM 112 & 113, EGEE 101, EGEE 102, GEOG 30N, PHYS 150, PHYS 151, PHYS 211, PHYS 212, PHYS 250, PHYS 251.
- Approved General Technical Elective courses (6 credits required): EGT 201, EMET 394, EMET 401, EMET 402, EMET 430, EMET 432, EMET 495, EMET 496, EMET 497, ENGR 310, ENTR 300, ENTR 320, IST 402, IST 431, IST 432, MATH 220, MATH 230, MATH 231, ME 300, ENGR 408, ENGR 405, ENGR 425, MGMT 301, MKTG 301, STAT 200. Additional courses may be petitioned in consultation with an adviser.
- Students who begin the math sequence beyond MATH 26 are required to replace the missing credits with General Technical Elective Courses.

Campus Advising Notes:

- Students can substitute Math 141 and Math 250 for Math 210 and Math 211.
- Approved Supporting Science course offered at Fayette include: CHEM 110 & 111, CHEM 112 & 113, EGEE 101, PHYS 211, PHYS 212, PHYS 250, PHYS 251.
- Approved General Technical Elective courses offered at Fayette include: EMET 495, EMET 497, MATH 220, MATH 230, MATH 231, STAT 200, ME 300, MGMT 301, and MKTG 301.

* Course requires a grade of C or better for the major

Electro-Mechanical Engineering Technology, B.S. at New Kensington Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
EDSGN 100	3 CMPET 117*	3
EET 105	3 CMPET 120*	1
MATH 26*	3 MET 111*	3
EMET 100	1 MATH 140*	4
ENGL 15 (GWS)*†	3 CAS 100A or 100B (GWS)*††	3
PSU 8	1 General Education Course	3
	14	17

Second Year

Fall	Credits Spring	Credits
EMET 222*	3 CMPSC 121	3
EGT 114	2 EET 114*	4
EET 275	3 EET 118*	1
IET 101	3 EMET 225	2
MATH 141*	4 ENGL 202C (GWS)*†	3
General Education Course (GN)	3 MATH 250	3
	18	16

Third Year

Fall	Credits Spring	Credits
EET 212W*	4 EMET 215	3
EMET 230*	3 EMET 325	3
EMET 326	3 EMET 330*	3
CMPET 211	3 EMET 350	3
General Health and Wellness (GHW)	1.5 STS 233	3
General Education Course	3 General Education Course	3
	17.5	18

Fourth Year

Fall	Credits Spring	Credits
EMET 405	3 EMET 440	3
EMET 410	4 IET 333	2
EMET 403	1 EMET Technical Elective	3
General Education Course	3 EMET Technical Elective	3
General Education Course (GN)	3 General Education Course	3
General Education Course (GHW)	1.5 General Education Course (GN)	3
	15.5	17

Total Credits 133

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Program Notes:

- Approved Supporting Science courses (3-4 credits required): BIOL 11 & 12, BIOL 110, BIOL 141, CHEM 110 & 111, CHEM 112 & 113, EGEE 101, EGEE 102, GEOG 30N, PHYS 150, PYHS 151, PHYS 211, PHYS 212, PHYS 250, PHYS 251.
- Approved General Technical Elective courses (6 credits required): EGT 201, EMET 394, EMET 401, EMET 402, EMET 430, EMET 432, EMET 495, EMET 496, EMET 497, ENGR 310, ENTR 300, ENTR 320, IST 402, IST 431, IST 432, MATH 220, MATH 230, MATH 231, ME 300, ENGR 408, ENGR 405, ENGR 425, MGMT 301, MKTG 301, STAT 200. Additional courses may be petitioned in consultation with an adviser.
- Students who begin the math sequence beyond MATH 26 are required to replace the missing credits with General Technical Elective Courses.

Campus Advising Notes:

- The required math courses offered at New Kensington include: Math 26, Math 140, Math 141, and Math 250.
- Approved Supporting Science course offered at New Kensington include: BIOL 141, CHEM 110 & 111, CHEM 112 & 113, EGEE 101, GEOG 30N, PHYS 150, PHYS 151, PHYS 211, PHYS 212, PHYS 250, PHYS 251.
- Approved General Technical Elective courses offered at New Kensington include: EMET 430, EMET 495, EMET 497, MATH 220, MATH 230, MATH 231, STAT 200, ME 300, MGMT 301, MKTG 301, and IST 402.

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Electro-Mechanical Engineering Technology, B.S. at York Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
EDSGN 100	3 CMPET 117*	3
IET 101	3 CMPET 120*	1
EET 105	3 MET 111*	3
MATH 26*	3 General Education Course	3
ENGL 15 or 30H	3 CAS 100A, 100B, or 100C (GWS) [†]	3
EMET 100	1 PHYS 150 (GN)	3
	16	16

Second Year

Fall	Credits Spring	Credits
EMET 222*	3 CMPET 211	3
EMET 225*	2 CMPSC 121, 131, or 201	3
EET 114*	4 EMET 215*	3
EET 118*	1 MATH 141*	4
EGT 114	2 ENGL 202C	3
MATH 140*	4 General Education Course (GHW)	1.5
	16	17.5

Third Year

Fall	Credits Spring	Credits
EET 212W*	4 EMET 325	3
EMET 230*	3 EMET 326	3
EET 275	3 EMET 330*	3
MATH 250	3 EMET 350	3
PHYS 151 (GN)	3 STS 233 (GH) [†]	3
	General Education Course	3
	16	18

Fourth Year

Fall	Credits Spring	Credits
EMET 403	1 EMET 405	3
CHEM 110 (GN)	3 EMET 440	3
CHEM 111 (GN)	1 Technical Elective	3
EMET 410	4 General Education Course	6
IET 333	2 General Education Course (GHW)	1.5
Technical Elective	3	
General Education Course	3	
	17	16.5

Total Credits 133

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Program Notes:

- Approved Supporting Science courses (3-4 credits required): BIOL 11 & 12, BIOL 110, BIOL 141, CHEM 110 & 111, CHEM 112 & 113, EGEE 101, EGEE 102, GEOG 30N, PHYS 150, PHYS 151, PHYS 211, PHYS 212, PHYS 250, PHYS 251.
- Approved General Technical Elective courses (6 credits required): EGT 201, EMET 394, EMET 401, EMET 402, EMET 430, EMET 432, EMET 495, EMET 496, EMET 497, ENGR 310, ENTR 300, ENTR 320, IST 402, IST 431, IST 432, MATH 220, MATH 230, MATH 231, ME 300, ENGR 408, ENGR 405, ENGR 425, MGMT 301, MKTG 301, STAT 200. Additional courses may be petitioned in consultation with an adviser.
- Students who begin the math sequence beyond MATH 26 are required to replace the missing credits with General Technical Elective Courses.

Campus Advising Notes:

- The required math courses offered at York include: Math 26, Math 140, Math 141, and Math 250.
- Approved Supporting Science course offered at York include: BIOL 141, CHEM 110 & 111, CHEM 112 & 113, PHYS 150, PHYS 151, PHYS 211, PHYS 212, PHYS 250, PHYS 251.
- Approved Supporting Science course offered the Web include: EGEE 101, GEOG 30N
- Approved General Technical Elective courses offered at York include: EMET 430, EMET 495, EMET 497, MATH 220, MATH 230, MATH 231, STAT 200, ME 300, MGMT 301, MKTG 301, IST 402 and IST 432.

Career Paths

The inclusion of both electrical and mechanical coursework in the EMET program makes our students highly marketable to employers.

EMET graduates may pursue engineering work that entails design, prototyping, testing, operation, or maintenance of equipment. Others may work in the areas of research and development, quality control, inspection of procedures and processes, manufacturing, or sales and service. These careers could be in a variety of industries including aerospace, agriculture, automotive, communications, computers, construction, energy, pharmaceuticals, plastics, or robotics to name a few.

* Course requires a grade of C or better for the major

† Course requires a grade of C or better for General Education

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ELECTRO-MECHANICAL ENGINEERING PROGRAM (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Students may choose to further their engineering education through graduate school. EMET graduates are prepared to continue their education into technical or professional Master's Degree programs. Graduate program admissions requirements vary by program and institution. Students intending to pursue this academic path are encouraged to investigate intended programs of interest early in their studies to tailor their course choices during their undergraduate studies.

Since the EMET program is ABET ETAC-accredited, EMET graduates are candidates to sit for the Fundamental of Engineering (FE) Exam, the first step in the engineering licensure process. Acceptable accreditation standards vary from state to state for professional licensure, so students must verify their state's requirements.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.engr.psu.edu/graduate-programs/>)

Accreditation

The Bachelor of Science in Electro-Mechanical Engineering Technology at Penn New Kensington, Penn State York, and Penn State Fayette is accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Electromechanical Engineering Technology and Similarly Named Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-865-2952

<https://www.sedi.psu.edu/>

Fayette

ELECTRO-MECHANICAL ENGINEERING TECHNOLOGY
2201 University Drive
Lemont Furnace, PA 15456
724-430-4109
nab141@psu.edu

<https://fayette.psu.edu/academics/baccalaureate/electro-mechanical-engineering-technology> (<https://fayette.psu.edu/academics/baccalaureate/electro-mechanical-engineering-technology/>)

New Kensington

ELECTRO-MECHANICAL ENGINEERING TECHNOLOGY
3550 Seventh Street Rd.
New Kensington, PA 15068

724-334-6730
jdc167@psu.edu

<https://newkensington.psu.edu/academics/4-year-electro-mechanical-engineering-technology> (<https://newkensington.psu.edu/academics/4-year-electro-mechanical-engineering-technology/>)

York

ELECTRO-MECHANICAL ENGINEERING TECHNOLOGY
1031 Edgecomb Avenue
York, PA 17403
717-771-4097
hhh2@psu.edu

<https://www.york.psu.edu/academics/baccalaureate/electro-mechanical-engineering-technology> (<https://www.york.psu.edu/academics/baccalaureate/electro-mechanical-engineering-technology/>)

Altoona

DIVISION OF BUSINESS, ENGINEERING, AND INFORMATION SCIENCES AND TECHNOLOGY
Learning Resources Center 145
3000 Ivyside Park
Altoona, PA 16601
814-949-5304
jls5991@psu.edu

<https://altoona.psu.edu/academics/bachelors-degrees/electro-mechanical-engineering-technology> (<https://altoona.psu.edu/academics/bachelors-degrees/electro-mechanical-engineering-technology/>)

Berks

EBC DIVISION
Gaige Building
Reading, PA 19610
610-396-6126
BKElecMechEng@psu.edu

<https://berks.psu.edu/academics/bs-electro-mechanical-engineering-technology> (<https://berks.psu.edu/academics/bs-electro-mechanical-engineering-technology/>)

Engineering and Community Engagement, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

A certificate in Engineering and Community Engagement is proposed for students in the College of Engineering. This certificate is intended to acknowledge students who have gained proficiency in design, research and application of appropriate technologies for use in serving communities in the U.S. and abroad while stressing an awareness of the cultural context of such engineering activities. Collaborations with communities are strongly encouraged along with emphasis on the importance of ethical considerations in collaborating/working in community settings. All students in good academic standing are eligible for admission to the program.

What is Engineering and Community Engagement?

Engineering and Community Engagement focuses on combining design, research, and engineering principles to address needs of communities in the U.S. and abroad, all while stressing cultural awareness, sustainability, innovation, and teamwork.

You Might Like This Program If...

- You would like to partner with communities to make a difference.
- You would like to explore and implement solutions to real problems.
- You would like to lead design and build teams.
- You would like to broaden your perspectives by collaborating with community stakeholders.
- You would like to develop professional skills.

Program Requirements

To earn an undergraduate certificate in Engineering and Community Engagement, a minimum of 12 credits is required.

Code	Title	Credits
Prescribed Courses		
EDSGN 352		
EDSGN 452	Projects in Humanitarian Engineering	2
ENGR 496	Independent Studies	1-18
YFE 211		3
Select one of the following:		1-18
EDSGN 395	Internship	
ENGR 408	Leadership Principles	
ENGR 411	Entrepreneurship Business Basics	
ENGR 425	New Venture Creation	
ENGR 493	Individual Leadership Experience	

Core requirements for the certificate program include courses in both:

1. Community Engagement, and
2. U.S. and International Cultures.

These courses may be scheduled to satisfy general education requirements (GS/GH/US/IL) depending on the courses selected. Beyond that, students have various course options available to them to complete the 12-credit requirement for the certificate including project-based courses in:

1. design,
2. entrepreneurship, and
3. leadership.

Students will be strongly encouraged to meet with the program director to discuss and formulate their program of study in the certificate program.

Prerequisites Required.

Certificate Learning Objectives

- **Appropriate Technologies:** Students will identify, understand and employ appropriate technologies commonly of use in marginalized communities when designing solutions.

- **Engineering Cultures:** Students will identify and utilize a variety of stakeholders and resources to provide pertinent cultural, political, economic and historical perspectives on community-based engineering design projects.
- **Engineering Design:** Students will demonstrate competency in use of the design process to provide technical solution(s) to problem(s) experienced by marginalized communities.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

John Gershenson

Director of Humanitarian Engineering and Social Entrepreneurship and Teaching Professor
213R Hammond Building
University Park, PA 16802
gersh@psu.edu

Career Paths

Careers

Penn State students with a Certificate in Engineering and Community Engagement have been successful in establishing careers in a wide variety of engineering, research, and education fields.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A CERTIFICATE IN ENGINEERING AND COMMUNITY ENGAGEMENT (<http://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Students interested in advancing their Engineering and Community Engagement knowledge may be interested in the School of Engineering Design and Innovation's graduate offerings in Engineering Design or Engineering Leadership and Innovation Management or numerous other advanced engineering studies offered by the College of Engineering.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.sedi.psu.edu/academics/graduate/>)

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-863-2587

sedtappcourses@psu.edu

<https://www.sedi.psu.edu/>

Engineering Design with Digital Tools, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

The Engineering Design with Digital Tools (EDDiT) certificate is a 13-credit certificate that enables students to specialize in digital design tools. This provides students with the opportunity to more fully develop their CAD and design skills, which are highly sought after by industry. Students are required to take at least one section of Engineering Design and Analysis with CAD (EDSGN 468), with each course section offering a different software package, such as SolidWorks, AutoCAD, or Catia. The certificate culminates in the preparation of a portfolio, through which students document and display their design work in a professional manner. Students must earn a C grade or better in each prescribed and additional course or independent study or pursue a replacement option.

What is Engineering Design?

Engineering Design is based on the concept of integrating ideas, disciplines, people, and resources within engineering and beyond that are necessary to achieve optimal design solutions for products, systems, processes, and services.

You Might Like This Program If...

- You are interested in learning about new design methods.
- You would like to learn more about interdisciplinary applications of design such as sustainability, innovative design, design for human variability, global design, and affective design.
- You are interested in interdisciplinary integrated design involving two or more distinct fields of knowledge.
- You would like to develop a portfolio of your design projects.

Program Requirements

To earn an undergraduate certificate in Engineering Design with Digital Tools, a minimum of 13 credits is required.

Code	Title	Credits
Required Courses		
EDSGN 100	Cornerstone Engineering Design	3
EDSGN 468	Engineering Design and Analysis with CAD	3
EDSGN 485	Engineering Design Portfolio	1
Select 6 credits from the following or from an approved list maintained by the program:		6
EDSGN 110	Spatial Analysis in Engineering Design	
EDSGN 210	Tolerancing and Spatial Models	
EDSGN 462	Introduction to Design for Additive Manufacturing	
EDSGN 468	Engineering Design and Analysis with CAD	
EMCH 461	Finite Elements in Engineering	

Non-Course Requirements:

- Students must take one but no more than two courses designated EDSGN 468. If taking two courses designated EDSGN 468, each must cover a different software package.
- No fewer than 7 credits must be completed at the 400-level or above. A list of approved courses will be maintained by the certificate director.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Elizabeth Starkey

Assistant Teaching Professor of Engineering Design
213 Hammond Building
University Park, PA 16802
814-865-2952
ems413@psu.edu

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-863-2587
sedtappcourses@psu.edu

<https://www.sedi.psu.edu/>

Engineering Design, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

The certificate provides an opportunity to pursue a specialization in engineering design; offering an incentive to take more courses in design and participate in more design projects, thereby improving employment prospects. Students must earn a C grade or better in each prescribed or additional course or independent study or pursue a replacement option. A minimum of 7 credits of required courses and an additional 6 credits of supporting courses minimum (at 400-level or above) are needed for completion of the certificate.

What is Engineering Design?

Engineering Design is based on the concept of integrating ideas, disciplines, people, and resources within engineering and beyond that are necessary to achieve optimal design solutions for products, systems, processes, and services.

You Might Like This Program If...

- You are interested in learning about new design methods.
- You would like to learn more about interdisciplinary applications of design such as sustainability, innovative design, design for human variability, global design, and affective design.
- You are interested in interdisciplinary integrated design involving two or more distinct fields of knowledge.
- You would like to develop a portfolio of your design projects.

Program Requirements

To earn an undergraduate certificate in Engineering Design, a minimum of 13 credits is required.

Code	Title	Credits
Prescribed Courses		
EDSGN 100	Cornerstone Engineering Design	3
EDSGN 367	Design Thinking and Making	3
EDSGN 485	Engineering Design Portfolio	1
Supporting Courses		
In addition to the required courses, students must taken a minimum of 6 credits of supporting courses, such as EDSGN 4XX or other 400-level courses with approval from the Certificate Director. ¹		6

¹ With approval from the Certificate Director, any course of 3 credits or more at the 400-level or above that can be shown to have a majority of content devoted to engineering design projects, and that has been completed with a semester grade of at least C, can be counted towards the certificate's 6 credits of supporting courses.

Non-Course Requirements

No fewer than 6 credits of supporting courses must be completed at the 400-level or above. Up to 3 of these credits may be obtained through pre-approved co-op (400-level) experiences that are primarily design work. Other examples of courses that would satisfy the certificate (in addition to the prescribed courses include any of the EDSGN 400 level courses offered by the School of Engineering Design and Innovation. In addition, the Director of the Certificate will maintain a list of courses that have been approved previously for the certificate.

Certificate Learning Objectives

- Students will demonstrate an application of an iterative design process to conceptualize and prototype an innovative solution to an engineering problem.
- Students will critically define a problem and evaluate appropriateness of proposed solutions, considering users of an intended design and other stakeholders affected by a designed intervention.
- Students will document the progressive stages of their work, not only within various single projects, but also indicating increased sophistication and responsibility in their roles from one project to the next, in a portfolio suitable for presentation to a professional engineering practice as evidence of experience and competencies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Elizabeth Starkey

Assistant Teaching Professor of Engineering Design
322 Engineering Design and Innovation Building
University Park, PA 16802
814-865-2952
ems413@psu.edu

Career Paths

Careers

Penn State students with a Certificate in Engineering Design have been successful in establishing careers in a wide variety of engineering, research, and education fields.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A CERTIFICATE IN ENGINEERING DESIGN (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Students interested in advancing their Engineering Design knowledge may be interested in the School of Engineering Design and Innovation's graduate offerings in Engineering Design or Engineering Leadership and Innovation Management or numerous other advanced engineering studies offered by the College of Engineering.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.sedi.psu.edu/academics/graduate/>)

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
307 Engineering Design and Innovation Building
University Park, PA 16802
814-863-2587
sedicourses@psu.edu

<https://www.sedi.psu.edu>

Engineering Design, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change

from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

To address design responsibilities necessary for engineering graduates, the engineering design minor develops design skills in students through a series of core project-based design courses supplemented by general electives in their discipline or related field. Through team-based projects, students apply engineering design processes to address design opportunities, from exploration of the problem space through exploration of the solution space. By focusing on different elements of a design process (e.g., defining and exploring the problem vs. identifying, prototyping, and evaluating design solutions), but covering in totality, the minor's courses complement each other and provide students with a deeper understanding of engineering design. Specific areas of emphasis in this minor include problem framing, stakeholder engagement, human-centered design, rapid prototyping, prototyping to validate assumptions, systems-level design and professional communication. The tools and techniques developed in this minor should be broadly applicable to various engineering disciplines.

What is Engineering Design?

Engineering Design is based on the concept of integrating ideas, disciplines, people, and resources within engineering and beyond that are necessary to achieve optimal design solutions for products, systems, processes, and services.

You Might Like This Program If...

- You are interested in learning about new design methods.
- You would like to learn more about interdisciplinary applications of design such as sustainability, innovative design, design for human variability, global design, and affective design.
- You are interested in interdisciplinary integrated design involving two or more distinct fields of knowledge.
- You would like to develop a portfolio of your design projects.

Entrance to Minor

For admission into the minor, students must have completed EDSGN 100 and EDSGN 367.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A minimum of 18 credits is required for completion of the minor with no fewer than 9 credits at the 400-level or above.

