INTERDISCIPLINARY BUSINESS WITH ENGINEERING STUDIES, B.S.

Begin Campus: Any Penn State Campus
End Campus: Erie

Program Description
This major provides students with an interdisciplinary program containing both business and engineering course content. The major includes a set of core courses in both business and engineering/engineering technology that should enable a graduate to function effectively in a technical business environment. In addition, a student will be able to choose, from a selection of modules, a set of courses or electives designed to enable a student to function in a specific business or technical area. The modules provide an entry-level set of skills that will help graduates provide immediate value as an employee. The modules or set of electives will be approved by both the Schools of Business and Engineering.

In addition to completing the broad-based core in business, science, and engineering, students acquire the ability to work as members of a team toward successful attainment of a common goal, preparing them to work in businesses or to further their study in graduate school. The program develops written and oral communication skills from an early stage and culminates in a capstone course sequence consisting of a project that stresses communication, strategic product development, and product realization.

What is Interdisciplinary Business with Engineering Studies?
Do you have an aptitude for business, yet are fascinated by engineering? Sometimes choices have to be made—but this is not one of those times. Penn State Behrend's unique B.S. in Interdisciplinary Business with Engineering Studies degree program allows you to combine your interest in both business and engineering in a way that creates multiple career pathways within technology and technical organizations. The breadth of experiences offered by Interdisciplinary Business with Engineering Studies is reflected in the diverse career paths possible in the industrial, service, and academic sectors. Graduates typically enter the business side of technical companies in positions such as technical/industrial sales, technical business/product development, technical support, junior-level product or brand management, production planning, operations analysis, operations/production management, and project management.

You Might Like This Program If...
- You’re interested in both business and engineering and don’t want to limit your education to one or the other.
- You’re looking for a versatile degree program.
- You envision working for a technical organization or in a tech-rich environment.

Entrance to Major
Entry to the Interdisciplinary Business with Engineering Studies (IBE) major requires the completion of 5 entry-to-major courses: ACCTG 211, ECON 102, ENGL 15 or ENGL 30, MATH 110 or MATH 140, STAT 200 or SCM 200 and a 2.00 or higher cumulative grade-point average.

Degree Requirements
For the Bachelor of Science degree in Interdisciplinary Business with Engineering Studies, a minimum of 127 credits are required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>106-107</td>
</tr>
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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

24 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). For more information, check the Suggested Academic Plan for your intended program.

Requirements for the Major
This includes 24 credits of General Education courses: 9 credits of GN courses; 6 credits of GQ courses, 6 credits of GS courses, 3 credits of GWS 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). For more information, check the Suggested Academic Plan for your intended program.

Supporting Courses and Related Areas

<table>
<thead>
<tr>
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<tr>
<td>CHEM 110</td>
<td>Chemical Principles I</td>
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<td>EDSGN 100S</td>
<td>Introduction to Engineering Design</td>
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<tr>
<td>ENGL 202C</td>
<td>Effective Writing: Technical Writing</td>
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<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
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<tr>
<td>PHYS 212</td>
<td>General Physics: Electricity and Magnetism</td>
<td>4</td>
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<tr>
<td>CMPSC 201</td>
<td>Programming for Engineers with C++</td>
<td>3</td>
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<tr>
<td>ECON 102</td>
<td>Introduction to Graphics and Solid Modeling</td>
<td>3</td>
</tr>
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<td>ECON 104</td>
<td>Introductory Macroeconomic Analysis and Policy</td>
<td>3</td>
</tr>
<tr>
<td>MATH 140</td>
<td>Calculus With Analytic Geometry I</td>
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</tr>
<tr>
<td>MATH 141</td>
<td>Calculus With Analytic Geometry II</td>
<td>4</td>
</tr>
<tr>
<td>ACCTG 211</td>
<td>Financial and Managerial Accounting for Decision Making</td>
<td>4</td>
</tr>
<tr>
<td>ECON 301</td>
<td>Corporation Finance</td>
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<tr>
<td>MGMT 301</td>
<td>Basic Management Concepts</td>
<td>3</td>
</tr>
<tr>
<td>MIS 204</td>
<td>Introduction to Business Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>MKTG 301</td>
<td>Principles of Marketing</td>
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<tr>
<td>SCM 301</td>
<td>Supply Chain Management</td>
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</tr>
<tr>
<td>MGMT 410</td>
<td>Project Management</td>
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</tr>
<tr>
<td>MGMT 475</td>
<td>Strategic Product Development</td>
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<tr>
<td>MGMT 476</td>
<td>Product Realization Capstone</td>
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| Additional Courses: Require a grade of C or better

