

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, mapping, photogrammetry, 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, levels, softcopy photogrammetry, 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. Through the use of projects and capstone courses students will design measurement systems, alignments, land information systems, and land development.

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.

Entrance to Major

In order to be eligible for entrance to this major, a student must:

1. attain at least a C (2.00) cumulative grade-point average for all courses taken at the University; and
2. have third-semester classification (http://www.registrar.psu.edu/registration/semester_classification.cfm).

READ SENATE POLICY 37-30: ENTRANCE TO AND CHANGES IN MAJOR PROGRAMS OF STUDY (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/37-00-entrance-to-a-college-or-major>)

Degree Requirements

For the Bachelor of Science degree in Surveying Engineering, a minimum of 132 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	114

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 (<http://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program>) 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.)

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

Knowledge Domains

- **Arts (GA):** 6 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 6 credits
- **Social and Behavioral Sciences (GS):** 6 credits
- **Natural Sciences (GN):** 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)

- **Inter-Domain or Approved Linked Courses:** 6 credits

27 of these 45 credits are included in the Requirements for the Major.

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 (<http://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.

Requirements for the Major

This includes 27 credits of General Education courses: 9 credits of GWS courses; 6 credits of GQ courses; 9 credits of GN courses; 3 credits of GS courses.

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 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CMPSC 201	Programming for Engineers with C++	3
EDSGN 100	Introduction to Engineering Design	3
IE 302	Engineering Economy	3
MATH 220	Matrices	2-3
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 213	General Physics: Fluids and Thermal Physics	2
PHYS 214	General Physics: Wave Motion and Quantum Physics	2
STAT 401	Experimental Methods	3
SUR 212	Route and Construction Surveying	4
SUR 222	Photogrammetry	3
SUR 262	Coordinate Systems in Map Projections	2
SUR 341	Adjustment Computations	3
SUR 351	Geodetic Models	3
SUR 362	Introduction to Geospatial Information Engineering	3
SUR 381	Stormwater Hydraulics and Hydrology	4
SUR 441	Data Analysis and Project Design	3
SUR 455	Precise Positioning Systems	3
SUR 462	Parcel-Based Geospatial Information Systems	3
SUR 471	Professional Aspects of Land Surveying	3
SUR 490	Seminar in Surveying	1
<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

SUR 111	Plane Surveying	4
SUR 162	Methods in Large Scale Mapping	3
SUR 241	Surveying Measurement Analysis	3
SUR 272	Cadastral Surveying	3
SUR 372	Legal Aspects of Land Surveying	3
Additional Courses		
CAS 100A or CAS 100B	Effective Speech	3
CE 410 or SUR 482	Sustainable Residential Land Development Land Development Design	3
ENGL 15 or ENGL 30	Rhetoric and Composition Honors Freshman Composition	3
ENGL 202C or ENGL 202D	Effective Writing: Technical Writing Effective Writing: Business Writing	3
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	
Supporting Courses and Related Areas		
Select 6 credits of the following:		6
CE 300-level courses ¹		
CE 400-level courses ¹		
SUR 313	Integrated Surveying	
SUR 422	Digital Photogrammetry	
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.

Program Educational Objectives

1. Proficiently use mathematics, science, measurement methods, and modern surveying tools to collect, analyze, and reduce spatial data in professional applications or advanced study in surveying engineering or a related field.
2. Proficiently apply basic principles of land surveying, professional practice, and professional ethics to design and conduct surveys, and to analyze and interpret data in surveying engineering applications.
3. Effectively convey technical and professional information in written, verbal, and graphic forms, as an individual and as a member of a professional team.
4. Demonstrate their recognition of the importance of professional organizations for advancement toward professional licensure, development of leadership skills, and maintaining a broad understanding of contemporary societal issues by participating in activities of professional organizations in capacities ultimately leading to leadership positions.
5. Demonstrate their recognition of the need for continuous, life-long learning by participating in continuing education as students or as instructors.

Program Outcomes (Student Outcomes)

The SURE program has adopted for its program student outcomes the following outcomes as listed in the general criteria of the EAC of ABET

“Criteria for Accrediting Engineering Programs, 2012-2013.” Engineering programs must demonstrate that their students attain:

1. an ability to apply knowledge of mathematics, science, and engineering,
2. an ability to design and conduct experiments, as well as to analyze and interpret data,
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
4. an ability to function on multidisciplinary teams,
5. an ability to identify, formulate, and solve engineering problems,
6. an understanding of professional and ethical responsibility,
7. an ability to communicate effectively,
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
9. a recognition of the need for, and an ability to engage in life-long learning,
10. a knowledge of contemporary issues,
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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 need to plan the chosen program of study, and referrals to other specialized resources.

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

Wilkes-Barre

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Suggested Academic Plan

Wilkes-Barre Campus

Survey Engineering

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 [‡]	3 ECON 102 or 104 [†]	3
EDSGN 100	3 MATH 141 ^{*††}	4
General Education Course	3 MATH 220	2
PSU 8	1 PHYS 211 ^{*†}	4
MATH 140 ^{*††}	4 SUR 162 [*]	3
SUR 111 [*]	4	
	18	16

Second Year

Fall	Credits Spring	Credits
MATH 230	4 CMPSC 201 or 200	3
PHYS 212 [†]	4 MATH 251	4
SUR 212	4 PHYS 213 [†]	2
SUR 241 [*]	3 PHYS 214	2
STAT 401	3 SUR 222	3
	SUR 262	2
	18	16

Third Year

Fall	Credits Spring	Credits
CAS 100A ^{††}	3 ENGL 202C [†]	3
General Education Course	3 General Education Course	3
General Education Course(GHW)	1.5 SUR 362	3
SUR 272 [*]	3 SUR 372 [*]	3
SUR 341	3 SUR 381	4
SUR 351	3	
	16.5	16