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
EDSGN 100	Cornerstone Engineering Design	3

EDSGN 367	Design Thinking and Making	3
EDSGN 467	Prototyping to Launch	3
EDSGN 485	Engineering Design Portfolio	1

Additional Courses

Additional Courses: Require a grade of C or better

Select 6-8 credits from the following courses: 6-8

EDSGN 270	Summers by Design: An International Engineering Design Experience
EDSGN 452	Projects in Humanitarian Engineering
EDSGN 453	Design for Developing Communities
EDSGN 462	Introduction to Design for Additive Manufacturing
EDSGN 468	Engineering Design and Analysis with CAD
EDSGN 494	Research Project
EDSGN 496	Independent Studies
ENGR/WFED 405	Project Management for Professionals
ENGR 310	Entrepreneurial Leadership
ENGR 407	Technology-Based Entrepreneurship
ENGR 408	Leadership Principles
ENGR 409	Leadership in Organizations
ENGR 422	Leadership of International Virtual Engineering Teams

Supporting Courses and Related Areas

Supporting Courses and Related Areas: Require a grade of C or better

None specified. In consultation with the minor director, students may receive up to 2 course credits for an approved course in support of their engineering design minor.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Elizabeth Starkey

Assistant Teaching Professor of Engineering Design
322 Engineering Design and Innovation Building
University Park, PA 16802
814-865-2952
ems413@psu.edu

Career Paths

Careers

Penn State students with a Minor in Engineering Design have been successful in establishing careers in a wide variety of engineering, research, and education fields.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN ENGINEERING DESIGN (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Students interested in advancing their Engineering Design knowledge may be interested in the School of Engineering Design and Innovation's graduate offerings in Engineering Design or Engineering Leadership and Innovation Management or numerous other advanced engineering studies offered by the College of Engineering.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.sedi.psu.edu/academics/graduate/>)

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
307 Engineering Design and Innovation Building
University Park, PA 16802
814-863-2587
sedicourses@psu.edu

<https://www.sedi.psu.edu>

Engineering Leadership Development, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

This interdisciplinary minor is designed to provide engineering students with critical principles and skills. Engineering graduates must demonstrate the ability to assume leadership roles in a competitive technologically complex global society. There are increasing demands for engineers to be able to deal effectively with other people, including the ability to work in teams and to interact with customers and other organizations on both national and international levels. Students will employ engineering case studies in active and collaborative classroom settings to develop these skills. The minor consists of 18 semester hours. Students in all engineering majors are eligible.

What is Engineering Leadership Development?

The Engineering Leadership Development (ELD) program focuses on providing a challenging, relevant, and dynamic world-class program that further engages students in their education while preparing them for leadership roles in a technical work environment. Courses in engineering leadership provide you with the understanding of individual, team, and organizational leadership; business acumen, global competencies and

multicultural awareness; and innovation and management. Skill sets of effective leaders are practiced in local and virtual international teams aimed at designing and building practical solutions.

You Might Like This Program If...

- You are interested in developing your leadership potential and business acumen.
- You would like to increase your multicultural awareness and global competencies.
- You would like to enhance your innovation and management skills.

Entrance to Minor

For admission to the minor, students must have completed ENGR 408. Students should apply during their sophomore year.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
ENGR 407	Technology-Based Entrepreneurship	3
ENGR 408	Leadership Principles	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select two courses from this group:		6
ENGR 405	Project Management for Professionals	
ENGR 409	Leadership in Organizations	
ENGR 422	Leadership of International Virtual Engineering Teams	
ENGR 496	Independent Studies	
Supporting Courses and Related Areas		
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 6 credits in consultation with the coordinator of the Engineering Leadership Development Minor		6

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary

academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Meredith Handley

213 Hammond Building
University Park, PA 16802
814-863-2587
ENGRLeadership@engr.psu.edu

Wilkes-Barre

Salvatore Marsico
Associate Professor
44 University Drive
Dallas, PA 18612
570-675-9125
sam4@psu.edu

Career Paths

Careers

Penn State students with a minor in Engineering Leadership Development have been successful in establishing careers as team leaders, managers, and entrepreneurs, in a wide variety of engineering, research, and education fields.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN ENGINEERING LEADERSHIP DEVELOPMENT (<https://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Students with a minor in Engineering Leadership Development may be interested in the School of Engineering, Technology, and Professional Programs' Master of Engineering in Engineering Leadership and Innovation Management, graduate certificate in Engineering Leadership in Innovation Management, or graduate minor in Engineering Leadership in Innovation Management or numerous other advanced engineering studies offered by the College of Engineering.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.sedi.psu.edu/academics/graduate/>)

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-863-2587
sedtappcourses@psu.edu

<https://www.sedi.psu.edu/>

Wilkes-Barre

44 University Drive
Dallas, PA 18612
570-675-9125
sam4@psu.edu

<https://wilkesbarre.psu.edu/academics/minors/engineering-leadership>
(<https://wilkesbarre.psu.edu/academics/minors/engineering-leadership/>)

Engineering Mechanics, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The Engineering Mechanics minor helps students prepare to analyze and/or design simple structures that are efficient and safe under foreseen loading conditions.

Contemporary engineering design of mechanical components requires precise information and modern analysis techniques to determine material response to anticipated loading. Designers must have the analytical and experimental tools to accurately define deformation under load to characterize dynamic response and to prevent mechanical failure. In the event of failure the cause(s) must be ascertained to prevent future failure through redesign and/or material substitution. Thus, industry has a real need for those with a sound foundation in Engineering Mechanics, the engineering science that deals with the effects of forces and torques on rigid and deformable bodies. Engineering Mechanics consists of Statics (bodies in equilibrium), Dynamics (bodies in unsteady motion such as vibration, moving on curvilinear paths) and the Mechanics of Deformable Media. The latter topic covers the change in dimensions of bodies of various shapes under the influence of forces, torques, temperature, and dynamic motion. Further failure criteria under such loadings are introduced and utilized in examples of engineering design. Some twenty undergraduate courses covering the above topics are available at two levels, i.e. sophomore introductory and senior (400) courses.

What is Engineering Mechanics?

Engineering mechanics is the engineering science that deals with the effects of forces and torques on particles, rigid bodies, or deformable media. Mechanics is typically subdivided into statics, dynamics, and mechanics of deformable bodies. The Engineering Mechanics minor is for undergraduates who wish to supplement their engineering backgrounds with extensive study in mechanics. The high-tech industry has a significant need for individuals with a sound background in engineering mechanics. Industries such as aerospace, automotive, power, structures, and appliance regularly hire graduates who are competent in engineering mechanics.

You Might Like This Program If...

- You wish to supplement your engineering background with extensive study in mechanics.
- You enjoyed your introductory courses in Statics, Dynamics, and Mechanics of Materials and would like to learn more.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules->

for-undergraduate-students/59-00-minors-and-certificates/#59-10). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Supporting Courses and Related Areas		
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Select 12 credits of EMCH courses, which may include the following:		12
EMCH 211	Statics	
EMCH 212	Dynamics	
EMCH 213	Strength of Materials	
EMCH 315	Mechanical Response of Engineering Materials	
EMCH 316	Experimental Determination of Mechanical Response of Materials	
Select 6 credits from 400-level EMCH courses		6

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Mark Horn

Professor

305C Earth and Engineering Sciences Building

University Park, PA

814-865-0332

mwh4@psu.edu

Career Paths

The high-tech industry has a significant need for individuals with a sound background in engineering mechanics. Industries such as aerospace, automotive, power, structures, and appliance regularly hire graduates who are competent in engineering mechanics. Graduate students in engineering science and mechanics conduct innovative research with a diverse, award-winning faculty on interdisciplinary programs that address society's grand challenges.

Careers

Penn State engineering science and mechanics alumni are successful entrepreneurs, business executives, captains of industry, leaders in national laboratories, startup founders, physicians, professors, and academic officials. Starting salaries for engineering science graduates in past years have been among the highest for all graduates in the College of Engineering.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN ENGINEERING MECHANICS (<http://www.esm.psu.edu/academics/resources/career-resources.aspx>)

Opportunities for Graduate Studies

The ESM department offers the following graduate degree options:

- Master of Engineering (M.Eng.) in Engineering Mechanics
- Master of Engineering (M.Eng.) in Additive Manufacturing
- Master of Science (M.S.) in Engineering at the Nano-scale
- Master of Science (M.S.) in Engineering Science and Mechanics
- Master of Science (M.S.) in Additive Manufacturing
- Doctor of Philosophy (Ph.D.) in Engineering Science and Mechanics
- Doctor of Medicine and Doctor of Philosophy in Engineering Science and Mechanics (M.D./Ph.D.)
- Graduate Certificate in Laser-Materials Processing and Laser-Based Manufacturing

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.esm.psu.edu/academics/graduate/prospective-students.aspx>)

Contact

University Park

DEPARTMENT OF ENGINEERING SCIENCE AND MECHANICS

212 Earth and Engineering Sciences Building

University Park, PA 16802

814-865-4523

mwh4@psu.edu

<http://www.esm.psu.edu/>

Engineering Science, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

Engineering Science is a multidisciplinary honors program that emphasizes enhanced understanding and integrated application of engineering, scientific, and mathematical principles. The program is unique because it provides 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 a research and design 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 and chemistry - (and biology for students in premedicine), students study thermodynamics, heat transfer, electromagnetics, solid and fluid mechanics, electrical devices, materials science, and topics selected as foundational and technical electives. During the junior year, students investigate a variety of research fields and identify a topic for their honor thesis research and design project. During the senior year, all students complete a capstone project on their chosen topic by writing a thesis that applies the scientific principles of research, design and analysis to engineering. Focus areas of study include, but are not limited to: electrical, mechanical, civil, biomedical, and materials engineering and are expected to be 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 specific program objectives are tied to the mission of the program as described above. They target the major outcomes expected of Engineering Science students and are flexible and readily adaptable to meet changing constituent needs.

Enrollment is limited to students who have demonstrated that they can benefit from the advanced courses of the curriculum; therefore a minimum grade-point average of 3.0 is required. Qualified students can participate in the integrated undergraduate graduate (IUG) program to streamline the process of earning B.S. and M.S. degrees. Interested students should contact their academic adviser.

What is Engineering Science?

Engineering science is a broad discipline that encompasses many different scientific principles and associated mathematics that underlie engineering. It integrates engineering, biological, chemical, mathematical, and physical sciences with the arts, humanities, social sciences, and the professions to tackle the most demanding challenges and advance the well-being of global society. The unique knowledge and interdisciplinary skill set of engineering scientists allows them to merge multidisciplinary resources to propose and develop innovative, enduring solutions and transform the latest scientific discoveries into enabling new technologies. Engineering scientists research, develop, and design new materials, devices, sensors, and processes for a diverse range of applications.

You Might Like This Program If...

- You are interested in, and excel at, science and math, and want to use your skills in these areas to research, develop, and design new products and processes in a wide variety of fields.
- You are interested in merging multidisciplinary resources to propose and develop innovative, enduring solutions and transforming the latest scientific discoveries into enabling new technologies.
- You're seeking to link science with the engineering disciplines such as electrical, mechanical, chemical, civil, and biomedical.
- You want an engineering curriculum and degree that you can tailor to your interests including research at the undergraduate level.
- You are in the Schreyer Honors College and want a curriculum that will automatically satisfy all requirements of the Honors College.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- 29-55 cumulative credits (excludes transfer and AP credits)
 - completed with a grade of C or better: EDSGN 100, CHEM 110, MATH 140, MATH 141, PHYS 211
 - earned a minimum cumulative grade-point average (GPA) of 3.00
- * In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.
- * Since Engineering Science is an honors program, admission is limited to students who attain a cumulative GPA of at least 3.0 by the end of the entrance to major semester. In the event that the major is under

enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Engineering Science, a minimum of 131 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	113

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

For the non-Honors B.S. degree in Engineering Science, 131 credits and a 2.50 grade-point average are required. The Honors degree requires the same number of total credits but a minimum of 16 honors Jr./Sr. year credits and a higher grade-point average as determined by the faculty.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CHEM 111	Experimental Chemistry I	1
EE 210	Circuits and Devices	4
EMCH 302H	Thermodynamics, Heat Conduction, and Principles of Modeling, Honors	4
ESC 312	Engineering Applications of Wave, Particle, and Ensemble Concepts	3
ESC 409	Senior Research and Design Project Preparation, Honors	1
ESC 410		3
ESC 411	Senior Research and Design Project II, Honors	2
ESC 433	Engineering Science Research Laboratory Experience	1
MATH 220	Matrices	2
MATH 230	Calculus and Vector Analysis	4
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
<i>Prescribed Courses: Require a grade of C or better</i>		
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
ENGL 202C	Effective Writing: Technical Writing	3
ESC 404	Analysis in Engineering Science	3
ESC 407	Computer Methods in Engineering Science, Honors	3
ESC 414M	Elements of Material Engineering	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 251	Ordinary and Partial Differential Equations	4

PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4

Additional Courses

Select 1 credit of First-Year Seminar	1
---------------------------------------	---

CMPSC 201	Programming for Engineers with C++	3
or ESC 261M	Computational Methods in Engineering	

Select one of the following:	3
------------------------------	---

ECON 14	Principles of Economics	
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	

Additional Courses: Require a grade of C or better

CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	

EMCH 210H	Statics and Strength of Materials, Honors	5
or EMCH 210	Statics and Strength of Materials	

EMCH 212H	Dynamics	3
or EMCH 212	Dynamics	

ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	

Supporting Courses and Related Areas

Select 15 credits from the department Foundational Elective List	15
--	----

Select 12 credits from the department Technical Elective List ¹	12
--	----

¹ Students may apply 3 credits of ROTC or 3 credits of co-op experience.**General Education**

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements**First Year Engagement**

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Integrated B.S. in Engineering Science and M.S. in Engineering Science and Mechanics

Requirements for the Integrated B.S. in Engineering Science and M.S. in Engineering Science and Mechanics can be found in the Graduate Bulletin (<https://bulletins.psu.edu/graduate/programs/majors/engineering-science-mechanics/#integratedundergradgradprogramtext>).

Program Educational Objectives

The expected accomplishments of Engineering Science graduates in the first several years following graduation are:

1. acquire and apply new knowledge through lifelong learning activities including, but not limited to, masters, doctorate, medical, and law degrees, continuing education, leadership development, management training, innovation/entrepreneurship, 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 in industry, academia and government;
3. research, develop, design and/or utilize new products, processes, materials, devices, systems, and/or tools;
4. communicate findings and best practices, at conferences and meetings, and to the general public through presentations, technical publications (journals, reports, memoranda), patents, and other media;
5. apply ethically and professionally the principles and latest tools of engineering, science, and mathematics for the benefit of society;
6. participate in and promote the values of diversity and sustainability in society; and
7. encourage and foster future generations of engineers through mentoring, service, and outreach.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Engineering Science program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the

habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Gary L. Gray
Associate Professor
212 Earth and Engineering Sciences Building
University Park, PA 16802
814-863-1778
gray@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Engineering Science, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year		
Fall	Credits Spring	Credits
CHEM 110 (GN) ^{**†}	3 CHEM 111	1
ECON 102 or 104 (GS) [†]	3 ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3
EDSGN 100 ^{*#}	3 ESC 261M or CMPSC 201	3
MATH 140 or 140E (GQ) ^{*†#†}	4 MATH 141 or 141E (GQ) ^{*†#†}	4
General Education Course [†]	3 PHYS 211 (PHYS 211L & PHYS 211R (GN)) ^{*#†}	4
	First Year Seminar [†]	1
	16	16

Second Year		
Fall	Credits Spring	Credits
EMCH 210H [*]	5 CAS 100A or 100B (GWS) ^{††}	3
MATH 220	2-3 EMCH 212H [*]	3
MATH 251 [*]	4 ME 302	4
PHYS 212 (PHYS 212L & PHYS 212R (GN)) ^{*†}	4 MATH 230	4
General Education Course [†]	3 PHYS 214	2
	18-19	16

Third Year

Fall	Credits Spring	Credits
EE 210	4 ESC 409	1
ESC 312	3 Foundational Elective	3
ESC 407*	3 Foundational Elective	3
ESC 414M*	3 Foundational Elective	3
ESC 433	1 Foundational Elective	3
General Education Course [†]	3 Foundational Elective	3
	17	16

Fourth Year

Fall	Credits Spring	Credits
ENGL 202C (GWS) ^{‡†}	3 ESC 411	2
ESC 404*	3 Technical Elective	3
ESC 410	3 Technical Elective	3
Technical Elective	3 General Education Course [†]	3
Technical Elective	3 General Education Course [†]	3
General Education Course (GHW) [†]	1.5 General Education Course (GHW) [†]	1.5
	16.5	15.5

Total Credits 131-132

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **CMPSC 201:** Students are expected to complete the version of CMPSC that is required for their intended major. The requirement varies across College of Engineering majors. Students should plan the CMPSC course requirement carefully with the assistance of an academic adviser.
- **Foundational Elective:** Select from department list.

- **Health and Physical Activity:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement.
- **Technical Elective:** Select from department list. A student may use **only one** of the following as a substitute for a Technical Elective: 3 co-op credits, provided the student completes three Cooperative Education Program rotations; 3 ROTC credits, provided the student completes the ROTC Program; or one 3-credit course required for a minor but not otherwise included in degree requirements, provided the student completes all the requirements of the minor.
- **These courses offered at University Park in fall semester only:**
 - EE 210
 - EMCH 210H
 - ESC 312
 - ESC 404
 - ESC 407
 - ESC 414M
 - ESC 433
- **These courses offered at University Park in spring semester only:**
 - EMCH 212H
 - ESC 261M
 - ME 302

Career Paths

Career opportunities for engineering science graduates are limited only by their imagination. Because of the breadth of their training, engineering scientists are well prepared to lead national and international interdisciplinary teams in a diverse array of science and engineering endeavors, in addition to careers in law, medicine, business, politics, and government service. Engineering science graduates are extremely well prepared for graduate study in most engineering disciplines, including mechanical, electrical, aerospace, industrial, and materials, as well as graduate study in physics and mathematics.

Careers

Penn State engineering science and mechanics alumni are successful entrepreneurs, business executives, captains of industry, leaders in national laboratories, startup founders, physicians, professors, and academic officials. Starting salaries for engineering science graduates in past years have been among the highest for all graduates in the College of Engineering.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ENGINEERING SCIENCE PROGRAM (<http://www.esm.psu.edu/academics/resources/career-resources.aspx>)

Opportunities for Graduate Studies

The ESM department offers the following graduate degree options:

- Master of Engineering (M.Eng.) in Engineering Mechanics
- Master of Engineering (M.Eng.) in Additive Manufacturing
- Master of Science (M.S.) in Engineering at the Nano-scale
- Master of Science (M.S.) in Engineering Science and Mechanics
- Master of Science (M.S.) in Additive Manufacturing
- Doctor of Philosophy (Ph.D.) in Engineering Science and Mechanics
- Doctor of Medicine and Doctor of Philosophy in Engineering Science and Mechanics (M.D./Ph.D.)
- Graduate Certificate in Laser-Materials Processing and Laser-Based Manufacturing

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.esm.psu.edu/academics/graduate/prospective-students.aspx>)

Accreditation

The Bachelor of Science in Engineering Science at University Park is Accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Engineering, General Engineering, Engineering Physics, Engineering Science, and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF ENGINEERING SCIENCE AND MECHANICS
212 Earth and Engineering Sciences Building
University Park, PA 16802
814-865-4523
undergradassistant@esm.psu.edu

<https://www.esm.psu.edu/>

Engineering, B.S.

Begin Campus: Abington, Brandywine, DuBois, Hazleton

End Campus: Abington, Brandywine, DuBois, Hazleton

Program Description

The Engineering program provides students with a broad foundation in engineering with specialization in a technically and professionally relevant topic. Students must choose the Multidisciplinary Engineering Design option at Abington, Brandywine and Great Valley campuses, Applied Materials option at the DuBois campus or the Alternative Energy and Power Generation option at the Hazleton campus. From this degree program, students will acquire the ability to work as members of a team toward successful attainment of a common goal, thus preparing them to work in for-profit or nonprofit organizations, or to further their studies in graduate school. Typical employment for General Engineering graduates includes positions such as engineer, product engineer, process engineer, manufacturing engineer, development engineer, and materials engineer. With employment opportunities such as these and others, graduates of the Engineering program can attain professional and economically sustaining employment in their desired regional area. This degree program develops written and oral communication skills, culminating in a two-semester senior design course sequence consisting of a project based largely on student interest and faculty input.

You Might Like This Program If...

- You have an interest in various different engineering disciplines and would like to diversify your skill set as much as possible.

- You want to concentrate your studies on product, process, and manufacturing engineering.
- You are passionate about the design and development of products.
- You have an interest in alternative and renewable energy and power generation.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out.