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<th>Code</th>
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<tr>
<td>EMCH 211</td>
<td>Statics</td>
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<td>or MCHT 111</td>
<td>Mechanics for Technology. Statics</td>
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<td>SCM 200</td>
<td>Introduction to Statistics for Business</td>
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<tr>
<td>or STAT 200</td>
<td>Elementary Statistics</td>
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<tr>
<td>BA 241</td>
<td>Legal Environment of Business</td>
<td>4</td>
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<tr>
<td>&amp; BA 242</td>
<td>and Social and Ethical Environment of Business</td>
<td>4</td>
</tr>
<tr>
<td>or BA 243</td>
<td>Social, Legal, and Ethical Environment of Business</td>
<td>4</td>
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<tr>
<td>EE 211</td>
<td>Electrical Circuits and Power Distribution</td>
<td>3</td>
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<tr>
<td>or EET 101</td>
<td>Electrical Circuits I</td>
<td>3</td>
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<tr>
<td>CMPET 117</td>
<td>Digital Electronics</td>
<td>3</td>
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<tr>
<td>or CMPEN 271</td>
<td>Introduction to Digital Systems</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 213</td>
<td>Strength of Materials</td>
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<tr>
<td>or MCHT 213</td>
<td>Strength and Properties of Materials</td>
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</tr>
<tr>
<td>ME 300</td>
<td>Engineering Thermodynamics I</td>
<td>3</td>
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<tr>
<td>or MET 330</td>
<td>Thermodynamics</td>
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<td>ECON 470</td>
<td>International Trade and Finance</td>
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<td>ECON 473</td>
<td>China in the Global Economy: History, Culture, and Society</td>
<td>3</td>
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<tr>
<td>FIN 471</td>
<td>International Finance</td>
<td>3</td>
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<tr>
<td>MKTG 445</td>
<td>Global Marketing</td>
<td>3</td>
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<td>MGMT 461</td>
<td>International Management</td>
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</tr>
<tr>
<td>Other 400-level international business course</td>
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Program Learning Objectives

Critical and Integrative Thinking:

1. Students will be able to think critically by actively considering different points of view and utilize an integrated, holistic approach to construct relevant analyses, arguments, and conclusions.
   a. Students will clearly identify the key issues in the analysis.
   b. Students will present the appropriate analytic framework or warrant.
   c. Students will identify and assess important assumptions and question their validity.
   d. Students will identify and assess the quality of supporting data/evidence & provide additional data/evidence related to the issue.
   e. Students will draw and discuss conclusions, implications, and consequences.
   f. Students will identify key business issues using an integrated approach.
   g. Students will apply appropriate holistic analyses to business issues.

1 Except where noted, courses taken to satisfy General Education requirements may not be used to satisfy module requirements.
h. Students will generate solutions that incorporate an integrated perspective to business problems.

**Oral Communication:**

1. Upon graduation our undergraduate students in The Sam and Irene Black School of Business will be able to execute the oral communication skills that they have learned in the interactive business courses to business situations where effective explanation, persuasion, exchanging information and ideas are essential.
   a. Students will be able to clearly express their line of thoughts to an audience.
   b. Student will be able to show confidence in their ability to communicate with their audience.
   c. Students will be able to effectively organize their thoughts and clearly communicate their organized thoughts with their audience.
   d. Students will be able to provide accuracy of content in their communication with their audience.
   e. Students will be able to provide depth of content in their communication with their audience.
   f. Students will be able to deliver a professional quality presentation to an audience while using appropriate and supporting technology.
   g. Students will be able to have a professional appearance in front of their audience.

**Writing Competence:**

1. Students will be able to demonstrate effective writing skills.
   a. Students will organize written assignments effectively.
   b. Students will develop a clear and well-structured argument.
   c. Students will identify and provide evidence sufficient to support the argument.
   d. Students will find reliable sources and cite and reference them correctly.
   e. Students will demonstrate proper writing mechanics with respect to spelling, punctuation, and grammar.

**Teamwork:**

1. Students will be positive contributors to effective team functioning via application of their functional skills in addition to strong interpersonal skills.
   a. Students will be able to recognize the different ways in which their peers contribute to collaborative work.
   b. Students will contribute effectively to teams.
   c. Students will display good interpersonal skills in teamwork contexts.
   d. Students will learn how to interact effectively on teams.

**Ethics and Social Responsibility:**

1. Students will be able to recognize ethical issues and apply ethical theories in business situations at individual and/or organizational levels.
   a. Students will recognize ethical issues and the inter-relationships between business and society.
   b. Students will identify stakeholders affected by decisions and actions.
   c. Students will understand the consequences of decisions/actions to stakeholders.
   d. Students will analyze an ethical dilemma applying multiple ethical theories.
   e. Students will be able to correctly apply relevant ethical principles.
   f. Students will be able to recommend a plan of action.
   g. Students will be able to supported recommend action with by ethical analysis/evaluation.

