PennState
Behrend

School of Engineering
Advising Handbook
Academic Year 2018-2019

Dear Student:

Welcome to the School of Engineering at Penn State Behrend. Penn State Behrend offers the strengths of a leading university in a small college environment; a wide variety of degree programs, talented and accessible faculty, undergraduate research opportunities and many career opportunities open to you with a Penn State degree.

This handbook provides valuable advising information concerning our academic programs and we hope that you find it useful. It is important that you consult regularly with your academic advisor, particularly when it is time to schedule courses. Below are some webpages you will find helpful:

- Penn State Course Catalog
  - This contains information on all courses offered by Penn State.
- Penn State Behrend
- School of Engineering
  - This has information on our academic programs, events and links to resources for students.
- LionPATH
- University Faculty Senate Policies and Rules for Undergraduate Students.

If you have additional questions, please see your advisor or department chair.

We hope the 2018-2019 academic year is an excellent one for you.

Sincerely,

Tim Kurzweg, Ph.D.
Director, School of Engineering
Professor of Electrical and Computer Engineering

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General Information and Advising

Department Directory

The academic majors offered by the School of Engineering are listed below. If you have questions about the majors, please contact the following department chairs:

Department	Department Chair	Phone Number	PSU Email
Computer Science & Software Engineering (CMPBC, SEBC)	Dr. Meng Su	814-898-6261	mus11@psu.edu
Computer & Electrical Engineering (CENBC, EEBC)	Dr. Thomas Hemminger	814-898-6479	tlh5@psu.edu
Electrical & Computer Engineering Technology (ECET)	Mr. David Loker	814-898-6478	drl3@psu.edu
Industrial Engineering (IESBC)	Dr. Dipo Onipede	814-898-6521	ouo1@psu.edu
Interdisciplinary Business with Engineering Studies (IBE)	Dr. Diane Parente	814-898-6436	dhp3@psu.edu
Mechanical Engineering (MEBC)	Dr. Yi (Elisa) Wu *Department Chair* Mr. Dean Lewis *Academic Coordinator*	814-898-6559 814-898-6692	yxw22@psu.edu dql11@psu.edu
Mechanical Engineering Technology (METBC)	Mr. Shannon Sweeney	814-898-6049	sks9@psu.edu
Plastics Engineering Technology (PLTBC)	Mr. Jonathan Meckley	814-898-6147	jam135@psu.edu

In the event that you need an immediate answer and are unable to contact one of the above, please call the School of Engineering office at 814-898-6153.

Engineering or Engineering Technology?

The Penn State Behrend School of Engineering is unique in its breadth of degree programs in engineering and engineering technology. This means that our degree programs accommodate a broad range of student learning styles and provide a wide range of career choices. We have a collaborative environment where faculty and students from different programs frequently work together on multi-disciplinary designs and research projects. Finally, graduates of all of our programs have excellent career opportunities.

Students ultimately need to select a major field of study. When selecting your academic major, please consider three important facets:

1. Your interests: What do you like to do and find interesting?
2. Your skills: What are you good at doing?
3. The career opportunities: Are there interesting job opportunities available to you that match your skills and interests?

If you can find a good intersection of these three facets, it will increase the likelihood of your long-term success. The following information provides a general overview of the distinctions between the engineering and engineering technology degrees at Penn State Behrend.

ENGINEERING PROGRAMS:

Student Profile

- Students tend to consider themselves as problem-solving innovators who like to design and develop new products and systems. Appeals to students who like to deal with the theoretical and abstract issues necessary for planning, designing and creating new products and systems.

Classroom and Laboratory Experience

- Engineering courses occur throughout the curriculum, but are concentrated later in the curriculum. These courses build on the base of mathematics and science. Design and applications are integrated into lecture and laboratory course work. The curriculum has an emphasis on engineering design and theoretical issues that are applicable to a broad range of problems. The programs culminate in a senior design experience.

Mathematics Component of the Curriculum

- Students typically start in a traditional calculus course, culminating in vector calculus and differential equations. Other courses may include matrices, probability and statistics and discrete mathematics, depending upon the major selected.

Science Component of the Curriculum

- Requires two or three physics courses (8-10 credits) that are calculus-based and four (4) credits of chemistry.

Career Paths

- Engineering and engineering technologists often work side-by-side to develop new products, processes, services and systems. Their career paths can overlap, as there are a wide variety of opportunities available in business and industry for both. Please visit our home page to obtain more information on success stories of Behrend alumni and their careers.

  Examples of career paths include, but are not limited to:

  - Complex technical analysis
  - Design and development
  - Research
  - Test and evaluation
  - Manufacturing
  - Management and supervision

Graduate School Opportunities

- Graduate school opportunities include science-based programs such as Master of Science (M.S.) and doctoral (Ph.D.) degree programs. Graduates also pursue professional graduate program opportunities such as Master of Engineering (MSE) and Master of Business Administration (MBA) programs.