- Completed 29-55 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
- Completed with a C or better the following courses: EDSGN 100, CHEM 110, MATH 140, MATH 141, and PHYS 211
- Attained at least a 2.6 cumulative grade point average

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in General Engineering, a minimum of 127 credits are required:

Requirement	Credits
General Education	45
Requirements for the Major	109

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Common Requirements for the Major (All Options)

Code	Title	Credits
Prescribed Courses		
CHEM 111	Experimental Chemistry I	1
EMCH 213	Strength of Materials	3
ENGR 490W	Senior Design I	1
ENGR 491W	Senior Design II	3
MATH 231	Calculus of Several Variables	2
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
<i>Prescribed Courses: Require a grade of C or better</i>		
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EMCH 211	Statics	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4

MATH 251	Ordinary and Partial Differential Equations	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4

Additional Courses

Select 1 credit of First-Year Seminar		1
ECON 102	Introductory Microeconomic Analysis and Policy	3
or ECON 104	Introductory Macroeconomic Analysis and Policy	
Select one of the following:		3
CMPSC 121	Introduction to Programming Techniques	
CMPSC 200	Programming for Engineers with MATLAB	
CMPSC 201	Programming for Engineers with C++	

Additional Courses: Require a grade of C or better

CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
ENGL 202C	Effective Writing: Technical Writing	3
or ENGL 202D	Effective Writing: Business Writing	
Select one of the following:		3
EMCH 407	Computer Methods in Engineering Design	
EMCH 461	Finite Elements in Engineering	
ENGR 350	Computational Modeling Methods	

Supporting Courses and Related Areas

Select 4 credits in General Technical Electives, in consultation with an adviser, from the program approved list. 4

Requirements for the Option

Select an option 45

Requirements for the Option**Applied Materials Option (45 credits)***Available at the following campuses: DuBois*

Code	Title	Credits
Prescribed Courses		
CHEM 112	Chemical Principles II	3
CHEM 202	Fundamentals of Organic Chemistry I	3
ENGR 320	Materials Properties Measurement I	3
ENGR 421	Materials Properties Measurements II	4
ENGR 450	Materials Design and Applications	3
MATSE 202	Introduction to Polymer Materials	3
MATSE 400	Crystal Chemistry	3
MATSE 402	Materials Process Kinetics	3
MATSE 411	Processing of Ceramics	3
MATSE 413	Solid-State Materials	3
MATSE 417	Electrical and Magnetic Properties	3
MATSE 430	Materials Characterization	3
<i>Prescribed Courses: Require a grade of C or better</i>		
MATH 220	Matrices	2
MATSE 201	Introduction to Materials Science	3

Additional Courses*Additional Courses: Require a grade of C or better*

ME 300	Engineering Thermodynamics I	3
or EME 301	Thermodynamics in Energy and Mineral Engineering	

Alternative Energy and Power Generation Option (45 credits)*Available at the following campuses: Hazleton*

Code	Title	Credits
Prescribed Courses		
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
EE 314	Signals and Circuits II	3
EE 485	Energy Systems and Conversion	3
EGEE 302	Principles of Energy Engineering	3
EGEE 420	Hydrogen and Fuel Cells	3
EME 303	Fluid Mechanics in Energy and Mineral Engineering	3
ME 345	Instrumentation, Measurements, and Statistics	4

Prescribed Courses: Require a grade of C or better

EE 210	Circuits and Devices	4
--------	----------------------	---

Additional Courses

Select 9 credits from the following:		9
EE 488	Power Systems Analysis I	
EGEE 437	Design of Solar Energy Conversion Systems	
EGEE 438	Wind and Hydropower Energy Conversion	
EGEE 441	Electrochemical Engineering Fundamentals	
NUCE 401	Introduction to Nuclear Engineering	

Additional Courses: Require a grade of C or better

ME 300	Engineering Thermodynamics I	3
or EME 301	Thermodynamics in Energy and Mineral Engineering	

Supporting Courses and Related Areas

Select 6 credits in Engineering Technical Elective courses, any 400-level courses in the College of Engineering or any 400-level courses with the Energy and Geoenvironmental Engineering (EGEE) abbreviation. Other substitutions outside the approved list must be approved by petition. 6

Multidisciplinary Engineering Design Option (45 credits)*Available at the following campuses: Abington, Brandywine*

Code	Title	Credits
Prescribed Courses		
CMPEN 271	Introduction to Digital Systems	3
EDSGN 401	Engineering Systems Design	3
EDSGN 402	Materials and Manufacturing	4
EDSGN 403	Product Realization	3
EDSGN 495	Internship	1
EE 316	Introduction to Embedded Microcontrollers	3
ENGR 407	Technology-Based Entrepreneurship	3
<i>Prescribed Courses: Require a grade of C or better</i>		
EDSGN 410	Robotics Design and Applications	4
EE 210	Circuits and Devices	4
EE 310	Electronic Circuit Design I	4
EMCH 212	Dynamics	3

Additional Courses

CHEM 112	Chemical Principles II (or any GN)	3
CHEM 113	Experimental Chemistry II (or any GN)	1

Additional Courses: Require a grade of C or better

Select one of the following:		3
------------------------------	--	---

EME 301	Thermodynamics in Energy and Mineral Engineering
ME 201	Introduction to Thermal Science
ME 300	Engineering Thermodynamics I

Supporting Courses and Related Areas

Select 3 credits in Engineering Technical Elective courses, in consultation with an adviser, from department list. 3

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The Engineering program offers a broad and cross-disciplinary curriculum that prepares students in a variety of technical areas and professional skills for the practice and future development in their profession. Due to their experience in our program, within few years of graduation, we expect our graduates to have the ability to:

1. Practice engineering in their chosen area in the private industry or the government.
2. Assume an increasing level of responsibility and leadership within their respective organizations.
3. Communicate effectively and work collaboratively with internal and external stakeholders in multidisciplinary, advanced technological and multicultural work environments.
4. Maintain a strong commitment to ethical practice with sensitivity for environmental, societal, and economic contexts at local and global levels.
5. Engage in continuous learning through graduate school, professional training programs, and independent study.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The B.S. Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

Abington

Robert Avanzato

Associate Professor and Campus Coordinator
1600 Woodland Road
Abington, PA 19001
215-881-7358
rla5@psu.edu

Brandywine

Maria Evans

Assistant Teaching Professor and Multidisciplinary Engineering Design Option Coordinator
25 Yearsley Mill Road
Media, PA 19063
610-892-1346
mje226@psu.edu

DuBois

Daudi Waryoba

Associate Professor and Applied Materials Option Coordinator
1 College Place
DuBois, PA 15801
814-375-4835
drw29@psu.edu

Great Valley

Sally Richmond

Assistant Teaching Professor of Engineering
220R Main Building
Malvern, PA 19355

610-725-5310
sss135@psu.edu

Hazleton

Will Yourey, Ph.D.

Associate Professor and Alternative Energy and Power Generation Option Coordinator
Kostos 113
76 University Drive
Hazleton, PA 18202
570-450-3084
wxy40@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Multi-Disciplinary Engineering Design Option: Engineering, B.S. at Abington Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN)*#	3 CAS 100A or 100B (GWS) ^{††}	3
CHEM 111	1 CHEM 112 (or any GN)	3
EDSGN 100*#	3 CHEM 113 (or any GN)	1
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 General Education Course (GHW)	1.5
First Year Seminar	1 MATH 141 (GQ)*# [†]	4
MATH 140 (GQ)*# [†]	4 PHYS 211*#	4
15		16.5

Second Year

Fall	Credits Spring	Credits
CMPEN 271	3 EMCH 212*	3
CMPSC 121, 201, or 200	3 EMCH 213	3
EMCH 211*	3 MATH 251*	4
MATH 231	2 PHYS 214	2

PHYS 212*	4 General Education Course	3	
	15	15	
Third Year			
Fall	Credits Spring	Credits Summer	Credits
EE 210*	4 EE 316	3 EDSGN 495	1
ECON 102 or 104†	3 EE 310*	4	
EDSGN 401	3 ENGL 202C (GWS)‡	3	
ME 201, 300, or EME 301*	3 EDSGN 402	4	
General Education Course	3 General Education Course	3	
	16	17	1
Fourth Year			
Fall	Credits Spring	Credits	
EDSGN 410*	4 Engr. Tech. Elective (ETE) EDSGN 420 or ME 480	3	
ENGR 350*	3 ENGR 407	3	
ENGR 490W	1 ENGR 491W	3	
EDSGN 403	3 General Education Course	3	
General Education Course (GHW)	1.5 General Education Course	3	
General Technical Elective(s) (GTE)	4		
	16.5	15	
Total Credits 127			

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain

attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

College Notes:

- General Technical Electives (GTE) are four credits of engineering, science or mathematics at a similar or higher level required for the major. Choose at least four credits from the program approved list of courses: BIOL 141 (3), BIOL 142 (1), CHEM 202 (3), CHEM 210 (3), CMPEN 270 (4), CMPEN 275 (1), EDSGN 110 (2), EDSGN 210 (2), EMCH 315 (2), EMCH 316 (1), MATH 220 GQ (2-3), MATH 232 (2) and PHYS 213 (2). Other GTE credits will be considered through the petition process.
- Upper division engineering courses will be offered in combination at both Penn State Abington and Penn State Great Valley
- EDSGN 495 (1) requires 300 hours of work and may be scheduled during the summer semester after the second or third year

Course Lists:

General Technical Electives (GTE) are 4 credits of engineering, science, or mathematics at a similar or higher level required for the major. Choose from:

- BIOL 141 Introduction to Human Physiology (3 cr.)
- BIOL 142 Physiology Laboratory (1 cr.)
- CHEM 202 Fundamentals of Organic Chemistry I (3 cr.) or CHEM 210 Organic Chemistry I (3 cr.)
- CMPEN 270 Digital Design: Theory and Practice (4 cr.)
- CMPEN 275 Digital Design Laboratory (1 cr.)
- EDSGN 110 Spatial Analysis in Engineering Design (2 cr.)
- EDSGN 210 Tolerancing and Spatial Models (2 cr.)
- EMCH 212 Dynamics (3 cr.) (Alternative Energy and Power Distribution Option only)
- EMCH 315 Mechanical Response of Engineering Materials (2 cr.)
- EMCH 316 Experimental Determination of Mechanical Response of Materials (1 cr.)
- MATH 220 Matrices (2-3 cr.)
- MATH 232 Integral Vector Calculus (2 cr.)
- MATH 310 Elementary Combinatorics (3 cr.)
- PHYS 213 General Physics: Fluids and Thermal Physics (2 cr.)

Other GTE credits will be considered through the petition process.

Engineering Technical Electives are 3 credits of engineering courses at the 300 or 400 level. Choose from:

- EDSGN 420 Advanced Robotics Design and Applications (3 cr.)
- ME 380 Machine Dynamics (3 cr.)
- ME 345 Instrumentation, Measurements, and Statistics (4 cr.)
- ME 357 System Dynamics (3 cr.)
- ME 480 Mechanism Design and Analysis (3 cr.)

Students are expected to complete the version of CMPSC that is required for their intended major. The requirement varies across College of Engineering majors. Students should plan the CMPSC course requirement carefully with the assistance of an academic adviser.

These courses offered at Abington in fall semester only:

- CMPEN 271 Introduction to Digital Systems (3 cr.)
- EMCH 211 Statics (3 cr.)

These courses offered at Abington in spring semester only:

- CHEM 112 Chemical Principles II (3 cr.)
- CHEM 113 Experimental Chemistry II (1 cr.)
- EE 210 Circuits and Devices (4 cr.)
- EMCH 212 Dynamics (3 cr.)
- EMCH 213 Strength of Materials (3 cr.)
- MATH 251 Ordinary and Partial Differential Equations (4 cr.)
- PHYS 214 General Physics: Wave Motion and Quantum Physics (2 cr.)

Multi-Disciplinary Engineering Design Option: Engineering, B.S. at Brandywine Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{*#}	3 CAS 100A or 100B (GWS) [‡]	3
CHEM 111	1 CHEM 112 (or any GN)	3
EDSGN 100 ^{*#}	3 CHEM 113 (or any GN)	1
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 General Education Course (GHW)	1.5
First Year Seminar	1 MATH 141 (GQ) ^{*†#}	4
MATH 140 (GQ) ^{*†#}	4 PHYS 211 (GN) ^{*#}	4
	15	16.5

Second Year

Fall	Credits Spring	Credits
CMPEN 271	3 EMCH 212 [*]	3
CMPSC 121, 200, or 201	3 EMCH 213	3
EMCH 211 [*]	3 MATH 251 [*]	4
MATH 231	2 PHYS 214	2
PHYS 212 [*]	4 General Education Course	3
	15	15

Third Year

Fall	Credits Spring	Credits Summer	Credits
EE 210 [*]	4 EE 316	3 EDSGN 495	1
ECON 102 or 104 [†]	3 EE 310 [*]	4	
EDSGN 401	3 ENGL 202C [‡]	3	
ME 201, 300, or EME 301 [*]	3 EDSGN 402	4	
General Education Course	3 General Education Course	3	
	16	17	1

Fourth Year

Fall	Credits Spring	Credits
EDSGN 410 [*]	4 Engr. Tech. Elective (ETE) EDSGN 420 or ME 480	3
ENGR 350 [*]	3 ENGR 407	3
ENGR 490W	1 ENGR 491W	3
EDSGN 403	3 General Education Course	3
General Education Course (GHW)	1.5 General Education Course	3
General Technical Elective(s) (GTE)	4	
	16.5	15

Total Credits 127

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

College Notes:

- General Technical Electives (GTE) are four credits of engineering, science or mathematics at a similar or higher level required for the major. Choose at least four credits from the program approved list of courses: BIOL 141 (3), BIOL 142 (1), CHEM 202 (3), CHEM 210 (3), CMPEN 270 (4), CMPEN 275 (1), EDSGN 110 (2), EDSGN 210 (2), EMCH 315 (2), EMCH 316 (1), MATH 220 GQ (2-3), MATH 232 (2) and PHYS 213 (2). Other GTE credits will be considered through the petition process.
- Upper division engineering courses will be offered at Penn State Great Valley.
- EDSGN 495 (1) requires 300 hours of work and may be scheduled during the summer semester after the second or third year.

Applied Materials Option: Engineering, B.S. at DuBois Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{**}	3 CAS 100 (GWS) ^{††}	3
CHEM 111	1 CHEM 112 (GN)	3
EDSGN 100 ^{*#}	3 CHEM 202	3
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 MATH 141 (GQ) ^{**†}	4
First Year Seminar	1 PHYS 211 (GN) ^{*#}	4
MATH 140 (GQ) ^{*†#}	4	
	15	17

Second Year

Fall	Credits Spring	Credits
ECON 102 or 104 [†]	3 CMPSC 121, 200, or 201	3
EMCH 211 [*]	3 EMCH 213	3
General Education Course	3 MATH 251 ^{*†}	4
General Education Course (GHW)	1.5 ME 300 or EME 301 [*]	3
MATH 231	2 PHYS 214 [*]	2
PHYS 212 [*]	4 General Education Course (GHW)	1.5
	16.5	16.5

Third Year

Fall	Credits Spring	Credits
General Education Course	3 ENGR 320	3
General Technical Elective	4 ENGR 350 [*]	3
MATH 220	2 MATSE 400	3
MATSE 201 [*]	3 MATSE 413	3
MATSE 202	3 ENGL 202C ^{††}	3
	15	15

Fourth Year

Fall	Credits Spring	Credits
ENGR 421 [*]	4 ENGR 450	3
ENGR 490W	1 ENGR 491W	3
General Education Course	3 General Education Course	3
General Education Course	3 MATSE 411	3
MATSE 402	3 MATSE 417 or ESC 417	3
MATSE 430	3	
	17	15

Total Credits 127

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

College Notes:

- General Technical Electives are 4 credits of engineering, science or mathematics at a similar or higher level required for the major.
- **Choose from:** BIOL 141 GN (3), BIOL 142 (1), CHEM 113 (1), CMPEN 270 (4), CMPEN 271 (3), CMPEN 275 (1), EDSGN 110 (2), EDSGN 210 (2), EMCH 212 (3) (Applied Materials and Alternative Energy & Power Generation Options only), EMCH 315 (2), EMCH 316 (1), MATH 232 (2), MATH 310 (3), and PHYS 213 GN (2).
- Other GTE credits will be considered through the petition process.

* Course requires a grade of C or better for the major

Alternative Energy and Power Generation Option: Engineering, B.S. at Hazleton Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
MATH 140 ^{*†‡}	4 MATH 141 ^{*†‡}	4
CHEM 110 ^{*#†}	3 PHYS 211 ^{*#†}	4
CHEM 111 [†]	1 CHEM 112 [†]	3
ENGL 15 or 30H ^{††}	3 CHEM 113 [†]	1
EDSGN 100 ^{*#}	3 ECON 102 or 104 [†]	3
PSU 8	1 CAS 100A or 100B ^{††}	3
	15	18

Second Year

Fall	Credits Spring	Credits
MATH 251 [*]	4 MATH 231	2
PHYS 212 ^{*†}	4 EE 210 [*]	4
EMCH 211 [*]	3 EMCH 213	3
CMPSC 200 ²	3 ME 300 [*]	3
GTE - General Tech Elective ¹	3 General Education Course	3
	17	15

Third Year

Fall	Credits Spring	Credits
EE 314	3 ENGR 350 [*]	3
EME 303	3 PHYS 214 [†]	2
ME 345	4 ENGL 202C or 202D ^{††}	3
General Education Course	3 General Education Course (GHW)	1.5
GTE - General Tech Elective ¹	1 EGEE 302	3
General Education Course (GHW)	1.5 NUCE 401 (Engrg. Tech. Elective) ³	3
	15.5	15.5

Fourth Year

Fall	Credits Spring	Credits
EE 485	3 EE 488 (Engrg. Tech. Elective) ³	3
EGEE 437 (Engrg. Tech. Elective) ³	3 EGEE 420	3
EGEE 438 (Engrg. Tech. Elective) ³	3 ENGR 491W	3
EGEE 441 (Engrg. Tech. Elective) ³	3 General Education Course	3
ENGR 490W	1 General Education Course	3

General Education Course	3
	16
	15

Total Credits 127

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ General Technical Electives (GTE) are 4 credits of engineering, science, or mathematics at a similar or higher level required for the major. Consultation with adviser is recommended to select the proper course.

² Students can take CMPSC 200, CMPSC 201 or CMPSC 121. Consultation with adviser is recommended to select the proper course.

³ Select 9 credits from NUCE 401, EE 488, EGEE 437, EGEE 438, EGEE 441 and 6 Engineering Technical Elective credits from any 400 level Engineering or EMS course. See adviser for details.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Career Paths

Graduates from the engineering program have built successful careers in a variety of fields including systems engineering, design, process engineering, product development, manufacturing, materials, and energy and power.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE ENGINEERING PROGRAM (<http://career.engr.psu.edu/>)

Opportunities for Graduate Studies

Graduates from the engineering program may advance their education with a graduate degree in a multitude of science, engineering, and technology fields.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.engr.psu.edu/students/grad-prospective/default.aspx>)

Accreditation

The Bachelor of Science in Engineering at Penn State Abington, Penn State Brandywine, Penn State DuBois, and Penn State Great Valley is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Engineering, General Engineering, Engineering Physics, Engineering Science, and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-865-2952

<https://www.sedi.psu.edu/>

Abington

DIVISION OF SCIENCE AND ENGINEERING
1600 Woodland Road
Abington, PA 19001
215-881-7358
rla5@psu.edu

<http://abington.psu.edu/engineering> (<http://abington.psu.edu/engineering/>)

Brandywine

25 Yearsley Mill Road
Media, PA 19063
610-892-1444
nmz5171@psu.edu

<http://brandywine.psu.edu/general-engineering> (<http://brandywine.psu.edu/general-engineering/>)

DuBois

1 College Place
DuBois, PA 15801
814-375-4835
drw29@psu.edu

<http://dubois.psu.edu/bs-engineering-applied-materials-option> (<http://dubois.psu.edu/bs-engineering-applied-materials-option/>)

Hazleton

Kostos 113
76 University Drive
Hazleton, PA 18202
570-450-3084
wxy40@psu.edu

<http://hazleton.psu.edu/bachelor-science-general-engineering> (<http://hazleton.psu.edu/bachelor-science-general-engineering/>)

Environmental Engineering, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

This minor is designed to provide students in engineering, science, and other majors with a comprehensive study of environmental issues and the skills necessary to solve problems associated with environmental pollution.

What is Environmental Engineering?

The challenges in our modern society are complex and multi-faceted, demanding solutions across a wide range of disciplines. Environmental engineers have long recognized the need for convergence across disciplines to find sustainable solutions to water and climate issues that have broad societal importance. Penn State's Environmental Engineering Minor is an interdisciplinary program administered by the Department of Civil and Environmental Engineering. This minor is designed to provide students in engineering, science, and other majors with a comprehensive study of environmental issues and the skills necessary to solve problems associated with environmental pollution and climate change. A certificate is awarded to students who complete the requirements of the minor.

You Might Like This Program If...

Environmental engineers use principles from engineering, chemistry, biology, and geology to solve environmental problems. Relevant issues include water treatment and remediation, waste disposal, air pollution, and energy production. Students enrolled in the minor may select from a suite of classes that develop the fundamental skills needed to address these problems. Multiple courses not listed in the requirements section can be approved to count towards the minor through the course substitution request system.

Entrance to Minor

For entrance into the minor, students must be at least fifth-semester standing and have completed:

Code	Title	Credits
CHEM 110	Chemical Principles I	3
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4

Program Requirements

Requirement	Credits
Requirements for the Minor	18

The minor consists of 18 credits, at least 6 of which must be at the 400 level.

Requirements for the Minor

2 credits of engineering design are included.

