SOFTWARE ENGINEERING, B.S.

Begin Campus: Any Penn State Campus
End Campus: Erie, World Campus

Program Description
This major provides students with a strong foundation in software engineering through combination of classroom study, software development experience, and design projects. Design, analysis, verification, and maintenance of software systems are stressed. Built upon a core of science and mathematics courses, this major has the objective of educating graduates to be problem solvers. Students acquire the ability to work as members of a team toward successful attainment of a common goal, preparing them for work in industry or further study in graduate school. In addition, written and oral communication skills are developed from an early stage, culminating in a senior design project that stresses communication as well as engineering content.

In addition to completing a broad-based science core in mathematics, chemistry, and physics, students pursue their interest in software engineering by studying principles in computer programming, object-oriented design, software design, software verification, information systems, operating systems, and data communications. The program has a capstone software design project that requires students to work together on teams to design, plan, manage, and implement a software design project.

What is Software Engineering?
Software engineering applies scientific and technological knowledge to the design, implementation, verification, and documentation of software. The study of software engineering teaches you the newest approaches to create, maintain, and improve software systems in economical, reusable, and extendable ways. Software engineers are creative problem solvers who put the functionality (and fun!) into our technology. Without software engineers there would be no Internet, no social networking, no apps, no streaming, no virtual or augmented reality, and no interactive entertainment.

You Might Like This Program If...
- You are patient in the face of a challenge.
- You are a creative thinker.
- You are interested in coding and programming, and also in mathematics, chemistry, and physics.
- You enjoy working on team-based projects.

Entrance To Major
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance to any of the engineering majors at The Behrend College must have at least a 2.0 cumulative GPA by the end of the semester prior to applying for entrance to the major and have completed, with a minimum grade of C: CHEM 110, MATH 140, MATH 141, and PHYS 211.

These courses must be completed by the end of the semester during which the admission to major process is carried out.

Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GQ</td>
<td>Quantification</td>
<td>6 credits</td>
</tr>
<tr>
<td>GWS</td>
<td>Writing and Speaking</td>
<td>9 credits</td>
</tr>
<tr>
<td>GN</td>
<td>Natural Sciences</td>
<td>9 credits</td>
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<tr>
<td>GS</td>
<td>Social and Behavioral Sciences</td>
<td>6 credits</td>
</tr>
<tr>
<td>GA</td>
<td>Arts</td>
<td>6 credits</td>
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<tr>
<td>GH</td>
<td>Humanities</td>
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<tr>
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For the Bachelor of Science degree in Software Engineering, a minimum of 126 credits is required:

<table>
<thead>
<tr>
<th>Requirements for the Major</th>
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<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Electives</td>
<td>1</td>
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</table>

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

21 of the 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.

End Campus: World Campus

End Campus: Erie, World Campus
• 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 21 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GWS courses; 3 credits of GS courses.

A student enrolled in this major must earn a grade of C or better in each 300- and 400-level course in 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 (http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44). For more information, check the Suggested Academic Plan for your intended program.

Additional Courses
- ECON 102 Introductory Microeconomic Analysis and Policy 3
  or ECON 104 Introductory Macroeconomic Analysis and Policy 3
- EE 210 Circuits and Devices 3-4
  or EE 211 Electrical Circuits and Power Distribution

Supporting Courses and Related Areas
Select 9 credits of technical elective courses from school-approved list 9

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)

Erie
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World Campus
Undergraduate Academic Advising
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University Park, PA 16802
814-863-3283
advising@outreach.psu.edu
Suggested Academic Plan

Software engineering at Erie 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

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<td>MATH 220&lt;sup&gt;†&lt;/sup&gt;</td>
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Third Year

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<td>SWENG 421&lt;sup&gt;‡&lt;/sup&gt;</td>
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<td>SWENG 411&lt;sup&gt;‡&lt;/sup&gt;</td>
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<td>SWENG 452&lt;sup&gt;‡&lt;/sup&gt;</td>
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<td>SWENG 481&lt;sup&gt;‡&lt;/sup&gt;</td>
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Total Credits 126

* 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.