Professional Registration

- Graduates are eligible for registration in all states. The process typically requires successful completion of the Fundamentals of Engineering and Professional Engineers examination. A certain number of years of professional experience is required before taking the Professional Engineers exam.

ENGINEERING TECHNOLOGY PROGRAMS:

Student Profile

- Students tend to consider themselves as problem-solvers and implementers who would like to be involved in product design and the application of new technologies. Appeals to students who like to deal with practical issues necessary for implementing, producing and realizing new products and systems.

Classroom and Laboratory Experience

- Engineering technology courses occur in every semester of the program with a higher concentration of technical courses in the first two years than in an engineering program. There is an intensive laboratory and application focus, with moderate emphasis on theory and design process. The design focus is on complex problems utilizing state-of-the-art technologies and solution methods. The programs culminate in a research, senior design or industrial project experience.

Mathematics Component of the Curriculum

- Students typically start in algebra-based and trigonometry-based technical mathematics. The math sequence takes students through intermediate calculus and differential equations with an emphasis on engineering technology applications.

Science Component of the Curriculum

- Requires one or two physics courses (4-8 credits) that are algebra-based and trigonometry-based and four (4) credits of college chemistry.

Career Paths

- Engineers and engineering technologists often work side-by-side to develop new products, processes, services and systems. Their career paths can overlap as there are a wide variety of opportunities available in business and industry for both. Please visit our home page to obtain more information on success stories of Behrend alumni and their careers.

  Example of career paths include, but are not limited to:

  - Design and development
  - Manufacturing
  - Test and evaluation
  - Field service engineering
  - Technical sales
  - Management and supervision

Graduate School Opportunities

- Graduate school opportunities include professional graduate program opportunities such as Master of Engineering (MSE) and Master of Business Administration (MBA) programs. Science-based programs, such as Master of Science (M.S.) and doctoral (Ph.D.) degree programs, are possible, but students may need to take additional courses depending on the graduate school and program they anticipate entering.

Professional Registration

- Graduates are eligible for registration in many states, including Pennsylvania. The process typically requires successful completion of the Fundamentals of Engineering and the Professional Engineers examination. A certain number of years of professional experience is required before taking the Professional Engineers exams.

General Education Requirements

Penn State has a General Education requirement for all degree programs. The purpose of the General Education requirement is to ensure that all students receive a well-rounded education and these credits make up about one-third of those needed for a baccalaureate degree. The General Education requirements are important preparation for a student's professional career.

Baccalaureate Degree General Education Requirements

The General Education program for all baccalaureate degrees consists of 45-credits that are distributed among three General Education components:

- Foundations courses in writing, speaking and quantification (15 credits)
- Knowledge Domains in the Arts, Humanities, Natural Sciences, Social and Behavior Sciences, and Health and Wellness (30 credits)
- Integrative Studies that bridges commonality and intersections between the Knowledge Domains

Foundations	Credits
Writing/Speaking (GWS) *	9 credits
Quantification (GQ) * †	6 credits
Total	15 credits

* Requires a grade of C or better

† 3-6 credits are selected from mathematics, applied mathematics and statistics; 3 credits may be selected from computer science or symbolic logic

Knowledge Domains	Credits
Health and Wellness (GHW) §	3 credits
Natural Sciences (GN) §	9 credits
Arts (GA) §	6 credits
Humanities (GH) §	6 credits
Social and Behavioral Sciences (GS) §	6 credits
Integrative Studies (either Inter-domain or Linked) courses	(6)
Total	30 credits

§ Students must complete at least 3 credits of a Single Domain coursework in each of the Knowledge Domains (GA, GH, GHW, GN, GS). A student's use of Inter-Domain courses, substitutions, or other flexibility options cannot replace this requirement.

Additional Requirements	Credits
First-Year Seminar	0-3 credits
United States Cultures (US)	3 credits
International Cultures (IL)	3 credits
Writing Across the Curriculum	3 credits
Total	9-12 credits

Information above is from the General Education section of the University Undergraduate Education Handbook

Penn State wants students to use General Education to experiment and explore, to take academic risks, to discover things they did not know before and to learn to do things they have not done before. To that end, the General Education program extends the concept of flexibility to all aspects of the degree program.

Students may, with the permission of their adviser/department chair:

1. Substitute a world language at the twelfth credit level of proficiency, as measured by the Penn State foreign language offerings, for 3 credits in any of the categories of General Education. Baccalaureate degree students may substitute study in a world/second language at the twelfth credit level of proficiency of higher for any 3 credits in any of the categories of general education only if those 3 credits are in language study beyond their degree requirements.
2. Substitute a course in one of the Knowledge Domains areas of Arts, Humanities, Social and Behavioral Sciences, Natural Sciences or Health and Wellness for a course in one of the other areas. For example, a student might take three courses in the Arts, and only one course in the Social and Behavioral Sciences. In another example, a student might take two courses in the Natural Sciences and three courses in the Humanities. This substitution is referred to as the Move 3 substitution.
3. The use of the two substitutions above, either alone or in combination, may not lead to the complete elimination of any area in the Foundations or Knowledge Domains categories in the student's General Education program, nor may they be applied to reduction of credits in the same domain.