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
CE 370	Introduction to Environmental Engineering	3

Additional Courses*Additional Courses: Require a grade of C or better***Chemistry and Biological Sciences**

Select one of the following: 3

BE 308	Engineering Elements of Biochemistry and Microbiology
CE 479	Environmental Microbiology for Engineers
CHEM 202	Fundamentals of Organic Chemistry I
CHEM 210	Organic Chemistry I

Process Engineering

Select 0-3 credits of the following: 0-3

BE 302	Heat and Mass Transfer in Biological Systems
CHE 210	Introduction to Material Balances
EGEE 302	Principles of Energy Engineering
MNPR 301	Elements of Mineral Processing
NUCE 430	Design Principles of Reactor Systems

Applied Fluid Mechanics

Select one of the following: 3

AERSP 308	Mechanics of Fluids
BE 467	Design of Stormwater and Erosion Control Facilities
CE 371	Water and Wastewater Treatment
CE 462	Open Channel Hydraulics
CHE 330	Process Fluid Mechanics
EME 303	Fluid Mechanics in Energy and Mineral Engineering
ME 320	Fluid Flow
METEO 454	Introduction to Micrometeorology
NUCE 431W	Nuclear Reactor Core Design Synthesis

Environmental Sciences and Design

Select 6-9 credits of the following: 6-9

BE 468	Microbiological Engineering
BE 477	Land-Based Waste Disposal
CE 472W	Environmental Engineering Capstone Design
CE 475	Water Quality Chemistry
CE 476	Solid and Hazardous Wastes
CHEM 402	Environment Chemistry: Atmosphere
EGEE/ME 430	Introduction to Combustion
EGEE 470	Air Pollutants from Combustion Sources
ENVSE 408	Contaminant Hydrology
ENVSE 427	Pollution Control in the Process Industries
ERM 411	Legal Aspects of Resource Management
ERM 412	Resource Systems Analysis
ERM 413W	Case Studies in Ecosystem Management
ERM 447	Stream Restoration
ERM 450	Wetland Science and Sustainability
FSC 431	The Chemistry of Fuels
GEOSC 452	Hydrogeology
ME 405	Indoor Air Quality Engineering
ME 433	Fundamentals of Air Pollution
NUCE 405	Nuclear and Radiochemistry
NUCE 420	Radiological Safety

NUCE 428 Radioactive Waste Control

SOILS 420 Remediation of Contaminated Soils

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Nathaniel Warner

Associate Professor

University Park, PA 16802

814-865-9423

nrw6@psu.edu

Career Paths

If your goals are to enter industry or academia students who complete a minor can apply for a wide range of graduate school programs and jobs focused on engineering and sustainability to solve the world's problems. Environmental engineers often work in interdisciplinary collaborative groups with other fields such as chemists, biologists or geoscientists-increasing the importance of course work preparation.

Careers

Environmental engineers help create sustainable solutions to problems faced in society. Examples include the renovation of the current aging and energy-intensive water infrastructure as well as solutions and adaption to changes in climate. Careers can include environmental consulting, sustainability officers, water resource and air quality engineers, and environmental compliance officers.

Opportunities for Graduate Studies

Students will take courses from multiple disciplines to provide the adequate depth and breadth so that they can pursue graduate studies. Here at Penn State we offer multiple advanced degrees, including a MEng (no thesis, typically 1 to 1.5 years to complete), MS (~ 2 years to complete), and PhD (~ 5 years to complete) in Environmental Engineering.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.cee.psu.edu/academics/graduate/>)

Contact

University Park

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

University Park, PA 16802

814-865-9423

nrw6@psu.edu

<https://www.cee.psu.edu>

Housing, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

This certificate program is designed to prepare students for a career in the housing industry. Students are required to take a set of complementary courses in the technology of housing, the development process, and the design and the delivery processes for housing. The minimum number of credits required is 12, with no less than six credits at the 400-level.

What is Housing?

This program is designed to provide undergraduate students with a means of developing some basic knowledge of housing and preparing for a career in the housing industry. Housing, from low-rise detached houses to multi-unit, multi-story apartment buildings, from motels to high-rise hotels, from student residences to rural housing, is a major and vital component of the built environment. New single-family housing represents at least 4% of the GDP, and housing and its consequences account for about 12% of the GDP. With a national housing stock in excess of 110,000,000 units, the maintenance, operation, repair - and especially the upgrading, retrofit and remodeling of the existing stock - are a very important component of the national economy. Engineers have many important roles to play in the housing business, especially with the developmental, economic and technical aspects of housing.

You Might Like This Program If...

You are passionate about housing and pursuing a career in the housing industry. Students are typically involved with the National Association of Home Builders (NAHB) Student Chapter at Penn State and/or student competition teams like the NAHB Student Competition and U.S. Department of Energy Race to Zero competition. This certificate will also help you to increase your competitiveness for employment in the residential construction industry.

Entrance to Certificate

For entrance into the certificate program, students must be at least 5th semester. The cumulative GPA considered for admission will be consistent with, or equivalent to, the GPA minimum of 2.00 for maintaining good academic standing. Students must earn a C grade or better in each of the four courses to continue with the certificate.

Program Requirements

To earn an undergraduate certificate in Housing, a minimum of 12 credits is required.

Code	Title	Credits
Prescribed Courses		
AE 470	Residential Building Design and Construction	3
Additional Courses		
Students must complete an application and choose an additional three courses of the following: ¹		9
AE 432	Design of Masonry Structures	

AE/CE 542	Building Enclosure Science and Design
BE 462	Design of Wood Structures
CE 410W	
RM 303	Real Estate Fundamentals

¹ With the approval of the Hankin Chair, one housing-related course of at least 3 credits not included in the list of recommended additional courses (e.g., demographics, urban geography, social housing, etc.) can be substituted for one of the three additional courses.

Student must be at least fifth semester standing. The cumulative GPA considered for admission will be consistent with, or equivalent to, the GPA minimum of 2.0 for maintaining good academic standing. Students must earn a C grade or better in each of the four courses to continue with the certificate.

Prerequisites Required.

Certificate Learning Objectives

- **Building Design:** Students will be able to demonstrate knowledge of design methods for several different systems within residential buildings for safety, comfort, energy efficiency, and affordability, among other criteria.
- **Building Science and Moisture Management:** Students will be able to demonstrate a basic understanding of building science that will help them in developing more sustainable, durable, and energy efficient homes. In particular, understanding the moisture related problems helps students to better address the stated learning objective.
- **Residential Construction Industry and Management:** Students will be able to demonstrate basic knowledge of housing construction industry and its role in local and national economy as well as some residential construction management.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Heather Hamby
Undergraduate Programs Assistant
218 Sackett Building
University Park, PA 16802
814-867-0470
hehce@engr.psu.edu

Career Paths

The Pennsylvania Housing Research Center (PHRC) hosts an annual career fair for the residential construction industry. This event offers opportunities for full-time employment and summer internships.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A CERTIFICATE IN HOUSING (<http://phrc.psu.edu/Student-Education/Career-Fair/2017-Career-Fair.aspx>)

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.cee.psu.edu/academics/graduate/>)

Contact

University Park

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING
212 Sackett Building
University Park, PA 16802
814-863-3084
hehce@engr.psu.edu

<http://www.cee.psu.edu/>

Industrial Engineering, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

The undergraduate program in industrial engineering, being the first established in the world, has a long tradition of providing a strong, technical, hands-on education in design, control, and operation of manufacturing processes and systems. The curriculum provides a broad-based education in manufacturing, operations research and ergonomics through a base of mathematics, physical and engineering sciences, and laboratory and industrial experiences. It builds a strong foundation for the development of a professionally competent and versatile industrial engineer, able to function in a traditional manufacturing environment as well as in a much broader economy, including careers in financial services, communication, information technology, transportation, health care, consulting, or academia.

After completing courses required for the core and fundamental competencies in the major, students can choose two IE technical elective courses from a department list. In addition, students must also complete the three-credit capstone design course.

What is Industrial Engineering?

Industrial Engineering is rooted in the sciences of engineering, the study of systems, and the management of people. Industrial engineers are big-picture problem solvers who optimize complex engineering systems and processes. They bring together people, machinery, materials, information, energy, and financial resources to improve efficiency, performance, quality, and safety while reducing cost and waste. According to the Institute of Industrial & Systems Engineers, Industrial Engineers "work to eliminate waste of time, money, materials, energy, and other commodities." Because it is a broad and versatile discipline, study of

industrial engineering prepares you for careers in every sector of the economy.

You Might Like This Program If...

Largely based in math and science, while incorporating business and psychology, the industrial engineering program is designed to prepare students to become leaders in engineering. We provide students with a comprehensive education in human factors/ergonomics; manufacturing; operations research; and supply chain/service engineering through coursework and hands-on experience. Our students become innovators who discover new solutions that address evolving challenges in a wide variety of sectors including academia, banking, communications, consulting, healthcare, information technology, transportation, etc.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out.

- Completed 29-55 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
- Completed with a C or better the following courses: EDSGN 100, CHEM 110, MATH 140, MATH 141, and PHYS 211
- Attained at least a 2.6 cumulative grade point average

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Industrial Engineering, a minimum of 129 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	111

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CHEM 111	Experimental Chemistry I	1
IE 425	Stochastic Models in Operations Research	3
IE 453	Simulation Modeling for Decision Support	3
IE 460	Service Systems Engineering	3
IE 470	Manufacturing System Design and Analysis	3
IE 480W	Capstone Design Project	3
MATH 220	Matrices	2

MATH 231	Calculus of Several Variables	2
MATH 250	Ordinary Differential Equations	3
MATSE 259	Properties and Processing of Engineering Materials	3
PHYS 212	General Physics: Electricity and Magnetism	4
<i>Prescribed Courses: Require a grade of C or better</i>		
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EMCH 210	Statics and Strength of Materials	5
ENGL 202C	Effective Writing: Technical Writing	3
IE 302	Engineering Economy	3
IE 305	Product Design, Specification and Measurement	3
IE 322	Probabilistic Models in Industrial Engineering	3
IE 323	Statistical Methods in Industrial Engineering	3
IE 327	Introduction to Work Design	3
IE 330	Engineering Analytics	3
IE 405	Deterministic Models in Operations Research	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4
Additional Courses		
Select 1 credit of First-Year Seminar		1
CMPSC 200	Programming for Engineers with MATLAB	3
or CMPSC 201	Programming for Engineers with C++	
ECON 102	Introductory Microeconomic Analysis and Policy	3
or ECON 104	Introductory Macroeconomic Analysis and Policy	
Select one of the following: ¹		3
IE 408	Cognitive Work Design	
IE 418	Human/Computer Interface Design	
IE 419	Work Design - Productivity and Safety	
<i>Additional Courses: Require a grade of C or better</i>		
CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
Supporting Courses and Related Areas		
Select 3 credits as a science selection from department list		3
Select 6 credits as non-major electives from department list ²		6
Select 3 credits in manufacturing processes from department list ¹		3
Select 6 credits of technical electives from the department list; all 6 credits must be IE credits		6

¹ The course not taken to satisfy this requirement can be taken as a technical elective. Please see the department list.

² Please see the department list.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements

of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

Integrative Studies

- Inter-Domain Courses (Inter-Domain): 6 credits

Exploration

- GN, may be completed with Inter-Domain courses: 3 credits
- GA, GH, GN, GS, Inter-Domain courses. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

Within three to five years after graduation, we anticipate graduates will:

- 1. Participate in and lead cross-functionally defined project teams, designing, implementing and improving processes, products and systems in the manufacturing, service or government sectors.
- 2. Work effectively in managerial and leadership positions, to establish and execute engineering and business strategies.
- 3. Work and communicate effectively with internal and external stakeholders in the global environment, while satisfying engineering, business and financial goals, and the end customers.
- 4. Embrace the importance of continuous learning through varied work assignments, graduate school, professional training programs and independent study, for the purpose of ongoing professional development.
- 5. Demonstrate proficiency in data analysis using state-of-the art tools, to assist with decision-making.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Industrial Engineering program is designed to enable students to:

- 1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- 2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- 3. Communicate effectively with a range of audiences
- 4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- 5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- 6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- 7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their

intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Giancarlo Labruna

Academic Adviser

113A Leonhard Building

University Park, PA 16802

814-863-5742

gkl5192@psu.edu

Erie

Omar Ashour, Ph.D.

Program Contact and Associate Professor

213 AMIC Building

Erie, PA 16563

814-898-6941

oma110@psu.edu (%20oma110@psu.edu)

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Industrial Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year		
Fall	Credits Spring	Credits
CHEM 110 (GN) ^{##†}	3 CHEM 111	1
ECON 102 or 104 (GS) [†]	3 ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3
EDSGN 100 ^{##}	3 IE 100 (or First Year Seminar) [†]	1
MATH 140 or 140E (GQ) ^{†##}	4 MATH 141 or 141E (GQ) ^{†##}	4
General Education Course [†]	3 PHYS 211 (PHYS 211L and PHYS 211R (GN)) ^{##†}	4

General Education Course [†]			3
16			16
Second Year			
Fall	Credits Spring		Credits
EMCH 210 [*]	5 CAS 100A or 100B (GWS) ^{††}		3
MATH 231	2 CMPSC 200 or 201		3
MATH 250	3 MATH 220		2-3
PHYS 212 (PHYS 212L and PHYS 212R (GN)) [†]	4 Engineering Elective		3
General Education Course [†]	3 Engineering Elective		3
	Science Elective		3
17			17-18
Third Year			
Fall	Credits Spring		Credits
IE 302 [*]	3 ENGL 202C (GWS) ^{††}		3
IE 305 [*]	3 IE 323 [*]		3
IE 322 [*]	3 IE 330 [*]		3
IE 327 [*]	3 IE 405 [*]		3
MATSE 259	3 Manufacturing Process Elective		3
General Education Course (GHW) [†]	1.5 General Education Course (GHW) [†]		1.5
16.5			16.5
Fourth Year			
Fall	Credits Spring		Credits
IE 408, 418, or 419	3 IE 453		3
IE 425	3 IE 480W (Writing Intensive) [†]		3
IE 460	3 IE-Technical Elective		3
IE 470	3 General Education Course [†]		3
IE-Technical Elective	3 General Education Course [†]		3
15			15

Total Credits 129-130

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and

ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **Engineering Elective Notes:** Select from department list: <http://www.ime.psu.edu/students/undergraduate/electives.aspx>
- **Health and Physical Activity Elective:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement.
- **Manufacturing Processing Course:** Select from department list: <http://www.ime.psu.edu/students/undergraduate/electives.aspx>
- **Science Elective:** Select from department list: <http://www.ime.psu.edu/students/undergraduate/electives.aspx>
- **Technical Elective:** Select from department list: <http://www.ime.psu.edu/students/undergraduate/electives.aspx>

Career Paths

An undergraduate degree in industrial engineering from Penn State is beneficial in a number of sectors, from finance and banking to manufacturing and material handling to ergonomics and workplace safety to a wide variety of industries within the service world (including theme parks, call centers, hospitals, etc.). Industrial engineers also have an attractive background to a number of graduate degrees that would compliment their skills including engineering design, operations research, mechanical engineering, supply chain management, business management, and more.

Careers

- **Human Factors/Ergonomics:** Business intelligence team leader, cognitive engineer, ergonomics assessment specialist, ergonomics expert, design engineer, systems engineer, usability expert, user experience engineer.
- **Manufacturing:** Manufacturing operations manager, production engineer, process control analyst, quality engineering manager, lean Six Sigma manager, product design/specification specialist, cost analysis manager, supply chain manager.
- **Operations Research:** Operations research engineer, applied research manager, performance engineer, process improvement engineer, global business intelligence and analytics director, operations engineer, statistician.
- **Production, Supply Chain, and Service:** Enterprise Engineering Analytics manager, global statistics manager, quality assurance director, strategic sourcing manager, operations engineer, new product engineer, process engineer, e-commerce manager, material scientists, service business development manager, Six Sigma analyst.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE INDUSTRIAL ENGINEERING PROGRAM (<https://career.engr.psu.edu>)

Opportunities for Graduate Studies

Opportunities for students with an undergraduate degree in industrial engineering are vast. The following disciplines would highly value an education in industrial engineering in graduate studies: engineering science and mechanics, business management, supply chain management, mechanical engineering, statistics, computer systems,

engineering design, operations research, systems engineering, engineering management, economics and more.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.ime.psu.edu/students/graduate/>)

Professional Resources

- Institute of Industrial and Systems Engineers (<https://www.iise.org/Home/>)
- Institute for Operations Research and the Management Sciences (<https://www.informs.org>)
- Human Factors and Ergonomics Society (<https://www.hfes.org>)
- Society of Manufacturing Engineers (SME) (<https://www.sme.org>)

Accreditation

The Bachelor of Science in Industrial Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Industrial and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

HAROLD AND INGE MARCUS DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING
310 Leonhard Building
University Park, PA 16802
814-865-7601
psuie@psu.edu

<http://www.ime.psu.edu/index.aspx> (<http://www.ime.psu.edu/>)

Erie

SCHOOL OF ENGINEERING
242 Jack Burke Research and Economic Development Center
5101 Jordan Road
Erie, PA 16563
814-898-6153
engineering@psu.edu

<http://behrend.psu.edu/school-of-engineering> (<http://behrend.psu.edu/school-of-engineering/>)

Information Sciences and Technology for Aerospace Engineering, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The role of Information Sciences and Technology in the practice of Aerospace Engineering is very important. Aerospace systems rely heavily on computers, software, and digital information; for control, sensors, and other onboard systems. The Boeing 777 has more than 1000 processors and roughly 20 million lines of software onboard, and F-16 and F-117As cannot fly without their onboard computers. In addition, many future aerospace vehicles will be unmanned, and the software challenges will be even greater. The onboard memory has also increased exponentially, the F-106 had 20 KBytes of memory and the new Joint Strike Fighter might have 2 GBytes of memory. The hardware and software must be carefully designed and thoroughly tested, since most aerospace systems are mission- or safety-critical systems. Computers and software are heavily used in the design, development, and manufacturing of aerospace systems. Large supercomputers are often used in the design process. The IST minor will enrich their educational achievements and increase their chances in obtaining employment or entering graduate school. The NSF and the DOD are encouraging universities to enhance their educational programs so that we have well-qualified engineers for future systems, and our IPAC members have stressed the importance of IT for our students.

What is Information Sciences and Technology for Aerospace Engineering?

The role of software in the practice of aerospace engineering is critical and continues to grow rapidly. The effective design, development, and manufacturing of aerospace systems rely heavily on computers, software, and digital information. Some aircraft cannot fly without their onboard computers, and many future aerospace vehicles will be unmanned, resulting in even greater software challenges. Providing undergraduate aerospace engineering students the opportunity to learn more about information sciences and technology by earning a minor in Information Sciences and Technology will not only enrich their educational achievements, but it will also make them more valuable to potential employers, and help them succeed in professional employment or graduate school. They will better appreciate the entire aerospace system better, and will be better equipped to work side-by-side with experts in the computing and software fields.

You Might Like This Program If...

- You are interested in learning more about the role of software in the practice of aerospace engineering.
- You want to better appreciate the entire aerospace system, and be better equipped to work side-by-side with experts in the computing and software fields.

Entrance to Minor

Student must apply for entrance to the minor no later than their 7th semester.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>).

In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
CMPSC 201	Programming for Engineers with C++	3
IST 110	Information, People and Technology	3
IST 210	Organization of Data	3
IST 220	Networking and Telecommunications	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select 6 credits of the following:		6
AERSP 423	Introduction to Numerical Methods in Fluid Dynamics	
AERSP 424	Advanced Computer Programming	
AERSP 440	Introduction to Software Engineering for Aerospace Engineers	
AERSP 460	Aerospace Control Systems	

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Amy R. Pritchett

Professor and Head of Aerospace Engineering
222A Hammond Building
University Park, PA 16802
814-865-3648
arp78@psu.edu

Contact

University Park

DEPARTMENT OF AEROSPACE ENGINEERING
229 Hammond Building
University Park, PA 16802
814-865-2569
aerospace@engr.psu.edu

<http://www.aero.psu.edu/>

Information Sciences and Technology for Industrial Engineering, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

Collection and processing of information have increased in all sectors for solving engineering problems, including manufacturing and service related problems. Efficient and timely analysis of data is critical for the survival of companies. There is a need for industrial engineers with a strong background in information technology and systems. The minor in Information Sciences and Technology for Industrial Engineering will augment the skills of students in the Department of Industrial and Manufacturing Engineering in the information systems area. All students pursuing a baccalaureate degree in Industrial Engineering are eligible for this minor.

What is Information Sciences and Technology for Industrial Engineering?

Collection and processing of information have increased in all sectors for solving engineering problems, including manufacturing and service related problems. Efficient and timely analysis of data is critical for the survival of companies. There is a need for industrial engineers with a strong background in information technology and systems.

You Might Like This Program If...

The minor in Information Sciences and Technology for Industrial Engineering augments the skills of students in the Department of Industrial and Manufacturing Engineering in the information systems area. All students pursuing a baccalaureate degree in Industrial Engineering are eligible for this minor.

Program Requirements

Requirement	Credits
Requirements for the Minor	21

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
IE 330	Engineering Analytics	3
IST 110	Information, People and Technology	3
IST 210	Organization of Data	3
IST 220	Networking and Telecommunications	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select 6 credits from the following:		6
IE 408	Cognitive Work Design	

IE 418	Human/Computer Interface Design
IE 433	Regression Analysis and Design of Experiments
Select 3 credits from the following:	
IST 402	Emerging Issues and Technologies
IST 431	The Information Environment
IST 442	Information Technology in an International Context
IST 454	Computer and Cyber Forensics
MATH 451	Numerical Computations
MATH 455	Introduction to Numerical Analysis I

3

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Giancarlo Labruna

Academic Adviser

113A Leonhard Building

University Park, PA. 16802

814-863-5742

gkl5192@psu.edu

Contact

University Park

HAROLD AND INGE MARCUS DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

310 Leonhard Building

University Park, PA 16802

814-865-7601

psuie@psu.edu

<http://www.ime.psu.edu/index.aspx> (<http://www.ime.psu.edu/>)

International Engineering, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

This certificate program is designed to provide recognition for students who have gained a proficiency in the skills needed by engineers in a global economy. The requirements of the certificate fall into three categories:

1. knowledge of global engineering and its professional and societal context,
2. knowledge of language and culture, and
3. participation in international experiences.