**Functional Area Knowledge:**

1. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material across various business domains.
   a. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Accounting domain.
   b. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Economics domain.
   c. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Management domain.
   d. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Quantitative Business Analysis domain.
   e. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Finance domain.
   f. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Marketing domain.
   g. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Legal and Social Environment domain.
   h. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the Information Systems domain.
   i. Students will be able to apply foundational knowledge to analyze and solve problems and interpret written and visual material in the International Issues domain.

**Functional Area Knowledge (ACCOUNTING):**

1. Students will be able to demonstrate a broad general knowledge of the principles of accounting, both managerial and financial.
   a. Students will be able to perform basic financial accounting transaction analysis.
   b. Students will prepare and interpret general purpose financial statements.
   c. Students will perform financial statement analysis.
   d. Students will apply various principles of managerial accounting.

**Functional Area Knowledge (ECONOMICS):**

1. Students will be able to demonstrate a broad general knowledge of the principles of economics, both microeconomics and macroeconomics.
   a. Students will apply concepts associated with free market operations.
b. Students will conduct decision making based on opportunity costs and marginal analysis.

c. Students will determine consumer behavior based on various measures of elasticity.

d. Students will interpret effects associated with the four major market structures.

e. Students will apply the theory of comparative advantage.

f. Students will apply the basic market and macroeconomic models to explain changes in price and quantity.

g. Students will define, calculate, and interpret major economic indicators.

h. Students will identify and analyze the phases of the business cycle and their characteristics, including the problems associated with each cycle.

i. Students will interpret the impact of fiscal policy effects on the macro economy.

j. Students will interpret the impact monetary policy on the macro economy.

k. Students will identify how various analytical frameworks, (e.g., classical, Keynesian, monetarist, etc.) used may affect the policy conclusions in debates over stabilization policy.

l. Students will apply the theory of comparative advantage and the flows of financial assets principle to trade.

Functional Area Knowledge (FINANCE):

1. Use discounted valuation techniques to make capital investment decisions.

a. Calculate the NPV for three scenarios (1) base case, (2) best case, and (3) worst case.

b. Identify relevant initial CFs for NPV calculation

c. Identify relevant operating CFs for NPV calculation

d. Identify relevant terminal CFs for NPV calculation

e. Create and interpret a NPV profile

f. Analyze and accept or reject a proposed investment project.

2. Understand the relationship between risk and return for equity and debt.

a. Understand the trade-off between risk and return for individual assets by computing a beta and required rate of return using the CAPM (Capital Asset Pricing Model).

b. Explain an appropriate proxy for the market rate of return for the CAPM.

c. Explain an appropriate risk-free rate proxy for the CAPM.

d. Calculate cost of debt or YTM of corporate bonds

3. Determine the required return on a proposed investment.

a. Calculate and interpret the weighted-average cost of capital (WACC) by estimating the market cost of equity and debt.

b. Understand when WACC is appropriate as the required return to calculate and interpret the weighted-average cost of capital (WACC) by estimating the market cost of equity and debt.

Functional Area Knowledge (MIS):

1. Students will be able to describe the benefits and challenges of applying information technology in various organizations and functional areas.

a. Students will describe the benefits and challenges of applying information technology in various organizations and functional areas.

b. Students will describe management issues and career paths in Information Technology.

Functional Area Knowledge (INTERNATIONAL BUSINESS):

1. Students will be able to will have basic multidisciplinary knowledge needed to conduct international business and understand the impact of globalization.

a. Our students will develop an awareness of global issues and diverse cultures.

b. Our students will be able to analyze how global factors affect decision making.

c. Our students will be able to use information resources to formulate global strategy.

Functional Area Knowledge (LEGAL ENVIRONMENT):

1. Students will be able to identify key terms, concepts, and theories of the law, understand how law affects business, demonstrate an ability to analyze legal issues, and apply the law to business situations.

a. Students will identify key terms, concepts, and theories of law.

b. Students will analyze legal issues and apply the law to business situations.

Functional Area Knowledge (MANAGEMENT):

1. Students will be able to demonstrate a broad knowledge of each business discipline, including management.

a. More particularly, students will be able to identify the correct core concepts in the context of the following 12 main topic areas:

i. Introduction to / History of Management

ii. Managing in the Global Environment

iii. Decision Making

iv. Planning & Strategy

v. Organizational Structure & Culture

vi. Managing Human Resources

vii. Individual Attitudes & Behavior

viii. Managing Teams

ix. Motivation

x. Leadership

xi. Communication

xii. Principles of Control

Functional Area Knowledge (MARKETING):

1. Students will be able to demonstrate a broad knowledge of marketing discipline.

a. Students will understand the concept of marketing and marketing philosophies.

i. Definition of marketing.

ii. Main marketing philosophies (e.g., market orientation, societal market orientation, sales orientation, production orientation).

b. Students will understand the process of marketing plan and how to set marketing strategies.

i. Be able to prepare an outline of marketing plan (e.g., SWOT analysis).

ii. Be able to choose an appropriate marketing strategy for different types of firms (e.g., market development, product development, diversification, market penetration).

c. Students will understand the process of market research.
i. Be able to choose an appropriate market research design and method for different types of market research questions.
d. Students will understand buyers and markets.
i. Be able to understand the mechanism of the buyer behaviors.
e. Students will understand the concept of target marketing strategy.
ii. Be able to use market segmentation variables for targeting and positioning.
iii. Students will understand the 4P’s (product, price, promotion, place) concepts.