The University requirements for GWS, GN, GQ and GHA will be met if a student follows the program schedule for a baccalaureate degree program listed in this book. However, a student has latitude in selecting the GS, GH, and GA courses and must do so carefully to meet requirements for graduation. Students choose two courses from each of the three GS/GH/GA areas of the general education course list provided by the University. This list is available in the class search in LionPATH. The following are important points to note in selecting GS/GH/GA courses:

- For certain majors, one of these six courses must be either ECON 102 or 104 (GS). See the Baccalaureate Degree Information section of this handbook for degree specific requirements.
- Note that a (US;IL) course may count for either the (US) or a (IL) category, but not both. Students admitted prior to summer of 2005 can take either an (US) or a (IL) course, and do not need to take both.

Foreign Language Requirement

Any baccalaureate student entering as a first-year student must have completed the second level proficiency of a high school foreign language. If you were admitted to Penn State without completing this admission requirement and graduated from high school in the year 2001 or later, then you must complete one foreign language course by the end of your sophomore year. If the student chooses, the course can be transferred from another institution.

First-Year Seminar Requirement

The First-Year Seminar is designated to engage students in learning, acquaint them with the resources available at Penn State and orient them to their chosen field of study. In addition, the First-Year Seminar facilitates students' adjustment to the high expectations, demanding workload, increased academic liberties, other aspects of the transition to college life and introduces them to their responsibilities as members of the University community. All Penn State Behrend baccalaureate and associate degree students must complete a First-Year Seminar course to qualify for graduation. First-Year Seminar courses are designated as either a PSU 7 or with the S designation, such as the EDSGN 100S course.

ROTC

Students enrolled in ROTC may substitute up to three (3) credits of ROTC for health and physical activity and up to three (3) credits of ROTC for technical elective credit. Students who are planning to substitute ROTC credits for technical elective credits should discuss with their adviser or department chair to make sure their plan is consistent with program requirements.

Associate Degree General Education Requirements

The associate degree General Education program consists of 21 credits that are distributed among two General Education components:

- Foundations courses in writing, speaking, and quantification (6 credits)
- Knowledge Domains in the Arts, Humanities, Natural Sciences, and Social and Behavioral Sciences (15 credits).

Associate degree students have a 3 credit requirement and may choose either a United States Cultures (US) course or an International Cultures (IL) course, and must complete a 3 credit Writing Across the Curriculum course. The First-Year Seminar is designed to engage students in learning acquaint them with the resources available at Penn State and orient them to their chosen field of study. In addition, the First-Year Seminar facilitates students' adjustment to the high expectations, demanding workload, increased academic liberties and other aspects of the transition to college life and introduces them to their responsibilities as members of the University community. All Penn State Behrend students must complete a First-Year Seminar course to qualify for graduation.

The Associate Degree Requirements for General Education is described in the tables below:

Skills Courses	Credits
Writing/Speaking (GWS) *	3 credits
Quantification (GQ) *	3 credits
Total	6 credits

* Requires a grade of C or better

Knowledge Domains	Credits
Natural Sciences (GN)	3 credits
Arts (GA)	3 credits
Humanities (GH)	3 credits
Social and Behavioral Sciences (GS)	3 credits
A General Education course selected from: GWS, GQ, GN, GA, GH or GS, and may include Integrative Studies (Inter-domain or Linked) courses	3 credits
Total	15 credits

Additional Requirements	Credits
United States Cultures (US) or International Cultures (IL) or combined designation (US;IL)	3 credits
Writing Across the Curriculum	3 credits*

* Requires a grade of C or better

Information above is from the General Education Section of the University Undergraduate Education Handbook.

Entrance to Major Process

It is important to understand the Entrance to Major process to avoid missing the opportunity to qualify for a major. Baccalaureate students can apply for entrance to major once they reach a third-semester standing (44-59 total credits earned). To be successful in upper division engineering courses, a student needs a strong background in mathematics, physics and engineering science. In order to enter in a major, the student must update their academics in LionPATH. Instructions on how to update academics can be found in the LionPATH Help Library.

The requirements for entrance into any Penn State Behrend **engineering majors** are that the student:

1. Must have completed a minimum of 44 cumulative credits, but no more than 59 cumulative credits;
2. Must have completed, with a grade of C or better, MATH 140 and 141, PHYS 211 and CHEM 110;
3. Must have at least a 2.0 cumulative GPA (2.4 for Mechanical Engineering).