All engineering students in good academic standing are eligible for admission to the program.

You Might Like This Program If...

- You want to bring a truly global perspective to your engineering education.

Program Requirements

To earn an undergraduate certificate in International Engineering, a minimum of 10 credits is required.

Students must complete an application and successfully complete:

Code	Title	Credits
Prescribed Courses		
3 credits of study in a second language, while a PSU student, at the 3 (third-semester) level or higher		3
6 credits (typically two courses) of study in courses approved to meet the International Cultures requirement (IL) of General Education		6
1-3 credits and/or at least six weeks of approved study or workabroad, consisting of course work, internship, research, etc.		1-3

Prerequisites Required.

Certificate Learning Objectives

- Demonstrate knowledge of other nations' cultural values, traditions, beliefs, and customs;
- Identify the similarities and differences among international cultures;
- Apply linguistic tools and cultural knowledge to interact with speakers of the foreign language in a variety of contexts;
- Identify and address interpersonal communication and interaction issues of individuals from different international cultures.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Patrick Tunno, Ph.D.

Director, Center for Global Engineering Engagement

208 Hammond Building

University Park, PA 16802
814-863-1654
international@engr.psu.edu

Contact

University Park

THE CENTER FOR GLOBAL ENGINEERING ENGAGEMENT
208 Hammond Building
University Park, PA 16802
814-863-1654
international@engr.psu.edu

<https://global.engr.psu.edu>

International Engineering, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The International Engineering Minor is paired with any engineering baccalaureate major at any campus in order to provide students with an opportunity to learn about, and understand their profession in a global context. It is designed to provide students with knowledge, language skills, and experiences to help prepare them for a professional career that is likely to include collaborations with professionals from various parts of the world. The minor will help students understand the cross-cultural communications challenges and the global arena in which their profession is practiced. Students completing this minor will gain a competitive advantage because they will be able to demonstrate a broader understanding of the role of their profession and will have demonstrated their ability to communicate across cultural lines.

You Might Like This Program If...

You want to bring a truly global perspective to your engineering education.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
ECON 333	International Economics	3
Supporting Courses and Related Areas		
<i>Supporting Courses and Related Areas: Require a grade of C or better</i>		
Demonstrate language skills in a currently spoken world language other than English ¹		6

Select 3 credits of Engineering/computer science courses with significant international content from a program list or as approved by the director of the program 3

Select 6 credits of 400-level engineering or computer science courses, in consultation with departmental undergraduate coordinator² 6

¹ Students must take a minimum of 6 credits in the same language, at a level determined by the Language Placement Policy, and achieve a minimum of 12th-credit proficiency in that language. Transfer credits for language courses taken prior to enrollment at Penn State may not be used.

² To be taken abroad at an international institution and taught by faculty at that institution.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Patrick Tunno, Ph.D.

Director, Center for Global Engineering Engagement
208 Hammond Building
University Park, PA 16802
814-863-1654
international@engr.psu.edu

Contact

University Park

THE CENTER FOR GLOBAL ENGINEERING ENGAGEMENT
208 Hammond Building
University Park, PA 16802
814-863-1654
international@engr.psu.edu

<https://global.engr.psu.edu>

Mechanical Engineering Technology, A.ENG.T. (Engineering)

Begin Campus: DuBois, York

End Campus: DuBois, York

Program Description

This major helps graduates prepare for technical positions in manufacturing, machine and tool design, computer drafting and design, computer integrated manufacturing, materials selection and processes, technical sales, and other related industries in mechanical applications. The primary objective of the program is to provide a broad foundation in mechanical systems and applications; computer systems in drafting (CAD), manufacturing (CAM), and automation and robotics (CIM); production and product design; mechanics, dynamics, and strength of materials.

Graduates of this major may qualify for admission to the baccalaureate degree majors in Mechanical Engineering Technology and Structural Design and Construction Engineering Technology programs at Penn State Harrisburg; the Mechanical Engineering Technology and the Plastics Engineering Technology programs at Penn State Erie, The Behrend College; or the baccalaureate degree major in Electro-Mechanical Engineering Technology offered at Penn State Altoona, Penn State Berks, Penn State New Kensington, or Penn State York. Two tracks are available to streamline the transition to these baccalaureate degree programs. A general track is provided for students who do not plan to continue their engineering technology education at the baccalaureate level.

What is Mechanical Engineering Technology?

Mechanical engineering technology is the understanding of how products and machinery work and how they are designed, made, and used.

You Might Like This Program If...

- You are interested in computer-aided drafting (CAD) and computer-aided manufacturing.
- You enjoy physics, math and statistics.
- You have a passion for robotics and automation.
- You have an interest in programming and data acquisition.

Entrance to Major

Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

Degree Requirements

For the Associate in Engineering Technology degree in Mechanical Engineering Technology, a minimum of 65 credits is required:

Requirement	Credits
General Education	21
Requirements for the Major	54-64

12-15 of the 21 credits for General Education are included in the Requirements for the Major. This includes: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses, 0-3 credits of GH or GS.

Requirements for the Major

A First-Year Seminar is required for students at Penn State Erie, The Behrend College.

Code	Title	Credits
Prescribed Courses		
CAS 100	Effective Speech	3

IET 215	Production Design	2
IET 216	Production Design Laboratory	2
MET 213	Strength and Properties of Materials	3
MET 214	Strength and Properties of Materials Laboratory ¹	1
MET 210W	Machine Design	3
<i>Prescribed Courses: Require a grade of C or better</i>		
IET 101	Manufacturing Materials, Processes, and Laboratory	3
MET 111	Mechanics for Technology: Statics	3
MET 206	Dynamics	3
Additional Courses		
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
Select 5-6 credits of the following:		5-6
MATH 22 & MATH 26	College Algebra With Analytic Geometry and Applications II and Plane Trigonometry and Applications of Trigonometry	
MATH 40	Algebra, Trigonometry, and Analytic Geometry ^{1,2}	
MATH 81 & MATH 82	Technical Mathematics I and Technical Mathematics II ^{1,2}	
MATH 82	Technical Mathematics II ^{1,2}	
Select 3-4 credits of the following:		3-4
PHYS 150	Technical Physics I	
PHYS 211	General Physics: Mechanics	
PHYS 250	Introductory Physics I	
Select 3-4 credits of the following:		3-4
PHYS 151	Technical Physics II	
PHYS 212	General Physics: Electricity and Magnetism	
PHYS 251	Introductory Physics II	
Select at least 19-24 credits from one of the following three tracks: 19-24		
General Track		
EDSGN 100	Cornerstone Engineering Design	
EDSGN 110	Spatial Analysis in Engineering Design	
or EGT 114	Spatial Analysis and Computer-Aided Drafting	
EET 105	Electrical Systems	
MET 107	Computer Applications for Technologists	
STS 200	Critical Issues in Science, Technology, and Society	
or STS 233	Ethics and the Design of Technology	
or STS 245		
Select at least 6 credits from the approved supporting course list for this track		
Baccalaureate Electro-Mechanical Engineering Technology (EMET) Track		
CMPT 117	Digital Electronics ¹	
CMPT 120	Digital Electronics Laboratory ¹	
EDSGN 100	Cornerstone Engineering Design	
EDSGN 110	Spatial Analysis in Engineering Design	
or EGT 114	Spatial Analysis and Computer-Aided Drafting	
EET 105	Electrical Systems	
EET 114	Electrical Circuits II ¹	
EET 118	Electrical Circuits Laboratory ¹	
MATH 83	Technical Calculus ^{1,2}	
or MATH 140	Calculus With Analytic Geometry I	

STS 200	Critical Issues in Science, Technology, and Society
or STS/ PHIL 233	Ethics and the Design of Technology
or STS 245	

Baccalaureate Mechanical Engineering Technology (METBC or MET) Track

EET 100	Electric Circuits, Power, and Electronics
EGT 120	Introduction to Graphics and Solid Modeling
EGT 121	Applied Solid Modeling
MET 107	Computer Applications for Technologists
Select 1 credit of First-Year Seminar	

Select 6 credits from the approved supporting course list for this track

- ¹ Students pursuing the baccalaureate track must take MATH 22 and MATH 26.
- ² Students who choose to take MATH 81 and MATH 82 must select MATH 83. Students who choose to take MATH 22 and MATH 26 must select MATH 140.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all associate degree students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 3 credits
- **Writing and Speaking (GWS):** 3 credits

Knowledge Domains

- **Arts (GA):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Note: Up to six credits of Inter-Domain courses may be used for any Knowledge Domain requirement, but when a course may be used to satisfy more than one requirement, the credits from the course can be counted only once.

Exploration

- **Any General Education course (including GHW and Inter-Domain):** 3 credits

University Degree Requirements

Cultures Requirement

3 credits of United States (US) or International (IL) cultures coursework are required and may satisfy other requirements

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 60 degree credits must be earned for an associate's degree. The requirements for some programs may exceed 60 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The Associate Mechanical Engineering Technology program prepares students with technical and professional skills for the professional practice. Due to their experience in our program, within few years of graduation, we expect our graduates to have the ability to:

1. Safely practice in the areas of applied design, manufacturing, testing, evaluation, technical sales, or 2D and 3D modeling.
2. Collaborate effectively in project team activities through recognizing the global, societal, and ethical contexts of their work.
3. Work collaboratively in multi-disciplinary teams and assume an increasing level of responsibility and leadership within their organizations.
4. Demonstrate troubleshooting skills by following protocols and using technical literature.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Associate Mechanical Engineering Technology program is designed to enable students to:

1. Apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve well-defined engineering problems appropriate to the discipline.
2. Design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline.
3. Apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.

- 4. Conduct standard tests, measurements, and experiments and to analyze and interpret the results.
- 5. Function effectively as a member or leader on a technical team.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

DuBois

Douglas J. Miller

Assistant Teaching Professor and Program Coordinator
1 College Place
110 DEF Building
DuBois, PA 15801
814-375-4731
djm290@psu.edu

York

Andrea Giorgioni

Lecturer and Program Coordinator
35 Main Classroom Building
1031 Edgecomb Ave.
York, PA 17403
717-771-4033
aug19@psu.edu

Erie

Fredrick Nitterright

Assistant Teaching Professor
227 Burke Center
Erie, PA 16563
814-898-6185
fxn101@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Mechanical Engineering Technology, A.ENG.T. Ending at DuBois Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit

(accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year		
Fall	Credits Spring	Credits
EDSGN 100	3 MET 111 ^{*2}	3
IET 101 [*]	3 General Education Course	3
MET 107	3 EET 105	3
MATH 26 ¹	3 EDSGN 110 or EGT 114	2
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 MATH 22 (GQ) ^{*†1}	3
CAS 100 (GWS) ^{††}		3
15		17
Second Year		
Fall	Credits Spring	Credits
MET 213 ²	3 MET 210W	3
MET 214	1 PHYS 151 or 251 (GN) ^{†2}	3-4
MET 206 ^{*2}	3 STS 200	3
IET 216	2 General Education Course	3
IET 215	2 Technical Electives ³	3-4
PHYS 150 or 250 (GN) ²	3-4 Technical Electives ³	2-3
Technical Electives ³	2-3	
16-18		17-20
Total Credits 65-70		

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

- ¹ MATH 26 and MATH 22 may be taken concurrently
- ² Students successfully completing MATH 140 and subsequently MATH 141 may choose to take the EMCH 211, EMCH 212 and EMCH 213 sequence of courses for Statics (MET 111), Dynamics (MET 206), and Strengths/Properties of Materials (MET 213); and similarly, PHYS 211 and PHYS 212 in place of (PHYS 150/PHYS 250) and (PHYS 151/PHYS 251), respectively.
- ³ A minimum of 6 credits of approved Technical Elective Credits are required in order to reach the minimum major graduation requirement of 65 credits.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS) requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Program Notes

Approved Technical Elective Courses include the following courses:

COURSE LIST: AET 296, 297; ACCTG 211; BA 241, 242, 243; CHEM 101, 110, 111, 112; CMPET 117, 120; CMPSC 101, 121, 122, 200, 201; EDSGN 210, 296, 297; EET 100, 114, 118, 275; EGT 201; EMET 100, 350, 430; IET 105, 109, 296, 297, 333; IST 110, 210, 220, 250, 402; MATH 083, 140, 141, 210; ME 300; MET 281, 296, 297, 306, 320, 330, 341; MGMT 301; MIS 204; PLET 205; SCM 200; STAT 200; STS 233; SUR 111.

Additional courses may be acceptable via academic petition, must discuss with your academic adviser and/or program coordinator.

Academic Advising Notes

A student's career/graduate school plans should be considered in developing an individual academic plan. Be sure to consult an adviser in this department when scheduling courses.

Mechanical Engineering Technology, A.ENG.T. Ending at York Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
EDSGN 100	3 MET 111 [*]	3
IET 101 [*]	3 General Education Course	3
EET 105	3 MET 107	3
MATH 26	3 PHYS 150 or 250 (GN)	3-4
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 MATH 22 (GQ) ^{†‡}	3
	15	15-16

Second Year

Fall	Credits Spring	Credits
MET 213	3 MET 210W	3
MET 214	1 IET 215	2
MET 206 [*]	3 IET 216	2
EDSGN 110 or EGT 114	2 CAS 100A, 100B, or 100C (GWS) [‡]	3
PHYS 151 or 251 (GN) [†]	3-4 STS 233	3
Technical Electives ¹	3 Technical Electives ¹	3-4
	General Education Course	3
	15-16	19-20

Total Credits 64-67

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ 6 credits of Technical Electives are required if student enrolled in either PHYS 250 or PHYS 251, otherwise 7 credits of Technical Electives are required to reach the minimum major requirement of 65 credits.

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS) requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Program Notes

Technical electives include the following courses:

COURSE LIST: CHEM 101, 110, 111; CMPET 117, 120; CMPSC 101, 121, 201; EET 114, 275; EGT 201; EMET 326, 350, 430; IET 333; IST 402; MATH 140; MGMT 301, MKTG 301, STAT 200

Career Paths

Graduates from the mechanical engineering technology program work in a variety of industries such as automotive, aeronautical, petroleum, defense, medical, power generation, transportation, and materials.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE MECHANICAL ENGINEERING TECHNOLOGY PROGRAM (<https://career.engr.psu.edu/>)

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.engr.psu.edu/graduate-programs/>)

Accreditation

The A.ENG.T. in Mechanical Engineering Technology at Penn State DuBois and Penn State York is accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Mechanical Engineering Technology and Similarly Named Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-865-2952
adviser@engr.psu.edu

<https://www.sedi.psu.edu/>

DuBois

ENGINEERING AND ENGINEERING TECHNOLOGY
1 College Place
DuBois, PA 15801
814-375-4731
djm290@psu.edu

<https://dubois.psu.edu/academics/degrees/engineering/options>
(<https://dubois.psu.edu/academics/degrees/engineering/options/>)

York

35 Main Classroom Building
1031 Edgecomb Ave.
York, PA 17403
717-771-4033
aug19@psu.edu

<https://www.york.psu.edu/academics/associate/mechanical-engineering-technology> (<https://www.york.psu.edu/academics/associate/mechanical-engineering-technology/>)

Erie

SCHOOL OF ENGINEERING

242 Jack Burke Research and Economic Development Center
5101 Jordan Road
Erie, PA 16563
814-898-6125
engineering@psu.edu

<https://behrend.psu.edu/school-of-engineering> (<https://behrend.psu.edu/school-of-engineering/>)

Mechanical Engineering, B.S. (Engineering)

Begin Campus: Any Penn State Campus

End Campus: Scranton, University Park

Program Description

Mechanical Engineering is one of the broadest engineering disciplines and is central in many new technological developments. Mechanical engineers create things that help improve the health, happiness and safety of our everyday lives such as biomedical devices, aircraft and cars, and ways to store renewable energies. Mechanical engineering is divided into two broad areas: mechanical systems and thermal systems. Mechanical systems include the design of mechanisms and the analysis of the strength and wear of materials. Thermal systems include methods of energy conversions, heat transfer and fluid flow.

What is Mechanical Engineering?

Mechanical engineering is the largest and broadest engineering discipline. It uses a combination of physics, chemistry, mathematics, and materials science to study mechanical, fluid, and thermal systems. Mechanical engineers are problem solvers: They use their foundational knowledge to apply scientific and engineering methods to the design, construction, and testing of products and components to ensure that they are safe, reliable, and cost effective. Mechanical engineering differs from mechanical engineering technology in that it emphasizes the math and science behind the theoretical development of engineering analysis and design process principles rather than the application of these principles. Mechanical engineers design everything from athletic equipment, medical devices, theme park rides, and personal computers to engines and power plants.

You Might Like This Program If...

You think outside the box to develop solutions to everyday problems. Mechanical engineers contribute to our health, happiness and safety, and often change the way we think about the world.

Entrance to Major University Park (ME_BS)

This program currently has administrative enrollment controls. Administrative Enrollment Controls are initiated when limitations of space, faculty, or other resources in a major prevent accommodating all students who request them. Students must follow the administrative enrollment controls that are in effect for the semester that they enter the university.

First-Year Students Entering Summer 2024, Fall 2024, Spring 2025

In order to be eligible for entrance to this major, students must satisfy the following requirements:

- be enrolled in the College of Engineering or the Division of Undergraduate Studies
- 29-55 graded Penn State credits (excludes transfer and AP credits)
- completed with a grade of C or better: CHEM 110, EDSGN 100, MATH 140, MATH 141, PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 3.00

Students Who Entered Prior to Summer 2024

Students who entered the University from Summer 2018 through Spring 2024 should view the administrative enrollment controls in the appropriate Undergraduate Bulletin archive (<https://bulletins.psu.edu/undergraduate/archive/>). Students who entered the University prior to the summer 2018 semester should consult with their academic adviser about the administrative enrollment controls in effect for the semester they entered the university.

Scranton (MEENG_BS)

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out:

- 29-55 cumulative credits (excludes transfer and AP credits)
- completed with a grade of C or better: CHEM 110, EDSGN 100, MATH 140, MATH 141, and PHYS 211
- earned a minimum cumulative grade-point average (GPA) of 2.60

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Mechanical Engineering, a minimum of 131 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	113-114

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
IE 312	Product Design and Manufacturing Processes	3
MATH 231	Calculus of Several Variables	2
MATSE 259	Properties and Processing of Engineering Materials	3

ME 390	Academic and Career Development for Mechanical Engineers	0.5
ME 490	Professional Development for Mechanical Engineers	0.5
<i>Prescribed Courses: Require a grade of C or better</i>		
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
EMCH 211	Statics	3
EMCH 212	Dynamics	3
EMCH 213	Strength of Materials	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 220	Matrices	2-3
MATH 251	Ordinary and Partial Differential Equations	4
ME 300	Engineering Thermodynamics I	3
ME 320	Fluid Flow	3
ME 330	Computational Tools	3
ME 340	Mechanical Engineering Design Methodology	3
ME 348	Circuit Analysis, Instrumentation, and Statistics	3
ME 360	Mechanical Design	3
ME 370	Vibration of Mechanical Systems	3
ME 410	Heat Transfer	3
ME 435	Mechanical Engineering Systems Lab	3
ME 450	Modeling of Dynamic Systems	3
ME 454	Mechatronics	3
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
Additional Courses		
Select 1 credit of First-Year Seminar		1
CMPSC 200	Programming for Engineers with MATLAB	3
or CMPSC 201 Programming for Engineers with C++		
ME 440W	Mechanical Systems Design Project	3
or ME 441W Thermal Systems Design Project		
Select 3 credits from the following:		3
BIOL 141	Introduction to Human Physiology	
BIOL 161	Human Anatomy and Physiology I - Lecture	
CHEM 111 & PHYS 214	Experimental Chemistry I and General Physics: Wave Motion and Quantum Physics	
CHEM 112	Chemical Principles II	
Select 3 credits from the following:		3
ECON 14	Principles of Economics	
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	
<i>Additional Courses: Require a grade of C or better</i>		
CAS 100A	Effective Speech	3
or CAS 100B Effective Speech		
ENGL 15	Rhetoric and Composition	3
or ENGL 30H Honors Rhetoric and Composition		
Supporting Courses and Related Areas		

Select 3 credits in a 400-level ME Technical Elective course from department list excluding ME 410, ME 435, ME 440W, ME 441W, ME 442W, ME 443W, ME 450, ME 454, ME 490, ME 494, and ME 496	3
Select 6 credits in Engineering Technical Elective courses from department list	6
Select 3 credits in General Technical Elective courses from department list ^{1,2}	3

¹ Three rotations of Engr Co-op (ENGR 295, ENGR 395, and ENGR 495) can be used as 3 credits of GTE.

² Students who complete Basic ROTC may substitute 6 ROTC credits for 3 credits of GTE and 3 credits of GHW.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN,** may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The overall educational objective of the Mechanical Engineering program is to help prepare our graduates to succeed and provide leadership in a range of career paths within their first five years. To that end we endeavor to maintain and continuously improve a curriculum that prepares our graduates to:

1. Apply foundational knowledge, critical thinking, problem-solving, and creativity in engineering practice or in other fields.
2. Grow as leaders while maintaining the highest societal responsibility and ethical standards in the global workplace.
3. Develop thoughtful solutions through effective communication, collaboration, inclusivity, and teamwork.
4. Seek advancement in their knowledge and careers through continuing technical and/or professional studies.