Functional Area Knowledge (QUANTATIVE BUSINESS ANALYSIS):

1. Upon graduation our undergraduate students in The Sam and Irene Black School of Business will be able to demonstrate a broad knowledge of business disciplines (quantitative business analysis).
a. Students will be able to apply the basic rules of probability to assess likelihood within a population.
b. Students will be able to identify and apply appropriate probability distribution concepts to analyze data.
c. Students will be able to demonstrate an understanding of correlation and regression analysis.

Functional Area Knowledge (SUPPLY CHAIN MANAGEMENT):

1. Students will be able to demonstrate a broad knowledge of business disciplines (supply chain management).
a. Students will be able to apply forecasting methods for demand of a product or service.
b. Students will be able to apply inventory and planning models for managing operations.
c. Students will be able to demonstrate an understanding of TQM tools.

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)

Suggested Academic Plan

Interdisciplinary Business with Engineering Studies 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

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
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<tbody>
<tr>
<td>CHEM 110†</td>
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<td>CMPSC 201†</td>
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<tr>
<td>EDSGN 100</td>
<td>3</td>
<td>ECON 102**†</td>
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<td>ENGL 15 or 36†</td>
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<td>MATH 140**†</td>
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Second Year

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<td>BA 241</td>
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<td>&amp; BA 242*</td>
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<td>ENGL 202C†</td>
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Third Year

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<td>FIN 301*</td>
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<td>MCHT 213*</td>
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<td>CMPET 117 or CMPEN 271*</td>
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Fourth Year

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<tr>
<td>**</td>
<td>13.5</td>
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<td>15</td>
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Total Credits 127

* Course requires a grade of C or better for the major
Interdisciplinary Business with Engineering Studies, B.S.

† 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 Please see your academic adviser for approval before scheduling your course.
2 In order for a course to be eligible for an Approved Elective, the course can not be a lower level ENGL (1-6) or MATH (2-41) OR a GHW designated course. Please see your academic adviser if you have a question on a specific course.
3 All students are required to fulfill 45 credits of General Education courses. They include 9 credits of Natural Science (GN), 6 credits of Arts (GA), 6 credits of Humanities (GH), 6 credits of Social Science (GS) and 3 credits of Health and Wellness (GHW). Two (2) classes must be Inter-domain (N) or Linked (Z) courses. One (1) course must be designated an United States culture (US) and one (1) course must be designated an International culture (IL).

Any 3 credits may be substituted for a different designation (GN,GA,GH,GS, or GHW) once 3 credits in each designation area have been successfully completed.

Career Paths

Interdisciplinary Business with Engineering Studies graduates have found early-career success in technical sales, new business development, technical support, brand management, production planning, purchasing, operations analysis and management, plant accounting, and project management. 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

Employers of recent Behrend B.S. in Interdisciplinary Business with Engineering Studies graduates include Volvo Groups, Donnelly Mechanical, FMC Technologies, Harris Corp., Exxon Mobil, Barrington Research, Logistics Plus, General Electric, Tenneco, and Covestro.

Opportunities for Graduate Studies

Students who have both business and engineering education are well-prepared to continue their education in a master’s- or doctoral-level degree program, including Penn State Behrend’s master’s degree programs in Business Administration (M.B.A.), Manufacturing Management (M.M.M.), or Project Management (M.P.M.).

MORE INFORMATION (http://behrend.psu.edu/admissions-financial-aid/graduate-admissions)

Professional Resources

• AACSB International (http://www.aacsb.edu)
• National Organization of Business and Engineering (https://www.nobenational.org)

Accreditation

The Black School of Business is accredited by AACSB International—The Association to Advance Collegiate Schools of Business. As the world’s largest business education alliance, AACSB connects educators, students, and business to achieve a common goal: to create the next generation of great leaders. Synonymous with the highest standards of excellence since 1916, AACSB provides quality assurance, business education intelligence, and professional development services to over 1,500 member organizations and more than 785 accredited business schools worldwide. AACSB’s mission is to foster engagement, accelerate innovation, and amplify impact in business education. For more information, visit http://aacsb.edu.

MORE INFORMATION (http://www.aacsb.edu)

Contact

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http://behrend.psu.edu/school-of-business

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