The requirements for entrance into Penn State Behrend's **computer science major** are that the student:

1. Must have completed a minimum of 44 cumulative credits, but no more than 59 cumulative credits;
2. Must have completed, with a grade of C or better, MATH 140 and 141, CMPSC 121 and 122, and CHEM 110 and 111 or BIOL 110 or PHYS 211;
3. Must have at least a 2.0 cumulative GPA.

The requirement for entrance to major into any of the Penn State Behrend **engineering technology majors** are that the student:

1. Must have completed a minimum of 44 cumulative credits, but no more than 59 cumulative credits;
2. Must have completed, with a grade of C or better, MATH 81 or 22, MATH 82 or 26, MATH 83 or 140 and PHYS 250;
3. Must have at least a 2.0 cumulative GPA.

Clubs and Student Organizations

The School provides numerous opportunities for its students to gain recognition for academic success, to compete against students from other colleges and universities for regional and national awards related to their majors and to learn more about their respective fields of study by interacting with guest speakers from the industrial sector, faculty and fellow students. The following is a list of some of the engineering honorary, professional and student organizations at Penn State Behrend.

Organization	Faculty Adviser(s)	Email
Phi Sigma Rho Sorority	Dr. Nancy Study	nes14@psu.edu
Society of Automotive Engineers (SAE)	Ms. Jill Johnson	jmj195@psu.edu
Institute of Electronics and Electrical Engineers (IEEE)	Mr. Steve Strom	sas83@psu.edu
Society of Women Engineers (SWE)	Mrs. Lucy Lenhardt	lad115@psu.edu
Behrend Robotics Club	Ms. Jill Johnson	jmj195@psu.edu
American Society of Mechanical Engineers (ASME)	Mr. Dean Lewis	dql11@psu.edu
Plastics Engineering Club	Mr. Jonathan Meckley	jam135@psu.edu
Tau Beta Pi Honor Society	Dr. Thomas Hemminger	tlh5@psu.edu
National Society of Black Engineers (NSBE)	Dr. Oladipo Onipede	ouo1@psu.edu
Tau Alpha Pi Honor Society	Dr. Gary Smith	gfs13@psu.edu

Club meetings frequently involve discussions of career-related topics and industrial tours. Active participation in such organizations can help to develop valuable organizational and leadership skills sought by employers. If you want more information or have questions about a club, you can contact the faculty adviser or visit the club's page on BEHRENDSync.

In addition, all qualified students are encouraged to take the Fundamentals of Engineering (FE) exam. Each year, faculty members offer a series of review sessions for interested students in preparation for taking this comprehensive examination. It is nationally recognized as one of the first steps towards becoming registered as a professional engineer.

Master Degree Information

This section contains the following information for the master's program offered by the School of Engineering:

- Program Description
- Admission Requirements
- Degree Requirements
- Course Descriptions

Master of Manufacturing Management

Co-Directors:
Dr. Dipo Onipede
814-898-6521
ouo1@psu.edu

Dr. Diane Parente
814-898-6436
dhp3@psu.edu

Program Description:
Penn State's Master of Manufacturing Management (MMM) degree is offered by the Quality and Manufacturing Management (QMM) program. The degree is conferred by Penn State Behrend, and is administered jointly by the School of Engineering and the Black School of Business. This interdisciplinary graduate program is designed to prepare students for careers in manufacturing, consulting, services and operations. The program is offered in both full-time and part-time in an executive style online and weekend format. Full-time study requires 12 months of continuous study starting in August (fall semester) and ending the following June. Beginning Fall 2019, full time students will be on campus two weekends per semester (Friday late afternoon to Sunday late afternoon). The part time scheduling pattern requires approximately 22 months to complete. Beginning Fall 2019, part time students will be on campus one weekend per semester (Friday late afternoon to Sunday late afternoon). Students will have one three-day residency in June which includes plant visits and lean audits for the plants visited.

The program develops future executives who possess in-depth, relevant manufacturing knowledge bridging engineering and management. Graduates are afforded a life-changing experience that provides them with a unique set of engineering, business and quality skills combined with a suite of communication skills critical to management success. Students fuse Six Sigma certification with corporate social responsibility and emotional intelligence to become well-rounded leaders. QMM students develop business plans, analyze and predict corporate financial performance in a global marketplace. They emerge from Penn State as international leaders understanding the fundamentals of materials and processes and project confidence in product and manufacturing system design.

Admission Requirements:
For admission to the Graduate School, applicants must hold either (1) a baccalaureate degree from a regionally accredited U.S. institution or (2) a tertiary (postsecondary) degree that is deemed comparable to a four-year bachelor's degree from a regionally accredited U.S. institution. This degree must be from an officially recognized degree-granting institution in the country in which it operates. The program draws its students from two groups: practicing professionals from industry and individuals who have graduated from, or are currently enrolled in, a business administration, science, or engineering program. Applicants who expect to graduate with a baccalaureate in engineering, science, or business administration may apply for admission to the program in their senior year.