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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 Course will satisfy Writing Across the Curriculum requirement.

PROGRAM NOTES:

- Only students who have gone through the entrance to major(ETM) process and have been accepted into this major may register for junior and senior-level courses.

ADVISING NOTES:

- CMPEN 270 and CMPSC 360 must be completed prior to the junior to ensure that fall semester junior year prerequisites are met.

software engineering at World Campus

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1 Course will satisfy Writing Across the Curriculum requirement.

PROGRAM NOTES:

- Only students who have gone through the entrance to major(ETM) process and have been accepted into this major may register for junior and senior-level courses.

ADVISING NOTES:

- CMPEN 270 and CMPSC 360 must be completed prior to the junior to ensure that fall semester junior year prerequisites are met.
General Education Course  3 STAT 301*  3
                        16  16

Third Year
Fall  Credits  Spring  Credits
CMPP 351*          3  CMPSC 465*          3
CMPP 441*          3  SWENG 421*          3
CMPP 431 or MIS 336*†  3  SWENG 431*          3
SWENG 411*          3  SWENG 452*          3
Technical Elective (300, 400-level)†  3  General Education Course  3
General Education Courses (GHW)          1.5
                                              16.5  15

Fourth Year
Fall  Credits  Spring  Credits
CMPP 461*          3  MGMT 301*          3
CMPP 461*          3  SWENG 481*          3
SWENG 480*          3  Technical Elective (300, 400-level)†  3
Technical Elective (300, 400-level)†  3  General Education Course  3
General Education Course          3  General Education Course  3
General Education Course (GHW)          1.5
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Career Paths
Software engineering is a relatively young discipline but has great buzz—the field consistently tops Best Jobs lists because it offers great pay, broad and growing demand, and opportunities for advancement. Penn State Behrend has a comprehensive support system to help you identify and achieve your goals for college and beyond. Meet with your academic adviser often and take advantage of the services offered by the Academic and Career Planning Center beginning in your first semester.

Careers
Students who major in software engineering work as developers, programmers, product managers, quality assurance engineers, network architects, support specialists, database administrators, and information security analysts. Software engineering skills are highly transferable and prepare you for careers in applications development, systems development, web development, and embedded systems development. Recent employers of Penn State Behrend’s B.S. in Software Engineering graduates include IBM, Intel, Lockheed Martin, Microsoft, Northrop Grumman, and Progressive Insurance.

MORE INFORMATION (http://behrend.psu.edu/school-of-engineering/academic-programs/software-engineering)

Opportunities for Graduate Studies
Graduate study allows you to delve deeper into the subdisciplines of software engineering that interest you most. Examples of master’s-level study include data science, network security, artificial intelligence, systems architecture, applications engineering, requirements engineering, project management, assessment and appraisal, or technical and managerial leadership.

MORE INFORMATION (http://behrend.psu.edu/school-of-engineering/academic-programs/software-engineering)

Professional Resources
• ABET (http://www.abet.org)
• IEEE (https://www.computer.org)
• Association for Computing Machinery (https://www.acm.org)
• Society of Women Engineers (http://societyofwomenengineers.swe.org)
• National Society of Black Engineers (http://www.nsbe.org/home.aspx)

Accreditation

ABET is a nonprofit, non-governmental accrediting agency for programs in applied and natural science, computing, engineering and engineering technology and recognized as an accreditor by the Council for Higher Education Accreditation. ABET accreditation is voluntary and provides assurance that a college or university program meets the quality
standards of the profession for which that program prepares graduates. The School of Engineering at Penn State Behrend consistently places in the Top 50 in U.S. News & World Report's rankings of the nation's undergraduate engineering programs.

MORE INFORMATION (http://www.abet.org)

**Contact**

**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

**World Campus**

DEPARTMENT OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING
SCHOOL OF ENGINEERING
5101 Jordan Road
Erie, PA 16563
814-898-6153
sweng@psu.edu

https://www.worldcampus.psu.edu/degrees-and-certificates/penn-state-online-software-engineering-bachelors-degree/overview