Fourth Year

Fall	Credits Spring	Credits
General Education Course	3 General Education Course(GHW)	1.5
General Education Course	3 SUR 313	3
IE 302	3 SUR 441	3
SUR 462	3 SUR 422	3
SUR 471	3 SUR 455	3
SUR 490	1 SUR 482	3
	16	16.5

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 University 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.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

Concurrent B.S. in Surveying Engineering & Civil Engineering at Wilkes Barre and University Park

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
CHEM 110 ^{*1}	3 CMPSC 201 or 200	3
CHEM 111	1 MATH 141 ^{**1,2}	4
EDSGN 100	3 MATH 220	2
ENGL 15 [‡]	3 PHYS 211 ^{**1,2}	4
MATH 140 ^{**1}	4 SUR 162 [*]	3
PSU 8	1 SUR 262	2
SUR 111 ^{*2,3}	4	
	19	18

Second Year

Fall	Credits Spring	Credits
MATH 230	4 MATH 251 ^{*1}	4
PHYS 212 ^{*1}	4 PHYS 213 [†]	2
SUR 212	4 PHYS 214 [†]	2
SUR 241 ^{*2}	3 SUR 222	3
SUR 272 ^{*2}	3 SUR 362 ²	3
	SUR 372 ^{*2}	3
	18	17

Third Year

Fall	Credits Spring	Credits
EMCH 211 ^{*3}	3 ENGL 202C [‡]	3
General Education Course(GHW) ⁶	1.5 EMCH 212 ^{*3}	3
SUR 341	3 EMCH 213 ^{*3}	3
SUR 351	3 SUR 381	4
SUR 462 (C E technical elective) ⁵	3 SUR 441 ⁵	3

SUR 471	3 SUR 455 (C E technical elective) ⁵	3
SUR 490	1	
	17.5	19

Fourth Year

Fall	Credits Spring	Credits
CAS 100A [‡]	3 CE 335 ^{*3}	3
CE 332 ^{*3}	3 CE 336 ^{*3}	3
CE 340 ^{*3}	3 CE 337 ^{*3}	1
CE 360 ^{*3}	3 CE 370 ^{*3}	3
General Education Course	3 ECON 102 or 104 [†]	3
GEOSC 1	3 General Education Course	3
	General Education Course(GHW) ⁶	1.5
	18	17.5

Fifth Year

Fall	Credits Spring	Credits
CE 321 ^{*3}	3 C E 3xx/4xx-SUR E technical elective ⁴	3
C E 3xx/4xx-SUR E technical elective ⁴	3 General Education Course	3
C E 3xx/4xx-SUR E technical elective ⁴	3 General Education Course	3
EE 211 or 212 ⁶	3 General Education Course	3
CE 410	3 IE 302	3
STAT 401	3 ME 201 ⁶	3
	18	18

Total Credits 180

* 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 University 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.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

¹ Courses CHEM 110, MATH 140, MATH 141, MATH 251, PHYS 211 and PHYS 212 require a grade of C or better for entrance into the C E major.

- ² Courses MATH 140, MATH 141, PHYS 211, SUR 111, SUR 241, SUR 272, SUR 362, and SUR 372W require a C or better for graduation in the SUR E major
- ³ Courses CE 321, CE 332, CE 335, CE 336, CE 337, CE 340, CE 360, CE 370, E MCH 211, EMCH 212, EMCH 213 and SUR 111 require a C or better for graduation in the CE major.
- ⁴ C E 3xx/4xx electives must be selected from two of three technical areas in the Civil Engineering program – Structures (C E x4x), Hydrosystems (C E x6x), and Environmental (C E x7x).
- ⁵ SUR 462, SUR 441, and SUR 455 may be substituted for a C E related areas technical elective if taken at the Wilkes-Barre campus prior to changing assignment to the University Park campus
- ⁶ For those students who complete the ROTC program, three ROTC credits may be used to substitute for E E 211/212 or M E 201 and three ROTC credits may be used to substitute for the GHW requirements.

Concurrent Degree Request and Acceptance Notes:

- To be eligible for this program, a student must initially enroll in the SURE program at the Wilkes-Barre campus. All SURE majors are assigned an "entrance-to-major" (ETM) pool semester, even though they are already enrolled in a major.
- Students in the SURE major must make their request for concurrent degree status during their ETM pool semester, which is typically the spring semester of their second year.
- ETM courses of CHEM 110, MATH 140, MATH 141, and PHYS 211 must be completed with a C or better before the request for concurrent degree status will be acted upon.
- To be considered for the concurrent degree option, the applicant must have a cumulative grade-point average of 2.70 or higher at the time of the ETM pool year. However, if the ETM GPA requirement is higher due to enrollment controls in the CE department, the higher GPA will be used for admission to the major.
- Upon acceptance in to the CE major, students will remain at the Wilkes-Barre campus to complete their third year of study. During the spring semester of the third year, students will request a change of campus from WB to UP for the fall semester of the fourth year (7th semester).
- Students who wish to change their major to SURE during their first year of study, and who are also in pursuit of the concurrent degree option, should contact the Surveying Engineering program chair to discuss feasibility of completing the option.

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 (<http://career.engr.psu.edu>)

Professional Resources

- National Society of Professional Engineers (<http://nspes.us.com>)
- American Society of Civil Engineers (<http://www.asce.org>)

Accreditation

The baccalaureate program in Surveying Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., www.abet.org (<http://www.abet.org>).

MORE INFORMATION (<http://wilkesbarre.psu.edu/academics/surveying/baccalaureate>)

Contact University Park

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