All applicants must submit scores from the GRE or the GMAT. Waivers may be requested for GRE/GMAT based on grades, prior graduate degrees, or substantive experience. The language of instruction at Penn State Behrend is English. All international applicants must take and submit scores for the TOEFL (Test of English as a Foreign Language) or the IELTS (International English Language Testing System), with the exceptions noted below. The minimum acceptable score for the TOEFL is 550 for the paper-based test, or a total score of 80, with a 19 on the speaking section for the internet-based test (iBT). Applicants with iBT speaking scores between 15 and 18 may be considered for provisional admission, which requires completion of specified remedial English courses with attainment of a grade of B or higher. The minimum acceptable composite score for the IELTS is 6.5.

Pre-requisite competencies may be achieved by undergraduate courses or online modules specified by the directors. Applicants cannot register until they have completed these courses. An appropriate internship experience is a precondition for entrance to the program if the applicant does not have sufficient work experience to waive the internship requirement. Students take 32 credits of work in 11 core courses.

Degree Requirements:
The MMM degree requires 32 credits of course work at the 400 level or higher, on a part- or full-time basis. The courses are as follows (each course is worth 3 credits unless otherwise specified): QMM 491 or QMM 492 (note: both may be required depending on background of the applicant); QMM 552, QMM 561, QMM 562, QMM 581, QMM 582, QMM 593 (1–2 credits), QMM 851, QMM 871, QMM 872, and QMM 891 (1–3 credits). One pre-approved elective is also required

Course Descriptions:
The MMM degree is awarded on the successful completion of 32 credits of required course work. MMM degree program students will take either QMM 491 or QMM 492, depending on their academic background. All students will complete the remainder of the core courses described below, for a total of 32 credits. There are no elective courses in the program.

QMM 491 – Introduction to Business Concepts for Manufacturing (3 credits)
Introduction to business topics in accounting and finance for non-business students in manufacturing management.

QMM 492 – Introduction to Engineering Design Principles (3 credits)
Engineering principles including different engineering fields, graphics, design, solid modeling and failure analysis.

QMM 581 – Quality Management (3 credits)
Concepts of design, assessment and improvement of quality systems; customer need analysis, identification of opportunities for application of measurement techniques.

QMM 522 – Applied Statistical Process Control and Experimental Design (3 credits)
Concepts and techniques of statistical process control and the design of experiments.

QMM 561 – Manufacturing Systems Planning and Control I (3 credits)
Systems, components and configurations, flow of material and information in a manufacturing system.

QMM 562 – Manufacturing Systems Planning and Control II (3 credits)
Flow of material and information in a manufacturing system; emphasis on systems integration.

QMM 87 1 – Design Practice for Manufacturing I (3 credits)
Contemporary concepts in design and design practice with emphasis on engineering, business and human strategy issues.

QMM 872 – Design Practice for Manufacturing II (3 credits)
Contemporary concepts in design and design practice with emphasis on logistics, risk, design and manufacturing readiness and production.

QMM 581 – Manufacturing Process and Materials (3 credits)
Characteristics of materials with respect to their properties and associated choices of processing to create a range of products; including consideration of investment, tooling, materials and manufacturing costs.

QMM 582 – Manufacturing and Supply Chain Strategy (3 credits)
Strategic decision context of manufacturing and its supply chains with linkage to corporate and business strategy.

QMM 891 – Communication and Leadership Skills for Manufacturing Managers (1-3 credits)
Applied principles of managerial, visual and written communication that support the needs of manufacturing leaders.

QMM 593 – Field Experience in Manufacturing (1-2 credits)
Experiential learning through the firsthand study of manufacturing plants and by interacting with manufacturing leaders.

Baccalaureate Degree Information

This section contains the following information for each of the baccalaureate degree programs offered by the School of Engineering:

- Program Description
- Entrance to Major Requirement
- Academic Plan
- Course Prerequisite Flowchart
- List of the Approved Technical Electives

To be certified for graduation, a student must complete the General Education, Writing Across the Curriculum and Cultural Diversity requirements, the requirements for the major and the number of elective credits required in each program. The minimum number of credits for each program is listed on the Academic Plans. In addition to the minimum number of credits required, each student must earn a grade of at least a C in each 300- and 400-level course in the major field and must have earned a minimum 2.0 grade point average.

Computer Engineering

Chair:
Dr. Thomas Hemminger
814-898-6479
tlh5@psu.edu

Program Description:
This major provides students with a strong foundation in computer engineering through a combination of classroom study, design projects and laboratory experience. Analysis and design of computer hardware and software systems is 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, students pursue their interest in computer engineering by studying principles of digital hardware design, computer architecture, computer software, microelectronics and computer data communications. The student will be required to analyze and solve a significant computer engineering design problem during the senior year.