Program Outcomes (Student Outcomes)

The program must have documented student outcomes that support the program educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Undergraduate Programs

140 Reber Building
University Park, PA 16802
814-863-1503
undergrad@me.psu.edu

Scranton

Majid Chatsaz

Assistant Professor, Engineering
120 Ridge View Drive
Dunmore, PA 18512
570-963-2578
chatsaz@psu.edu

Altoona

Grant A. Risha, Ph.D.

Professor and Program Chair, Mechanical Engineering
203 Force Advanced Technology Center
3000 Ivyside Park
Altoona, PA 16601

814-949-5074
gar108@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Mechanical Engineering, B.S. at University Park Campus (Last Names Starting with A-K)

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <https://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
First-Year Seminar ¹	1 Science Elective ²	3
ENGL 15 ^{‡†}	3 ECON 102 or 104 (GS)	3
EDSGN 100 ^{*#}	3 MATH 141 ^{*‡#†}	4
General Education Course [†]	3 General Education Course [†]	3
MATH 140 ^{*‡#†}	4 PHYS 211 ^{*#†}	4
CHEM 110 ^{*#†}	3	
	17	17

Second Year

Fall	Credits Spring	Credits
CMPSC 200	3 EMCH 212 [*]	3
CAS 100A or 100B ^{‡†}	3 EMCH 213 [*]	3
EMCH 211 [*]	3 ME 300 [*]	3
MATH 251 [*]	4 MATH 231	2
PHYS 212 ^{*†}	4 MATH 220 [*]	2-3
	General Education Course [†]	3
	17	16-17

Third Year

Fall	Credits Spring	Credits
IE 312	3 ME 454 [*]	3
MATSE 259	3 ENGL 202C ^{‡†}	3
ME 330 [*]	3 ME 340 [*]	3
ME 370 [*]	3 ME 360 [*]	3
ME 348 [*]	3 ME 320 [*]	3
ME 390	0.5 ME 490	0.5
	General Education Course (GHW)	1.5
	15.5	17

Fourth Year

Fall	Credits Spring	Credits
Engineering Technical Elective (ETE)	3 ME 440W	3
ME 410 [*]	3 General Education Course [†]	3
ME 450 [*]	3 General Education Course [†]	3
Mechanical Engineering Technical Elective (METE)	3 General Technical Elective (GTE)	3
ME 435 (Mechanical Engineering Lab) ^{*3}	3 Engineering Technical Elective (ETE)	3
General Education Course (GHW)	1.5	
	16.5	15

Total Credits 131-132

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

¹ Students who did not take a 1-credit College of Engineering First-Year Seminar should verify completion of this requirement with ME adviser

² Science Elective Choices: CHEM 112, BIOL 141, BIOL 161, or CHEM 111 and PHYS 214 (3 credits total)

³ Recommend ME 410 before or concurrent

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Successful completion of MATH and EMCH courses before the 5th semester is important for future course sequencing.
- EMCH 210 or EMCH 210H is not a direct substitute for EMCH 211 and EMCH 213 requirements and should not be taken for ME_BS
- Information on Technical Elective requirements can be found at: <https://www.me.psu.edu/students/undergraduate/curriculum-electives.aspx>

- General Education in ME_BS Curriculum:
 - Single Domain: 3 credits GS (ECON 102 or ECON 104), 3 credits GN (CHEM 110), 3 Credits GA, 3 Credits GH, 3 Credits GHW
 - Inter-Domain: 6 credits
 - Exploratory: 6 credits GN (PHYS 211 and PHYS 212), 3 credits any GA/GH/GS/GN/Inter-Domain or 12th credit level language
- Students must take 3 credits of United State Cultures (US) and 3 credits of International Cultures (IL) (these can be captured in the General Education selections)

Mechanical Engineering, B.S. at University Park Campus (Last Names Starting with L-Z)

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <https://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
First-Year Seminar ¹	1 Science Elective ²	3
ENGL 15 ^{††}	3 ECON 102 or 104 (GS)	3
EDSGN 100 ^{*#}	3 MATH 141 ^{*†#†}	4
General Education Course [†]	3 General Education Course [†]	3
MATH 140 ^{*†#†}	4 PHYS 211 ^{*#†}	4
CHEM 110 ^{*#†}	3	
	17	17

Second Year

Fall	Credits Spring	Credits
CMPSC 200	3 EMCH 212 [*]	3
CAS 100A or 100B ^{††}	3 EMCH 213 [*]	3
EMCH 211 [*]	3 ME 300 [*]	3
MATH 251 [*]	4 MATH 231	2
PHYS 212 ^{*†}	4 MATH 220 [*]	2-3
	General Education Course [†]	3
	17	16-17

Third Year

Fall	Credits Spring	Credits
ENGL 202C ^{††}	3 IE 312	3
General Education Course [†]	3 MATSE 259	3
ME 340 [*]	3 ME 330 [*]	3
ME 360 [*]	3 ME 370 [*]	3
ME 320 [*]	3 ME 348 [*]	3
General Education Course (GHW)	1.5 ME 390	0.5
	16.5	15.5

Fourth Year

Fall	Credits Spring	Credits
ME 440W	3 Engineering Technical Elective (ETE)	3
General Education Course [†]	3 ME 410 [*]	3
ME 454 [*]	3 ME 450 [*]	3
General Technical Elective (GTE)	3 Mechanical Engineering Technical Elective (METE)	3
Engineering Technical Elective (ETE)	3 ME 435 (Mechanical Engineering Lab) ^{*3}	3

ME 490	0.5 General Education Course (GHW)	1.5
	15.5	16.5

Total Credits 131-132

- * Course requires a grade of C or better for the major
- † Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

- ¹ Students who did not take a 1-credit College of Engineering First-Year Seminar should verify completion of this requirement with ME adviser
- ² Science Elective Choices: CHEM 112, BIOL 141, BIOL 161, or CHEM 111 and PHYS 214 (3 credits total)
- ³ Recommend ME 410 before or concurrent

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Successful completion of MATH and EMCH courses before the 5th semester is important for future course sequencing.
- EMCH 210 or EMCH 210H is not a direct substitute for EMCH 211 and EMCH 213 requirements and should not be taken for ME_BS
- Information on Technical Elective requirements can be found at: <https://www.me.psu.edu/students/undergraduate/curriculum-electives.aspx>
- General Education in ME_BS Curriculum:
 - Single Domain: 3 credits GS (ECON 102 or ECON 104), 3 credits GN (CHEM 110), 3 Credits GA, 3 Credits GH, 3 Credits GHW
 - Inter-Domain: 6 credits
 - Exploratory: 6 credits GN (PHYS 211 and PHYS 212), 3 credits any GA/GH/GS/GN/Inter-Domain or 12th credit level language
- Students must take 3 credits of United State Cultures (US) and 3 credits of International Cultures (IL) (these can be captured in the General Education selections)

Mechanical Engineering, B.S. at Scranton Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
First-Year Seminar	1 ECON 102 or 104 (GS)	3
CHEM 110 ^{*#†}	3 General Education Course (GA, GH, or GS) [†]	3
ENGL 15 ^{††}	3 MATH 141 ^{*#††}	4
EDSGN 100 ^{*#}	3 PHYS 211 ^{*#†}	4
General Education Course (GA, GH, or GS) [†]	3 Science Elective (see below)	3
MATH 140 ^{*#††}	4	
	17	17

Second Year

Fall	Credits Spring	Credits
CAS 100A or 100B ^{††}	3 EMCH 212 [*]	3
CMPSC 200	3 EMCH 213 [*]	3
EMCH 211 [*]	3 General Education Course (GA, GH, GS) [†]	3
MATH 251 [*]	4 MATH 220 [*]	2
PHYS 212 ^{††}	4 MATH 231	2
	ME 300 [*]	3
	17	16

Third Year

Fall	Credits Spring	Credits
ENGL 202C ^{††}	3 IE 312	3
ME 320 [*]	3 MATSE 259	3
ME 340 [*]	3 ME 330 [*]	3
ME 360 [*]	3 ME 348 [*]	3
ME 390	0.5 ME 370 [*]	3
General Education Course (GA, GH, or GS) [†]	3 ME 490	0.5
General Education Course (GHW)	1.5	
	17	15.5

Fourth Year

Fall	Credits Spring	Credits
ME 440W [*]	3 ME 410 [*]	3
ME 454 [*]	3 ME 435 (Mechanical Engineering Lab) [*]	3
Engineering Technical Elective (ETE)	3 ME 450 [*]	3
General Technical Elective (GTE)	3 Engineering Technical Elective (ETE)	3
General Education Course (GA, GH, or GS) [†]	3 Mechanical Engineering Technical Elective (METE)	3

General Education Course (GHW) 1.5

15 16.5

Total Credits 131

* Course requires a grade of C or better for the major

‡ Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- Science elective choices: CHEM 112, BIOL 141, BIOL 161, or CHEM 111 and PHYS 214 (3 credits total)
- Completion of EMCH and MATH courses before the 5th semester is important for future course sequencing
- Details on the METE, ETE and GTE can be found at <https://www.me.psu.edu/students/undergraduate/curriculum-electives.aspx>

Career Paths

University Park: Penn State's mechanical engineering curriculum offers many opportunities to gain hands-on experience in the profession. At the University Park campus, our experiential laboratory components and design course sequence are tailored to prepare you to enter industry or graduate school. The design component of the curriculum culminates in an industry-sponsored senior design project, in which you'll work in a multidisciplinary team to solve a real-world issue. Our laboratory course encourages higher-order thinking skills. Students explore fundamental mechanical engineering knowledge through the lens of solving real-world problems in topics such as energy and sustainability, autonomy and robotics, and machine learning.

Penn State Scranton: Penn State Scranton is one of only five campuses that offer the mechanical engineering major. The Bachelor of Science in Mechanical Engineering provides students with the necessary

training and education to become technical leaders in various industrial, commercial, consulting, and governmental organizations.

Careers

University Park: Penn State's mechanical engineering program at the University Park campus has had a long and successful history. Mechanical engineering was introduced at Penn State in 1881. Graduates from our department go on to work in a diverse range of industries for large multinational companies and small local firms. Mechanical engineers are well prepared to work as managers due to their broad backgrounds and creative problem-solving skills. Historically, our graduates regularly accept positions at Fortune 500 companies, such as Ingersoll Rand, Boeing, Toshiba-Westinghouse, General Electric, Lockheed Martin, Northrop Grumman, Dow Chemical, ExxonMobil, Procter & Gamble, United Technologies Corporation, and Johnson & Johnson.

Penn State Scranton: The mechanical engineering program at Penn State Scranton prepares you for entering the mechanical engineering industry or going on to graduate school. Mechanical engineering is called "*the mother of all engineering majors*" for a reason; it gives the student exposure to many different disciplines. Mechanical engineering graduates get jobs in many different types of industries both locally, nationally, and globally. Examples of career opportunities for mechanical engineers are:

- design engineers
- research engineers
- biomedical equipment
- analyst
- entrepreneur
- test engineer
- rocket engineer
- project manager
- sales engineer

According to the Bureau of Labor Statistics mechanical engineers earn an average starting salary of \$70,000 and mid-career salary of \$100,000.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE MECHANICAL ENGINEERING PROGRAM (<https://www.me.psu.edu/students/undergraduate/what-is-an-engineer.aspx#MechanicalENGINEer>)

Opportunities for Graduate Studies

University Park: If you want to work with renowned faculty, scientists, and engineers, the Department of Mechanical Engineering located at the University Park campus is a great place for you. We are one of the nation's largest engineering departments with more than 60 full-time faculty, numerous research staff, visiting faculty, scientists, and more than 300 graduate students. Research funding comes from industry and government sources, including the Department of Energy, the National Science Foundation, the Army, the Air Force, and NASA. Our graduates are known for their ability to find high-level positions in national research centers and laboratories as well as postdoctoral and tenure-track positions in top-tier research universities.

Penn State Scranton: Mechanical Engineering graduates of Penn State Scranton campus are eligible to continue for a master's degree at many US colleges and universities.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.me.psu.edu/research/>)

Professional Resources

- American Society of Mechanical Engineers (ASME) (<https://sites.psu.edu/asmeuniversitypark/>)
- Professional Licensure/Certification Disclosures by State (<https://app.powerbi.com/view/?r=eyJrJoiNjAxYmU1N2MtNzRmZC00NjRmLWJlMzAtYmQ1NDliYjU1MjUzliwidCI6IjdjZjQ4ZDQ1LTNkZGltNDM4OS1hOWMxLWwMTU1MjZlYjUyZSIsImMiOiJF9g>)

Accreditation

The Bachelor of Science in Mechanical Engineering at University Park and Penn State Scranton is Accredited by the Engineering accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Mechanical and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

DEPARTMENT OF MECHANICAL ENGINEERING
140 Reber Building
University Park, PA 16802
814-863-1503
undergrad@me.psu.edu

<https://www.me.psu.edu>

Scranton

120 Ridge View Drive
Dunmore, PA 18512
570-963-2578
chatsaz@psu.edu

<https://scranton.psu.edu/academics/degrees/bachelors/mechanical-engineering> (<https://scranton.psu.edu/academics/degrees/bachelors/mechanical-engineering/>)

Altoona

DIVISION OF BUSINESS, ENGINEERING, AND INFORMATION SCIENCES AND TECHNOLOGY
203 Force Advanced Technology Center
3000 Ivyside Park
Altoona, PA 16601
814-949-5074
gar108@psu.edu

<https://altoona.psu.edu/academics/bachelors-degrees/mechanical-engineering> (<https://altoona.psu.edu/academics/bachelors-degrees/mechanical-engineering/>)

Nanotechnology, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

The primary goal of the program is to offer students and incumbent workers worldwide the opportunity to earn this 18-credit certificate, which will be available only online. All candidates are required to successfully complete the required courses.

What is Nanotechnology?

Nanotechnology is inherently interdisciplinary and bridges across physics, biology, materials science, and chemistry. It is a general purpose, enabling technology that is already impacting a broad spectrum of human endeavors, from medicine and catalysis to textiles and quantum computing. The Nanotechnology certificate is designed to help prepare students from a broad range of disciplines for careers or graduate study in fields involving nanotechnology. It builds upon the strengths of Penn State's faculty, expertise, academic programs, and nanofabrication facilities, including its class 1 and class 10 cleanrooms. The curriculum provides students with fundamental knowledge and skills in nanoscale simulation, design, syntheses, characterization, properties, processing, manufacturing, and applications.

You Might Like This Program If...

You are interested in gaining fundamental knowledge and skills in nanoscale simulation, design, syntheses, characterization, properties, processing, manufacturing, and applications.

Program Requirements

To earn an undergraduate certificate in Nanotechnology, a minimum of 18 credits is required.

Code	Title	Credits
Prescribed Courses		
ESC 211	Material, Safety and Equipment Overview for Nanotechnology	3
ESC 212	Basic Nanotechnology Processes	3
ESC 213	Materials in Nanotechnology	3
ESC 214	Patterning for Nanotechnology	3
ESC 215	Nanotechnology Applications	3
ESC 216	Characterization, Testing of Nanotechnology Structures and Materials	3

Prerequisites Required.

Certificate Learning Objectives

- **Characterization:** Students will examine characterization techniques and measurements essential for testing and for controlling material fabrication and final device performance.
- **Material Modification:** Students will learn in detail processing techniques and about the operation of specialty tools used in materials modification in forming nanoscale devices and systems. Students will also learn to avoid unintentional material modifications. Application fields of nanotechnology in health sciences, energy, manufacturing, food, agriculture, medicine and environmental discussions will be highlighted.

- **Materials and Safety:** Students will learn the principles and practices of safe equipment operation/maintenance and materials handling in regards to environment, health and safety issues. Material classification methods based on their physical, mechanical and optical properties will be covered while vacuum systems are introduced.
- **Nanostructure:** Students will develop a detailed understanding of how materials are fabricated into nano-structures used in nanotechnology. Nanoparticles, quantum dots will be covered with their bio applications. Oxidation and plasma techniques will also be studied.
- **Nanotechnology Processes:** Students will be introduced to the basic processes involved in "top down", "bottom up", and hybrid nanofabrication including deposition, etching, and pattern transfer. Students will learn the similarities and differences in the equipment used and process flows. Nano-characterization methods will also be outlined.
- **Patterning:** Students will be able to identify techniques of advanced pattern transfer and select the appropriate tool and technique that will best create the product needed in the competitive modern workplace.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Mark Horn

Professor

305C Earth and Engineering Sciences Building

University Park, PA

814-865-0332

mwh4@psu.edu

World Campus

Undergraduate Academic Advising

301 Outreach Building

University Park, PA 16802

814-863-3283

advising@outreach.psu.edu

Career Paths

In addition to preparing students for career opportunities in a diverse variety of fields such as microelectronics, information storage, optoelectronics, pharmaceuticals, agriculture, and medicine, the certificate also prepares undergraduate students for exciting research

opportunities and multidisciplinary nanotechnology-based advanced degree programs in graduate schools around the world.

Contact

University Park

DEPARTMENT OF ENGINEERING SCIENCE AND MECHANICS
212 Earth and Engineering Sciences Building
University Park, PA 16802
814-865-4523
mwh4@psu.edu

<https://www.esm.psu.edu>

World Campus

ENGINEERING SCIENCE AND MECHANICS/CENTER FOR
NANOTECHNOLOGY EDUCATION AND UTILIZATION
118 Research West
University Park, PA 16802
814-865-9635
nanotech@engr.psu.edu

Nanotechnology, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The Nanotechnology minor is designed to help prepare students from diverse disciplines for careers in a broad range of industries innovating with nanotechnology. The minor builds on the singular strengths of Penn State's nanofabrication facilities including its class 1 and class 10 clean rooms, its faculty, and existing academic programs. The minor provides students with fundamental knowledge and skills in simulation, design, modeling, syntheses, characterization, properties, processing, manufacturing, and applications at the nano scale.

As nanotechnology increasingly bridges across disciplines, a basic understanding of mathematics, physics, biology, and chemistry is recommended. To complete the 18 credit nanotechnology minor, students will take two prescribed courses (6 credits) in nanoscience fundamentals, and then select four additional courses (12 credits) from a growing list of courses that address the areas described in the previous paragraph.

In addition to nanotechnology career opportunities in microelectronics, information storage, optoelectronics, bioelectronics, pharmaceuticals, agriculture, medicine, life sciences and the sciences, the minor prepares undergraduate students to support major new nanotechnology research programs as graduate students. Interested 3rd and 4th year students from related fields in engineering, the chemical, physical, and the biological sciences, medicine, life, and agricultural sciences are encouraged to enroll.

What is Nanotechnology?

Nanotechnology is inherently interdisciplinary and bridges across physics, biology, materials science, and chemistry. It is a general purpose, enabling technology that is already impacting a broad spectrum of

human endeavors, from medicine and catalysis to textiles and quantum computing.

You Might Like This Program If...

- You are interested in an interdisciplinary minor that bridges across physics, biology, materials science, and chemistry.
- You are interested in gaining fundamental knowledge and skills in nanoscale simulation, design, syntheses, characterization, properties, processing, manufacturing, and applications.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
ESC 312	Engineering Applications of Wave, Particle, and Ensemble Concepts	3
ESC 313	Introduction to Principles, Fabrication Methods, and Applications of Nanotechnology	3

Supporting Courses and Related Areas

Supporting Courses and Related Areas: Require a grade of C or better
Select 12 credits (at least 6 credits at the 400 level) from an approved 12 list

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Mark Horn

Professor
305C Earth and Engineering Sciences Building
University Park, PA
814-865-0332
mwh4@psu.edu

Career Paths

In addition to preparing students for career opportunities in a diverse variety of fields such as microelectronics, information storage, optoelectronics, pharmaceuticals, agriculture, and medicine, the minor also prepares undergraduate students for exciting research opportunities and multidisciplinary nanotechnology-based advanced degree programs in graduate schools around the world. Graduate students in engineering science and mechanics conduct innovative research with a diverse, award-winning faculty on interdisciplinary programs that address society's grand challenges.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN NANOTECHNOLOGY (<http://www.esm.psu.edu/academics/resources/career-resources.aspx>)

Opportunities for Graduate Studies

The ESM department offers the following graduate degree options:

- Master of Engineering (M.Eng.) in Engineering Mechanics
- Master of Engineering (M.Eng.) in Additive Manufacturing
- Master of Science (M.S.) in Engineering at the Nano-scale
- Master of Science (M.S.) in Engineering Science and Mechanics
- Master of Science (M.S.) in Additive Manufacturing
- Doctor of Philosophy (Ph.D.) in Engineering Science and Mechanics
- Doctor of Medicine and Doctor of Philosophy in Engineering Science and Mechanics (M.D./Ph.D.)
- Graduate Certificate in Laser-Materials Processing and Laser-Based Manufacturing

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.esm.psu.edu/academics/graduate/prospective-students.aspx>)

Contact

University Park

DEPARTMENT OF ENGINEERING SCIENCE AND MECHANICS
212 Earth and Engineering Sciences Building
University Park, PA 16802
814-865-4523
mwh4@psu.edu

<http://www.esm.psu.edu/>

Nuclear Engineering, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

The overall educational objective of the Nuclear Engineering program is to help prepare our graduates to function effectively in the marketplace in a wide range of career paths in Nuclear Engineering. The technical part of the curriculum, emphasizes nuclear power engineering, which refers to complex systems used to generate electricity. Because of our strong educational and research emphasis in nuclear power engineering, and because a shortage for this expertise exists in the industry, generally the industry values our graduates highly. We recognize that nuclear science, including nuclear security and non-proliferation, is an important growth area. We constantly assess and review the needs of our undergraduate

students and their most frequent employers and use this feedback to consider revisions to our curriculum so that it is responsive to the needs of our constituents.

The first two years of the program stress fundamentals in mathematics, chemistry, physics, computer programming, and engineering sciences such as mechanics, materials, and thermodynamics. The last two years provide the breadth and depth in nuclear science, behavior of heat and fluids, reactor theory and engineering, and radiation measurement. The laboratory work includes experiments using the University's 1,000-kilowatt research reactor. Engineering design is incorporated in many courses from the freshman year to the senior year, but is particularly emphasized in the senior capstone design course, which integrates the critical elements of reactor theory, reactor engineering, safety considerations and economic optimization into a reactor design.

Many graduates are employed by electric power companies that use nuclear power plants, or by companies that help service and maintain those plants. They use their knowledge of engineering principles, radioactive decay, interactions of radiation with matter, and nuclear reactor behavior to help assure that the power plants meet the demand for reliable, economic electricity while ensuring a safe environment. To do this, graduates must be problem solvers who can develop and use complex computer models and sophisticated monitoring systems, design systems to handle radioactive waste, determine if the materials in the plant are becoming brittle or corroded, or manage the fuel in the reactor to get the maximum energy from it. Other graduates work in industries that use radioactivity or radiation to detect problems or monitor processes. Jobs are also found in branches of the government as designers of the next generation of reactors for submarines, aircraft carriers, or space probes, or to manage and clean up contaminated wastes. They could also be involved with regulation of nuclear power or radiation uses, or in research to develop advanced technologies that will be used in next-generation power plants. Graduates who want to further their education in the fields of health physics, radiation biology, or nuclear medical applications find this degree to be a useful preparation.

What is Nuclear Engineering?

Nuclear Engineering is a multidisciplinary field that goes beyond providing nuclear power for electrical production. Nuclear engineers may apply their knowledge in various fields, including disease treatment, safeguarding food supplies, operate nuclear energy systems, develop regulations to ensure safety, or facilitate space exploration.

You Might Like This Program If...

You are interested in using basic science to make the world a better place for humankind through the production of clean energy, keeping the country safe from nuclear attack, and the application of nuclear science.

Entrance to Major

In order to be eligible for entrance to this major, students must satisfy the following requirements by the end of the semester during which the admission to major process is carried out.

- Completed 29-55 cumulative credits (credits completed at Penn State for which a quality letter grade was earned)
- Completed with a C or better the following courses: EDSGN 100, CHEM 110, MATH 140, MATH 141, and PHYS 211
- Attained at least a 2.6 cumulative grade point average

* In the event that the major is under enrollment control, a higher minimum cumulative grade-point average is likely to be needed and students must be enrolled in the College of Engineering or Division of Undergraduate Studies at the time of confirming their major choice.

Degree Requirements

For the Bachelor of Science degree in Nuclear Engineering, a minimum of 129 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	111

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CHEM 111	Experimental Chemistry I	1
EE 212	Introduction to Electronic Measuring Systems	3
EMCH 211	Statics	3
EMCH 212	Dynamics	3
EMCH 213	Strength of Materials	3
EMCH 315	Mechanical Response of Engineering Materials	2
EMCH 316	Experimental Determination of Mechanical Response of Materials	1
MATH 230	Calculus and Vector Analysis	4
ME 300	Engineering Thermodynamics I	3
ME 320	Fluid Flow	3
ME 410	Heat Transfer	3
NUCE 310W	Issues in Nuclear Engineering	2
NUCE 403	Advanced Reactor Design	3
NUCE 451	Experiments in Reactor Physics	3
NUCE 431W	Nuclear Reactor Core Design Synthesis	4
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
<i>Prescribed Courses: Require a grade of C or better</i>		
CHEM 110	Chemical Principles I	3
EDSGN 100	Cornerstone Engineering Design	3
ENGL 202C	Effective Writing: Technical Writing	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 251	Ordinary and Partial Differential Equations	4
NUCE 301	Fundamentals of Reactor Physics	4
NUCE 302	Introduction to Reactor Design	4
NUCE 309	Analytical Techniques for Nuclear Concept	3
NUCE 430	Design Principles of Reactor Systems	3

NUCE 450	Radiation Detection and Measurement	3
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4

Additional Courses

Select 1 credit of First-Year Seminar	1
CMPSC 200 Programming for Engineers with MATLAB or CMPSC 201 Programming for Engineers with C++	3
Select one of the following:	3
ECON 102 Introductory Microeconomic Analysis and Policy	
ECON 104 Introductory Macroeconomic Analysis and Policy	
EBF 200 Introduction to Energy and Earth Sciences Economics	

Select 6 credits, of which 3 credits must be designated as design, from the following:

BME 406 Medical Imaging	
NUCE 405 Nuclear and Radiochemistry	
NUCE 408 Radiation Shielding	
NUCE 409 Nuclear Materials	
NUCE 420 Radiological Safety	
NUCE 428 Radioactive Waste Control	
NUCE 470 Power Plant Simulation	
NUCE 490 Introduction to Plasmas	
NUCE 496 Independent studies	
NUCE 497 Special Topics	
500-level NUCE courses with approval of adviser	

Additional Courses: Require a grade of C or better

CAS 100A Effective Speech or CAS 100B Effective Speech	3
ENGL 15 Rhetoric and Composition or ENGL 30H Honors Rhetoric and Composition	3

Supporting Courses and Related Areas

Select 3 credits in General Technical Elective (GTE) courses from department list ^{1,2}

¹ These courses may have to be chosen so that the engineering design or engineering science requirements for the major are met.

² Students who complete Basic ROTC may substitute 6 of the ROTC credits for 3 credits of GTE and 3 credits of GHW.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- **United States Cultures:** 3 credits
- **International Cultures:** 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or

within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

Accordingly, we will endeavor to maintain and provide a curriculum that prepares our graduates such that:

- Within two to three years of graduation, we expect the majority of our B.S. graduates to:
 - be working in industry, especially related to nuclear power engineering,
 - be working in government agencies or national laboratories,
 - be pursuing advanced degrees.
- We expect that our students will continue to develop professionally and establish themselves in their careers and in this way may take the opportunity to further their education and training by attending graduate school or by pursuing other professional development.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Nuclear Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Amanda Johnsen
Assistant Professor and Undergraduate Program Director of Nuclear Engineering
113 Hallowell Building
University Park, PA 16802
814-865-5928
amj15@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Nuclear Engineering, B.S. at University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer to: <http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
CHEM 110 (GN) ^{**†}	3 ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3
CHEM 111 (GN)	1 MATH 141 or 141E (GQ) ^{*†#†}	4
ECON 102 or 104 (GS) [†]	3 PHYS 211 (GN, PHYSICS 211L & PHYSICS 211R) ^{*#†}	4
EDSGN 100 ^{*#}	3 First Year Seminar [†]	1
MATH 140 or 140E (GQ) ^{*†#†}	4 General Education Course [†]	3
General Education Course [†]	3 General Education Course (GHW) [†]	1.5
17		16.5

Second Year

Fall	Credits Spring	Credits
CMPSC 200 (CMPSC 201 acceptable)	3 EMCH 212	3
EMCH 211	3 EMCH 213 or 213D	3
MATH 251 [*]	4 MATH 230	4
PHYS 212 (GN, PHYSICS 212L & PHYSICS 212R) ^{*†}	4 ME 300	3
General Education Course [†]	3 PHYS 214	2
	General Education Course (GHW) [†]	1.5
17		16.5

Third Year

Fall	Credits Spring	Credits
CAS 100A or 100B (GWS) ^{††}	3 EE 212	3
ME 320	3 EMCH 315	2
NUCE 301 [*]	4 EMCH 316	1
NUCE 309 [*]	3 ME 410	3
NUCE 310W	2 NUCE 302 [*]	4
	NUCE 450 [*]	3
15		16

Fourth Year

Fall	Credits Spring	Credits
ENGL 202C (GWS) ^{††}	3 NUCE 431W	4
NUCE 403	3 General Technical Elective (GTE)	3
NUCE 430 [*]	3 Nuclear Engineering Elective (NETE)	3
NUCE 451	3 General Education Course [†]	3
Nuclear Engineering Elective (NETE)	3 General Education Course [†]	3
15		16

Total Credits 129

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and satisfy a portion of that General Education requirement. If the student's program prescribes GWS these courses will replace both ENGL 15/ENGL 30H and CAS 100A/CAS 100B/CAS 100C. Each course is 3 credits.

College Notes:

- **General Technical Elective (GTE):** Select from NUCE program lists. Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for the GTE requirement. Students who complete three co-op rotations may substitute 3 co-op credits for the GTE requirement.

- **Health and Physical Activity Elective:** Students who complete the ROTC Program may substitute 3 ROTC credits for the GHW requirement and 3 ROTC credits for the GTE requirement.
- **Nuclear Engineering Elective (NETE):** Select from NUCE program lists.
- **These courses offered at University Park in fall semester only:**
 - NUCE 301
 - NUCE 309
 - NUCE 310W
 - NUCE 403
 - NUCE 430
 - NUCE 451
- **These courses offered at University Park in spring semester only:**
 - NUCE 302
 - NUCE 431W
 - NUCE 450

Career Paths

Penn State's nuclear engineering program relates theory to practice in a way that most universities cannot. Penn State is one of the few universities where undergraduate students can work with a functioning nuclear reactor. The Breazeale Nuclear Reactor is the longest operating licensed research reactor in the country and is one of the premier nuclear research facilities in the world. In addition to University facilities, students also gain professional experience through an industry-sponsored project in their capstone design course. Penn State's collaboration with Westinghouse, as well as other nuclear companies and agencies, provides an unmatched educational experience using the simulation and analysis codes currently used in industry. Penn State also collaborates effectively with industry, the military, and government as sponsors of the capstone design project.

Careers

Many nuclear engineering graduates work for electric power companies that use nuclear power plants or help service and maintain these plants. Other graduates work in industries that use radioactivity or radiation, such as medicine, food, and agriculture. These fields need nuclear engineers to detect problems, monitor processes, and protect the public. The federal government also hires nuclear engineers to design next-generation reactors for submarines, aircraft carriers, and space probes; regulate nuclear power or radiation uses; and develop advanced technologies that will be used in future power plants. Other industries where nuclear engineers may work include energy, government, medicine, agriculture, and space.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE NUCLEAR ENGINEERING PROGRAM (<https://www.nuce.psu.edu/industry/>)

Opportunities for Graduate Studies

Penn State University is home to the Breazeale Nuclear Reactor, one of the premier reactor research facilities in the country. Our students have the unique opportunity to learn and research in state-of-the-art experimental facilities under the supervision of internationally renowned faculty, scientists, and engineers. We have especially strong research programs in nuclear power, reactor design, nuclear science, and nuclear materials.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<https://www.nuce.psu.edu/students/graduate/prospective.aspx>)

Accreditation

The Bachelor of Science in Nuclear Engineering at University Park is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Nuclear, Radiological, and similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

KEN AND MARY ALICE DEPARTMENT OF NUCLEAR ENGINEERING
113 Hallowell Building
University Park, PA 16802
814-865-5928
lay1@psu.edu

<https://www.nuce.psu.edu/about/contact-us.aspx>

Product Innovation Entrepreneurship, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

Learn and practice the entrepreneurial mindset in the Product Innovation Entrepreneurship Certificate. This certificate prepares you to run an entrepreneurial venture or to be an intrapreneur where you utilize the entrepreneurial mindset within an existing organization. Learn and practice business fundamentals from an entrepreneurial perspective and deal with the challenges of leading a creative entrepreneurial organization and the associated ambiguity. The certificate is open to any student who has the goal to own their own business or wants to learn to think outside the box. This certificate will help the student work effectively within any organization, always looking for ways to be more creative and innovative.

Program Requirements

To earn an undergraduate certificate in Product Innovation Entrepreneurship, a minimum of 9 credits is required.

Code	Title	Credits
Required Courses		
BA 250 or ENGR 411	Small Business Management Entrepreneurship Business Basics	3
Select 6 credits from the following:		6
ENGR 310	Entrepreneurial Leadership	
ENGR 407	Technology-Based Entrepreneurship	
ENGR 415	Launching Innovation: Ideas to Opportunities	
ENTR 300	Principles of Entrepreneurship	
ENTR 430	Entrepreneurship and New Product Development	
MGMT 427	Managing an Entrepreneurial Start-Up Company	

MGMT 431	Entrepreneurship and Small Business Management
----------	--

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
307 Engineering Design and Innovation Building
University Park, PA 16802
814-863-2587
sedicourses@psu.edu

<https://www.sedi.psu.edu>

Residential Construction, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

The objective of the Residential Construction Minor is to provide an opportunity for students to gain an understanding of the residential building construction topics and issues with emphasis on sustainable land development, design and construction of residential buildings, as well as construction management of residential projects. Residential building construction is a unique interdisciplinary field that draws upon civil and architectural engineering, architecture, real estate, management, finance, and marketing disciplines, and design principles including economical, safe, and serviceable structural design, green building systems design, sustainable land development, and construction management. This minor is expected to be primarily of interest to students from Civil and Environmental Engineering, Architectural Engineering, and Architecture majors, but students from other majors can also enroll in this minor. This minor will help students to increase their competitiveness for employment in residential market and construction industry.

What is Residential Construction?

Residential Construction is the building of single- and multi-family single-units, manufactured, duplex and quad-plex homes and apartments and condominiums.

You Might Like This Program If...

- You have an interest in architectural engineering, civil engineering, or architecture.
- You want to build residential homes.
- You have an interest in real estate.

Program Requirements

Requirement	Credits
Requirements for the Minor	22

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>).

In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
AE 470	Residential Building Design and Construction	3
AE 471	CONSTRUCTION MANAGEMENT OF RESIDENTIAL BUILDING PROJECTS	3
ARCH 412	Integrative Energy and Environmental Design	3
CE 411	Residential Construction Design Project	1
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select 12 credits from one of the following tracks:		12
<i>Architecture Track</i>		
AE 211		
AE 421	Architectural Structural Systems I	
AE 422	Architectural Structural Systems II	
FIN 100	Introduction to Finance	
RM 303	Real Estate Fundamentals	
<i>Architectural Engineering Track</i>		
AE 202	Introduction to Architectural Engineering Concepts	
AE 372	Introduction to the Building Construction Industry	
AE 402	Design of Concrete Structures for Buildings	
AE 404	Building Structural Systems in Steel and Concrete	
AE 454	Advanced Heating, Ventilating, and Air Conditioning	
AE 456		
AE 542	Building Enclosure Science and Design	
BE 462	Design of Wood Structures	
<i>Civil Engineering Track</i>		
AE 432	Design of Masonry Structures	
AE 542	Building Enclosure Science and Design	
BE 462	Design of Wood Structures	
CE 332	Professionalism, Economics & Construction Project Delivery	
CE 341	Design of Concrete Structures	
CE 410W		

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Ali Memari

Professor and Bernard and Henrietta Hankin Chair in Residential Building Construction
222 Sackett Building
University Park, PA 16802
814-863-9788
amm7@psu.edu

Career Paths

Students with a minor in Residential Construction serve in a variety of roles relating to design, construction, research and education.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES WITH A MINOR IN RESIDENTIAL CONSTRUCTION (<http://www.ae.psu.edu/industry/career-fair/>)

Opportunities for Graduate Studies

Students with a minor in Residential Construction may be interested in graduate studies in architectural engineering, facilities engineering and management or civil engineering.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.ae.psu.edu/academics/graduate/>)

Contact

University Park

DEPARTMENT OF ARCHITECTURAL ENGINEERING
104 Engineering Unit A
University Park, PA 16802
814-865-6394
jad6832@psu.edu

<https://www.ae.psu.edu/academics/undergraduate/residential-construction-minor.aspx>

Service Enterprise Engineering, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

Service sector represents over 80% of the economy and represents over 70% of jobs in the U.S. Service enterprises constitute a wide range in terms of labor intensity, information intensity, and prevailing productivity. Examples of service enterprises include hospitals, retailers, banks, financial institutions, and airlines. This minor is designed for students interested in learning about applying industrial engineering techniques to service enterprises. Students completing this minor will gain an understanding of applying industrial engineering and operations research tools for modeling, analysis, design and control of service enterprises.

In addition to the stated courses for the minor, students in IE pursuing this minor may be required to take the prerequisites for the courses listed for the Service Cluster. Students in HPA, HDFS and any other major will require MATH 220 as a prerequisite for IE 405. IE 405 and IE 322 (or

an equivalent course in probability and statistics) are prerequisites for IE 460.

What is Service Enterprise Engineering?

Service Enterprise Engineering is the study, design, and implementation of new systems that improve the processes and efficiencies of the service sector, in which 80 percent of the U.S. workforce is employed. The minor answers a critical need for operational expertise in health care and human service fields. Students completing this minor will gain an understanding of applying industrial engineering and operations research tools for modeling, analysis, design and control of service enterprises.

You Might Like This Program If...

Most applicable for those students in industrial engineering, health policy administration, and human development and family studies, this minor gives students the ability to apply industrial engineering techniques to processes in hospitals, nonprofit organizations, retailers, banks, financial institutions, airlines, and more.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
IE 460	Service Systems Engineering	3
IE 478	Retail Services Engineering	3
Additional Courses		
<i>Additional Courses: Require a grade of C or better</i>		
Select 6 credits from Engineering Cluster:		6
IE 302	Engineering Economy	
IE 322	Probabilistic Models in Industrial Engineering	
IE 323	Statistical Methods in Industrial Engineering	
IE 330	Engineering Analytics	
IE 402	Advanced Engineering Economy	
IE 405	Deterministic Models in Operations Research	
or MATH 484 Linear Programs and Related Problems		
IE 424	Process Quality Engineering	
IE 467	Facility Layout and Location	
IE 468	Optimization Modeling and Methods	
IE 480W	Capstone Design Project	
Select 6 credits from the Service Cluster:		6
HDFS 311	Human Development and Family Studies Interventions	
HDFS 455	Development and Administration of Human Services Programs	
HPA 332	Health Systems Management	

HPA 433	Administration of Hospital and Health Service Systems
HPA 442	Long-Term Care Management
HPA 475	Health Care Quality

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Vittal Prabhu

Professor & Charles and Enid Schneider Faculty Chair in Service Enterprise Engineering
Harold and Inge Marcus Department of Industrial and Manufacturing Engineering
348 Leonhard Building
University Park, PA 16802
814-863-3212
vxp7@psu.edu

Career Paths

Over 60 percent of graduating industrial engineering students have started their careers in the service sector. Industries that have hired include consulting, retailing, supply chain, logistics, distribution, transportation, government, entertainment, financial analyst, revenue management, and health care services.

Contact

University Park

HAROLD AND INGE MARCUS DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING
310 Leonhard Building
University Park, PA 16802
814-865-7601
psuie@psu.edu

<http://www.ime.psu.edu/index.aspx> (<http://www.ime.psu.edu/>)

Six Sigma, Minor

Requirements for a minor may be completed at any campus location offering the specified courses for the minor. Students may not change from a campus that offers their major to a campus that does not offer their major for the purpose of completing a minor.

Program Description

Six Sigma has been increasingly internalized by companies involved in manufacturing, health care, and service industries. The Six Sigma process has also been used to address environmental concerns such as water quality and energy conservation. Thus, this minor is designed for students who are interested in the Six Sigma statistical methodology for increasing productivity and enhancing quality. The minor will provide students with an understanding of how business models are changing in response to globalization and how the Six Sigma process and product improvement methodology is thus a vehicle for industry prosperity in this climate. Students completing the minor will develop their analytical and statistical skills, and gain a competitive advantage in the work place.

What is Six Sigma?

Six Sigma is a highly disciplined process that puts sharp focus on developing and delivering near-perfect products and services. It has been used to shape both the strategy and operation of companies of all sizes and sectors. Six Sigma provides a framework for quality improvement and innovation that builds upon statistical tools to achieve results. Students completing the minor should:

- Be knowledgeable about why organizations use Six Sigma and how they apply it
- Gain experience with using the DMAIC methodology for problem solving
- Gain experience with using the DMADOV methodology for new product innovation
- Understand the links between customer requirements, product specifications, and process capability
- Understand the theory and application of regression analysis, design of experiments, and statistical quality control
- Be familiar with the project selection process including knowing when to use the Six Sigma methodology.

You Might Like This Program If...

- You are interested in problem solving in business operations, lean manufacturing/business practices, and improving industry efficiencies.

The Six Sigma Minor is an 18-credit minor designed for any student who is interested in the Six Sigma statistical methodology. Industries utilizing Six Sigma skills include: manufacturing, transportation, warehousing, health care, defense, financial services, retail, leisure/hospitality, education, construction, consulting, and more.

Program Requirements

Requirement	Credits
Requirements for the Minor	18

Requirements for the Minor

A grade of C or better is required for all courses in the minor, as specified by Senate Policy 59-10 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/59-00-minors-and-certificates/#59-10>). In addition, at least six credits of the minor must be unique from the prescribed courses required by a student's major(s).