The educational objectives of the Computer Engineering program are to produce graduates who, within three years after graduation, are able to:

1. be employed as a practicing engineer in fields such as design, research, development, testing, manufacturing, operations and service systems;
2. assume positions of leadership and responsibility within an organization; and
3. progress through advanced degree or certificate programs in engineering, business, and other professionally related fields.

The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC of ABET), 415 North Charles Street, Baltimore, MD 21201. Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Computer Engineering major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in CHEM 110, MATH 140, MATH 141 and PHYS 211. These courses must be completed prior to exceeding 59 total enrolled credits.

Academic Plan – Computer Engineering (CENBC)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
CMPSC 121 (GQ) Introduction to Programming Techniques †	3	CHEM 110 (GN) Chemical Principles I *#†	3
ENGL 15 or 30 (GWS) Rhetoric and Composition or Honors ‡†	3	CHEM 111 (GN) Experimental Chemistry I *#†	1
MATH 140 (GQ) Calculus With Analytic Geometry I *‡#†	4	CMPSC 122 Intermediate Programming *	3
PHYS 211 (GN) General Physics: Mechanics *#†	4	MATH 141 (GQ) Calculus With Analytic Geometry II *‡#†	4
PSU 7 First-Year Seminar	1	PHYS 212 (GN) General Physics: Electricity & Magnetism †	4
General Education Course (GHW)	1.5		
Total Credits:	16.5	Total Credits:	15
Semester 3	**Credits**	**Semester 4**	**Credits**
CAS 100 (GWS) Effective Speech ‡†	3	CMPSC 360 Discrete Mathematics for Computer Science * [1]	3
CMPEN 270 Introduction to Digital Systems * [1]	4	EE 210 Circuits & Devices * [1]	4
ECON 102 or 104 (GS) Intro. to Micro/Macro Economics Analysis & Policy †	3	ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3
MATH 220 (GQ) Matrices *†	2	MATH 230 Calculus & Vector Analysis *	4
MATH 250 Ordinary Differential Equations *	3	PHYS 214 (GN) General Physics: Wave Motion/Quantum Physics †	2
General Education Course	3		
Total Credits:	18	Total Credits:	16
Semester 5	**Credits**	**Semester 6**	**Credits**
CMPEN 351 Microprocessors *	3	CMPEN 352 Embedded Systems Design * [2]	3
CMPEN 371 Advanced Digital Design *	3	CMPEN 411 VLSI Design Circuits *	3
CMPSC 465 Data Structures & Algorithms *	3	CMPEN 431 Introduction to Computer Architecture *	3
EE 310 Electronic Circuit Design *	4	EE 352 Signals and Systems: Continuous and Discrete-Time *	4
STAT 301 Statistical Analysis I * [3]	3	General Education Course	3
Total Credits:	16	Total Credits:	16
Semester 7	**Credits**	**Semester 8**	**Credits**
CMPEN 441 Operating Systems *	3	CMPEN 481 Computer Engineering Projects *	3
CMPEN 461 Communications Network *	3	Technical Elective(300,400-level) *	3
CMPEN 480 Computer Engineering Senior Design *	3	Technical Elective(300,400-level) *	3
Computer Engineering Technical Elective *	1	General Education Course	3
Technical Elective (300, 400-level) *	3	General Education Course	3
General Education Course	3	General Education Course (GHW)	1.5
Total Credits:	16	Total Credits:	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 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). Foundation 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.

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 EE, CMPEN and SWENG courses.

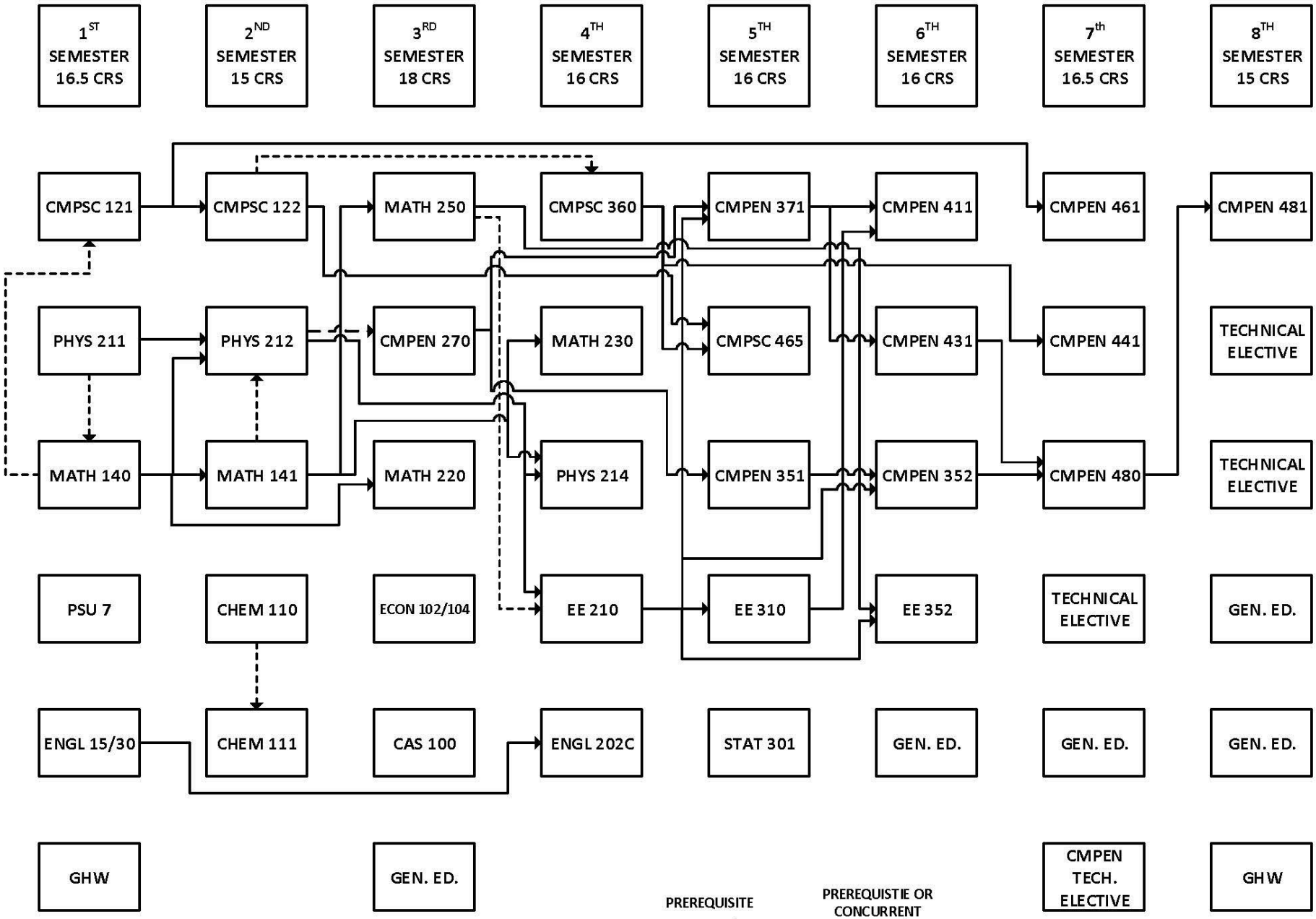
Academic Advising Notes:

[1] EE 210, CMPEN 270 and CMPSC 360 must be completed prior to the junior year to ensure that fall semester junior year prerequisites are met.

[2] A course that satisfies the University Writing Across the Curriculum requirements.

[3] If STAT 301 is not offered, students should schedule STAT 318 in its place.

COMPUTER ENGINEERING (CENBC)



School-Approved Electives for Computer Engineering

Technical electives allow students to choose areas of interest to explore. Technical electives come in two categories, primary and secondary. Primary technical electives are those courses offered to Electrical and Computer Engineering majors which are not required for the Computer Engineering major. Secondary technical electives are offered outside your home department and provide a broader latitude. **Students must complete at least two (2) primary technical electives, and at most, one (1) secondary technical elective. Courses listed below as asynchronous are offered as needed when the appropriate faculty member is available.**

*Exceptions to the above policy will be granted to students who **successfully** complete a minor in one of the areas listed in the Academic Minors part of this Handbook.*

Primary Technical Electives

Any 300 or 400-level SWENG course
Any 300 or 400-level EE course not already required for the major
Any 300 or 400-level CMPEN course not already required for the major
Any 400-level CMPSC course not already required for the major, with the exception of CMPSC 455 and CMPSC 456
Any 300 or 400-level technical gaming course

Secondary Technical Electives

Course	Credits	Name	Offered
CMPEN 395	Variable	Internship	Fall/Spring
CMPEN 495	Variable	Internship	Fall/Spring
CMPSC 461	3	Programming Language Concept	Fall
CMPSC 471	3	Introduction to Compiler Construction	Spring
ECON 481	3	Business Forecasting Techniques	Spring
ECON 485	3	Econometric Techniques	Fall
IE 302	3	Engineering Economy	Fall/Spring
MATH 455	3	Introduction to Numerical Analysis I	Fall
MATH 456	3	Introduction to Numerical Analysis II	Spring (Even Years)
MGMT 409	3	Project Management for Engineers	Fall/Spring
PSYCH 444	3	Engineering Psychology	Fall
PHYS 458	4	Intermediate Optics	Every Other Year

Computer Science

Chair:
Dr. Meng Su
814-898-6261
mus11@psu.edu

Program Description:
The goal of the Computer Science major at Behrend is to produce graduates with a firm foundation in the fundamentals of computer science along with a significant background in one or more of the natural sciences to provide context. Students are encouraged to pursue a minor in one of the natural sciences (biology and chemistry), math, statistics, or game development. Students prepare for the major by taking lower-division courses in programming, discrete math, computer organization and data communications. They then complete upper-division courses in data structures and algorithms, data base management systems, net-centric programming, programming language fundamentals, operating systems and systems programming.