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		

IE 305	Product Design, Specification and Measurement	3
IE 322	Probabilistic Models in Industrial Engineering	3
IE 323	Statistical Methods in Industrial Engineering	3
IE 433	Regression Analysis and Design of Experiments	3
IE 434	Statistical Quality Control	3
IE 436	Six Sigma Methodology	3

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Giancarlo Labruna

Academic Adviser

113A Leonhard Building

University Park, PA. 16802

814-863-5742

gkl5192@psu.edu

Contact

University Park

HAROLD AND INGE MARCUS DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

310 Leonhard Building

University Park, PA 16802

814-865-7601

psuie@psu.edu

<http://www.ime.psu.edu/index.aspx> (<http://www.ime.psu.edu/>)

Space Systems Engineering, Certificate

Requirements for an undergraduate certificate may be completed at any campus location offering the specified courses for the certificate.

Program Description

This certificate program is designed to prepare students for careers in the space industry and for work on space systems. To achieve this, a minimum program of three space systems engineering related courses, a space systems engineering seminar, and project work is to be completed.

You Might Like This Program If...

You would like to explore a how to approach the engineering of complex systems; you have an interest in space, aerospace engineering, or satellites, or have an interest in working within the defense and/or aerospace industry.

Entrance to Certificate

For entrance into the certificate program, students must be at least 5th semester standing. The cumulative GPA considered for admission will be consistent with, or equivalent to, the GPA minimum of 2.00 for maintaining good academic standing.

Program Requirements

To earn an undergraduate certificate in Space Systems Engineering, a minimum of 12 credits is required.

Students must earn a C grade or better in each of the courses to continue with the certificate.

Code	Title	Credits
Prescribed Courses		
<i>Prescribed Courses: Require a grade of C or better</i>		
EE 474	Satellite Communications Systems	3
Select one of the following:		2-9
AERSP 401A	Spacecraft Design--Preliminary	
AERSP 401B	Spacecraft Design--Detailed	
AERSP 430	Space Propulsion and Power Systems	
AERSP 450	Orbit and Attitude Control of Spacecraft	
AERSP 492	Space Astronomy and Introduction to Space Science	
AERSP 497	Special Topics	
AERSP 550	Astrodynamics	
AERSP 597	Special Topics	
AERSP 597	Special Topics	
EE 472	Space Astronomy and Introduction to Space Science	
EE 474	Satellite Communications Systems	
Select one of the following:		3-9
AERSP 55	Space Science and Technology	
AERSP 309	Astronautics	
AERSP 540	Theory of Plasma Waves	
EDSGN 597	Special Topics	
EE 471	Introduction to Plasmas	
EE 477	Fundamentals of Remote Sensing Systems	
EE 534	Conformal Antennas	
EE 541	Manufacturing Methods in Microelectronics	
EE 576	Inversion Techniques in Remote Sensing	
EE 579	Microwave Radar Remote Sensing	
EE 580	Linear Control Systems	
EE 581	Optimal Control	
GEOSC 21	Earth and Life: Origin and Evolution	
GEOSC 474	Astrobiology	
METEO 477	Fundamentals of Remote Sensing Systems	
NUCE 490	Introduction to Plasmas	

NUCE 540	Theory of Plasma Waves
STS 55	Space Science and Technology

Students must complete an application. A project report must be submitted adhering to SPSYS Certificate formatting and systems content guidelines.

Prerequisites Required.

Certificate Learning Objectives

- Students will complete a hands-on project experience representing the application of principles learned.
- Students will demonstrate a basic understanding of the following: systems approach to engineering; several technical subjects related to space systems; processes and procedures for development of space hardware.
- Students will work effectively in multifunctional teams.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

Sven Bilén

Professor of Engineering Design, Electrical Engineering, and Aerospace Engineering

213B Hammond Building

University Park, PA 16802

814-863-1526

sgb100@psu.edu

Career Paths

Students will learn more about how to plan, design, build, integrate, test launch, operate, and manage various forms of space systems, subsystems, launch vehicles, spacecraft, payload or ground systems in order to work as space system architects, launch system experts, propulsion technicians and much more.

Contact

University Park

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE
Electrical Engineering East

University Park, PA 16802

814-863-1526

sgb100@psu.edu

<https://www.eecs.psu.edu/students/undergraduate/Majors-Minors-Certificates.aspx>

Surveying Engineering Technology, A.ENG.T.

Begin Campus: Wilkes-Barre

End Campus: Wilkes-Barre

Program Description

The Surveying Engineering Technology major provides the basic undergraduate education required for private and public service as a technician in the surveying profession. Basic knowledge is provided in the areas of boundary, construction, topographic, photogrammetry, laser scanning, and land development. The curriculum is designed to develop an individual understanding of the skills and equipment needed to make precise surveying measurements.

Graduates of the Surveying Engineering Technology major may qualify for admission to the baccalaureate degree majors in Surveying Engineering or Structural Design and Construction Engineering Technology.

What is Surveying Engineering Technology?

Surveying is the science of measuring physical features of Earth to collect spatial information and to establish land boundaries. Survey engineering technologists learn the elements of surveying as applied to construction, land, topographic, geodetic, city, and photogrammetric surveys.

You Might Like This Program If...

- You enjoy the outdoors.
- You have an interest in math and science.
- You are passionate about robotic, GPS, scanner, GIS, and drone technology.
- You are interested in geographic data and how it is captured, stored, manipulated, analyzed, and managed.

Entrance to Major

Students must have a minimum 2.0 GPA to change to this Associate degree after admission to the University.

Degree Requirements

For the Associate in Engineering Technology degree in Surveying Engineering Technology, a minimum of 66-69 credits is required:

Requirement	Credits
General Education	21
Requirements for the Major	57-60

12 of the 21 credits for General Education are included in the Requirements for the Major. This includes: 3 credits of GN courses; 3 credits of GQ courses; 6 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as

specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
EDSGN 100	Cornerstone Engineering Design	3
SUR 132	Surveying Software Analysis Tools	3
SUR 213	Route and Construction Surveying	3
SUR 222	Photogrammetry	3
SUR 241	Surveying Measurement Analysis	3
SUR 361	Surveying Laser Scanning	3
SUR 382	Subdivision Design	2
<i>Prescribed Courses: Require a grade of C or better</i>		
SUR 121	Elementary Surveying	3
SUR 122	Control Surveying	3
SUR 221	Large-scale Mapping Surveys	3
SUR 373W	Cadastral and Legal Aspects of Surveying	4
Additional Courses		
ENGL 202C	Effective Writing: Technical Writing	3
or ENGL 202D	Effective Writing: Business Writing	
MATH 22 & MATH 26	College Algebra With Analytic Geometry and Applications II and Plane Trigonometry and Applications of Trigonometry	5-6
or MATH 40	Algebra, Trigonometry, and Analytic Geometry	
Select 3-4 credits from the following:		3-4
PHYS 150	Technical Physics I	
PHYS 211	General Physics: Mechanics	
PHYS 250	Introductory Physics I	
Select 3-4 credits from the following:		3-4
PHYS 151	Technical Physics II	
PHYS 212	General Physics: Electricity and Magnetism	
PHYS 251	Introductory Physics II	
<i>Additional Courses: Require a grade of C or better</i>		
CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
MATH 110	Techniques of Calculus I	4
or MATH 140	Calculus With Analytic Geometry I	

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all associate degree students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 3 credits
- **Writing and Speaking (GWS):** 3 credits

Knowledge Domains

- **Arts (GA):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Note: Up to six credits of Inter-Domain courses may be used for any Knowledge Domain requirement, but when a course may be used to satisfy more than one requirement, the credits from the course can be counted only once.

Exploration

- **Any General Education course (including GHW and Inter-Domain):** 3 credits

University Degree Requirements

Cultures Requirement

3 credits of United States (US) or International (IL) cultures coursework are required and may satisfy other requirements

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 60 degree credits must be earned for a associates degree. The requirements for some programs may exceed 60 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The Associate Surveying Engineering Technology program prepares students with technical and professional skills for professional practice. Within three to five years of graduation, our Associate Surveying Engineering Technology graduates will have:

1. Demonstrated proficiency in applying basic principles and methods of surveying practice to perform surveys, analyze results, and assist in surveying and/or engineering design solutions.

- 2. Demonstrated proficiency in effectively articulating technical and non-technical concepts to diverse audiences through written, verbal, and graphical mediums.
- 3. Worked collaboratively within multidisciplinary teams, showcasing their ability to function as productive team members, respect diverse perspectives, and contribute to team success.
- 4. Engaged in continuous professional development, or further their education to pursue professional certification(s), or participating in professional organizations, to enhance their knowledge and skills and stay current in the field.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Associate Surveying Engineering Technology program is designed to enable students to:

- 1. Apply knowledge, techniques, skills, and modern tools of mathematics, science, engineering, and technology to solve well-defined engineering problems appropriate to the discipline.
- 2. Design solutions for well-defined technical problems and assist with the engineering design of systems, components, or processes appropriate to the discipline.
- 3. Apply written, oral, and graphical communication in well-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.
- 4. Conduct standard tests, measurements, and experiments and to analyze and interpret the results.
- 5. Function effectively as a member of a technical team.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

Wilkes-Barre

Dimitrios Bolkas

Program Coordinator, Surveying Engineering Programs
Center for Technology, 104
44 University Drive
Dallas, PA 18612
570-675-9127
dxb80@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>)

to view the appropriate Undergraduate Bulletin edition.

Surveying Engineering Technology, A.ENG.T. at Wilkes-Barre Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year		
Fall	Credits Spring	Credits
ENGL 15 (GWS) ^{††}	3 MATH 110 or 140 (GQ) ^{*††}	4
MATH 40 or 22 <i>and</i> 26	5-6 PHYS 150 or 250 (GN) [†]	3-4
EDSGN 100	3 SUR 122 [*]	3
SUR 121 [*]	3 SUR 132	3
General Education Course	3 CAS 100A or 100B (GWS) ^{††}	3
17-18		16-17
Second Year		
Fall	Credits Spring	Credits
PHYS 151 or 251 (GN)	3-4 ENGL 202C or 202D	3
SUR 221 [*]	3 SUR 222	3
SUR 213	3 SUR 373W [*]	4
SUR 241	3 SUR 382	2
SUR 361	3 General Education Course	3
	General Education Course	3
15-16		18

Total Credits 66-69

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS) requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Career Paths

Graduates from the surveying engineering technology program work at government agencies and private industry companies and specialize in boundary surveying, geodesy, image analysis (photogrammetry and remote sensing), and geographic information systems.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE SURVEYING ENGINEERING TECHNOLOGY PROGRAM (<http://career.engr.psu.edu/>)

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.engr.psu.edu/students/grad-prospective/default.aspx>)

Accreditation

The A.ENG.T. in Surveying Engineering Technology at Penn State Wilkes-Barre is Accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Surveying/Geomatics Engineering Technology and Similarly named Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
213 Hammond Building
University Park, PA 16802
814-865-2952

<https://www.sedi.psu.edu/>

Wilkes-Barre

44 University Drive
Dallas, PA 18612
570-675-9127
dx80@psu.edu

<https://wilkesbarre.psu.edu/academics/surveying/associate> (<https://wilkesbarre.psu.edu/academics/surveying/associate/>)

Surveying Engineering, B.S.

Begin Campus: Wilkes-Barre

End Campus: Wilkes-Barre

Program Description

The Surveying Engineering major provides a basic undergraduate education required for private and public service in the profession of surveying. Particular emphasis is placed on fundamental surveying principles required in all areas of surveying. Instruction is provided in the main divisions of surveying, including land surveying, boundary mapping, photogrammetry, laser scanning, data analysis and adjustment, geodesy and map projection coordinate systems, remote sensing, geographic information systems, and land development. Students study various data collection techniques using surveying tools including total stations, photogrammetry, laser scanners, unmanned aerial systems (UASs), remote sensing satellite imagery, and the global navigation satellite system (GNSS). They also study legal principles related to land surveying, professional ethics, applications for Geographic Information Systems

(GIS) in surveying, and data management techniques, and point cloud processing methods for 3D modeling and surveying product delivery.

What is Surveying Engineering?

Surveying is the science of measuring physical features of Earth to collect spatial information and to establish land boundaries. Surveying engineers learn the elements of surveying as applied to construction, land, topographic, geodetic, city, and photogrammetric surveys.

You Might Like This Program If...

- You enjoy the outdoors.
- You have an interest in math and science.
- You are passionate about robotic, GPS, scanner, GIS, and drone technology.
- You are interested in geographic data and how it is captured, stored, manipulated, analyzed, and managed.

Direct Admission to the Major

Incoming first-year students who meet the program admission requirements are admitted directly into the major. Admission restrictions may apply for change-of-major and/or change-of-campus students.

For more information about the admission process for this major, please send a request to the college, campus, or program contact (listed in the Contact tab).

Degree Requirements

For the Bachelor of Science degree in Surveying Engineering, a minimum of 127-128 credits is required:

Requirement	Credits
General Education	45
Electives	0-1
Requirements for the Major	108-110

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
EDSGN 100	Cornerstone Engineering Design	3
MATH 230	Calculus and Vector Analysis	4
MATH 251	Ordinary and Partial Differential Equations	4
PHYS 211	General Physics: Mechanics	4
PHYS 212	General Physics: Electricity and Magnetism	4
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
SUR 132	Surveying Software Analysis Tools	3
SUR 213	Route and Construction Surveying	3
SUR 222	Photogrammetry	3

SUR 341	Adjustment Computations	3
SUR 352	Geometric and Physical Geodesy	3
SUR 361	Surveying Laser Scanning	3
SUR 381	Stormwater Hydraulics and Hydrology	4
SUR 421	Advanced Photogrammetry	3
SUR 441	Data Analysis and Project Design	3
SUR 455	Precise Positioning Systems	3
SUR 471	Professional Aspects of Land Surveying	3
<i>Prescribed Courses: Require a grade of C or better</i>		
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
MATH 220	Matrices	2-3
SUR 121	Elementary Surveying	3
SUR 122	Control Surveying	3
SUR 221	Large-scale Mapping Surveys	3
SUR 241	Surveying Measurement Analysis	3
SUR 373W	Cadastral and Legal Aspects of Surveying	4
Additional Courses		
CE 410	Sustainable Residential Subdivision Design	3
or SUR 482	Land Development Design	
CMPSC 201	Programming for Engineers with C++	3
or CMPSC 200	Programming for Engineers with MATLAB	
STAT 401	Experimental Methods	3-4
or STAT 200	Elementary Statistics	
Select one of the following:		3
ECON 102	Introductory Microeconomic Analysis and Policy	
ECON 104	Introductory Macroeconomic Analysis and Policy	
ECON 14	Principles of Economics	
<i>Additional Courses: Require a grade of C or better</i>		
CAS 100A	Effective Speech	3
or CAS 100B	Effective Speech	
ENGL 15	Rhetoric and Composition	3
or ENGL 30H	Honors Rhetoric and Composition	
ENGL 202C	Effective Writing: Technical Writing	3
or ENGL 202D	Effective Writing: Business Writing	
Supporting Courses and Related Areas		
Select 6 credits from the following:		6
CE 300-level courses ¹		
CE 400-level courses ¹		
IE 302	Engineering Economy	
SUR 313	Integrated Surveying	
SUR 362	Introduction to Geospatial Information Engineering	
SUR 424	Monitoring Applications in Surveying	
SUR 432	Geospatial Applications in Surveying	
SUR 496	Independent Studies	
SUR 497	Special Topics	

¹ These courses are not offered at Wilkes-Barre campus. They are provided to accommodate concurrent degree students in CE and SURE.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills

necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (p. 3184) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)

- **Arts (GA):** 3 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 3 credits
- **Social and Behavioral Sciences (GS):** 3 credits
- **Natural Sciences (GN):** 3 credits

Integrative Studies

- **Inter-Domain Courses (Inter-Domain):** 6 credits

Exploration

- **GN**, may be completed with Inter-Domain courses: 3 credits
- **GA, GH, GN, GS, Inter-Domain courses.** This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- **United States Cultures:** 3 credits
- **International Cultures:** 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits.

Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Program Educational Objectives

The Surveying Engineering program prepares students with technical and professional skills for professional practice. Within three to five years of graduation, our Surveying Engineering graduates will have:

1. Forged careers as surveyors, engineers, and/or managers within surveying, engineering, or related fields, whether in the private or public sector, actively contributing to business operations.
2. Demonstrated expertise in using mathematics, scientific principles, measurement techniques, and contemporary technology tools in surveying for proficiently collecting and analyzing spatial data, as well as for developing surveying and/or engineering design solutions for practical applications.
3. Exhibited a strong commitment to ethical and professional conduct, consistently adhering to industry standards and ethical principles across all aspects of their professional work.
4. Demonstrated proficiency in effectively articulating technical and non-technical concepts to diverse audiences through written, verbal, and graphical mediums.
5. Worked collaboratively within multidisciplinary teams, showcasing their ability to function as productive team members, lead projects, respect diverse perspectives, and contribute to team success.
6. Engaged in continuous professional development, including pursuing advanced degrees, pursuing professional certification(s) and/or licensure, or participating in professional organizations, to stay current in the field, enhance their knowledge and skills, and share that with the professional community.

Student Outcomes

Student outcomes describe what students are expected to know and be able to do by the time of graduation. The Surveying Engineering program is designed to enable students to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. Communicate effectively with a range of audiences
4. Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the

impact of engineering solutions in global, economic, environmental, and societal contexts

5. Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. Acquire and apply new knowledge as needed, using appropriate learning strategies.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<https://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

Wilkes-Barre

Dimitrios Bolkas

Program Coordinator, Surveying Engineering
Center for Technology, 104
44 University Drive
Dallas, PA 18612
570-675-9127
dxb80@psu.edu

Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2024-25 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition.

Surveying Engineering, B.S. at Wilkes-Barre Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

If you are starting at a campus other than the one this plan is ending at, please refer here:

<http://advising.engr.psu.edu/degree-requirements/academic-plans-by-major.aspx>

First Year

Fall	Credits Spring	Credits
ENGL 15 (GWS) ^{††}	3 ECON 102 or 104 (GS) [†]	3
EDSGN 100	3 MATH 141 (GQ) ^{*††}	4
PSU 8	1 PHYS 211 (GN) [†]	4
MATH 140 (GQ) ^{*††}	4 STAT 200	4
General Education Course	3 General Education Course	3
General Education Course	3	
	17	18

Second Year

Fall	Credits Spring	Credits
MATH 230	4 MATH 251	4
PHYS 212 (GN) [†]	4 PHYS 214 (GN)	2
CMPSC 201 or 200	3 ENGL 202C or 202D (GWS) ^{††}	3
SUR 121 [*]	3 SUR 122 [*]	3
	SUR 132	3
	MATH 220 [*]	2
	14	17

Third Year

Fall	Credits Spring	Credits
SUR 221 [*]	3 SUR 222	3
SUR 213	3 SUR 373W [*]	4
SUR 241 [*]	3 SUR 341	3
SUR 361	3 SUR 352	3
CAS 100A or 100B (GWS) ^{††}	3 SUR 381	4
General Education Course (GHW)	1.5	
	16.5	17

Fourth Year

Fall	Credits Spring	Credits
SUR 441	3 SUR 471	3
SUR 455	3 SUR 482	3
SUR 421	3 SUR 432 or 313 (Technical Elective)	3
SUR 362, 424, or IE 302 (Technical Elective)	3 General Education Course	3
General Education Course (GHW)	1.5 General Education Course	3
	13.5	15

Total Credits 128

- * Course requires a grade of C or better for the major
 ‡ Course requires a grade of C or better for General Education
 # Course is an Entrance to Major requirement
 † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy Cultural Diversity Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

General Education includes Foundations (GWS and GQ), Knowledge Domains (GHW, GN, GA, GH, GS) and Integrative Studies (Inter-domain) requirements. N or Q (Honors) is the suffix at the end of a course number used to help identify an Inter-domain course, but the inter-domain attribute is used to fill audit requirements. Foundations courses (GWS and GQ) require a grade of 'C' or better.

Career Paths

Graduates from the surveying engineering program work at government agencies and private industry companies and specialize in boundary surveying, geodesy, image analysis (photogrammetry and remote sensing), and geographic information systems.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE SURVEYING ENGINEERING PROGRAM (<http://career.engr.psu.edu/>)

Professional Resources

- National Society of Professional Engineers (<https://nspes.us.com>)
- American Society of Civil Engineers (<http://www.asce.org>)

Accreditation

The Bachelor of Science in Surveying Engineering at Penn State Wilkes-Barre is accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the commission's General Criteria and Program Criteria for Surveying and Similarly Named Engineering Programs.

Professional Licensure/Certification

Many U.S. states and territories require professional licensure/certification to be employed. If you plan to pursue employment in a licensed profession after completing this program, please visit the Professional Licensure/Certification Disclosures by State (<https://www.psu.edu/state-licensure-disclosures/>) interactive map.

Contact

University Park

SCHOOL OF ENGINEERING DESIGN AND INNOVATION
 213 Hammond Building
 University Park, PA 16802
 814-865-2952
adviser@engr.psu.edu

<https://www.sedi.psu.edu/>

Wilkes-Barre

44 University Drive
 Dallas, PA 18612
 570-675-9127
dx80@psu.edu

<https://wilkesbarre.psu.edu/academics/surveying> (<https://wilkesbarre.psu.edu/academics/surveying/>)