Graduates of this program will be prepared for a wide variety of computer-oriented careers in business, industry and government, as well as for graduate study in computer science or in computationally intensive disciplines that require the practical application of computer science concepts and techniques to solving problems.

The educational objectives of the Computer Science program are to produce graduates who within three years of graduation are able to:

1. be employed in industry, government, or entrepreneurial endeavors to demonstrate professional advancement through significant technical achievements and expanded leadership responsibility;
2. demonstrate the ability to work effectively as a team member and/or leader in an ever-changing professional environment; and
3. progress through advanced degree or certificate programs in computing, science, engineering, business, and other professionally related fields.

The program is accredited by the Computing Accreditation Commission of Accreditation Board for Engineering and Technology (CAC of ABET), 415 North Charles Street, Baltimore, MD 21201. Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Computer Science major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in MATH 140, MATH 141, CMPSC 121, CMPSC 122, and one of the following: BIOL 110, PHYS 211, or the combination of CHEM 110 and CHEM 111. These courses must be completed prior to exceeding 59 total enrolled credits

Academic Plan – Computer Science (CMPBC)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
CMPSC 121 (GQ) Intro. to Programming Techniques *#†	3	CMPSC 122 Intermediate Programming *#	3
ENGL 15/30(GWS) Rhetoric and Composition or Honors ‡†	3	MATH 141 (GQ) Calculus With Analytic Geometry II *‡#†	4
MATH 140 (GQ) Calculus With Analytic Geometry I *‡#†	4	Science Sequence Course † [3]	4
PSU 7 First-Year Seminar	1	General Education Course	3
Science Sequence Course (GN) #† [3]	4	General Education Course (GHW)	1.5
Total Credits:	15	Total Credits:	15.5
Semester 3	**Credits**	**Semester 4**	**Credits**
CAS 100 (GWS) Effective Speech ‡†	3	CMPSC 360 Discrete Mathematics for Computer Science *	3
CMPSC 221 Object Oriented Programming with Web Based Applications	3	ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3
MATH 220 (GQ) Matrices	2	STAT 301 Statistical Analysis I * [7]	3
Science Sequence Course (GN) † [3]	2-3	Science Elective [4]	3
General Education Course	3	General Education Course	3
General Education Course (GHW)	1.5		
Total Credits:	14.5-15.5	Total Credits:	15
Semester 5	**Credits**	**Semester 6**	**Credits**
CMPSC 312 Computer Organization and Architecture *[1]	3	CMPSC 421 Net-centric Computing *[2]	3
CMPSC 335 Fundamentals of Communication Networks *[1]	3	CMPSC 474 Operating Systems and Systems Programming *	3
CMPSC 431W Database Management Systems * [1]	3	Computing Elective [5]	3
CMPSC 465 Data Structures and Algorithms *	3	Supporting and Related Area [6]	3
Science Elective [4]	3	Science Elective [4]	3
Total Credits:	15	Total Credits:	15
Semester 7	**Credits**	**Semester 8**	**Credits**
CMPSC 461 Programming Language Concepts *[1]	3	CMPSC 485 Computer Science Senior Project II *[W] [2]	3
CMPSC 484 Computer Science Senior Project I *[1]	2	Computing Elective [5]	3
SWENG 411 (Computing Elective) *[5]	3	Science Elective [4]	3
Supporting and Related Area [6]	3	General Education Course	3
Science Elective [4]	3	General Education Course	3
General Education Course	3		
Total Credits:	17	Total Credits:	15

Total Credits: 122-123

* 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 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). Foundation 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.

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 EE, CMPEN and SWENG courses.

Academic Advising Notes:

[1] This course is only offered in the **FALL SEMESTER.**

[2] This course is only offered in the **SPRING SEMESTER.**

[3] Students need to complete one of the following three semester science (GN) course sequences, which will also count toward their general education.

- Biology: CHEM 110 (3), BIOL 110S (4), and BIOL 220W (4) or BIOL 230W (4) or BIOL 240W (4)
- Chemistry: CHEM 110 (3), CHEM 111 (1), CHEM 112 (3), CHEM 113 (1), and CHEM 210 (3)
- Physics: PHYS 211 (4), PHYS 212 (4), and PHYS 213 (2) or PHYS 214 (2)

[4] It is strongly suggested (but not required) that students follow one of the natural sciences, math or statistics minors in selecting their science electives. Students may choose from the following courses:

- ASTRO 291 or higher; BIOL 110 or higher; CHEM 110 or higher; CMPSC 311 or higher
- GEOG 160 or higher; MATH 200 level or higher; METEO 101 or higher
- PHYS 211 or higher, except PHYS 250 or PHYS 251
- STAT 300 level or higher

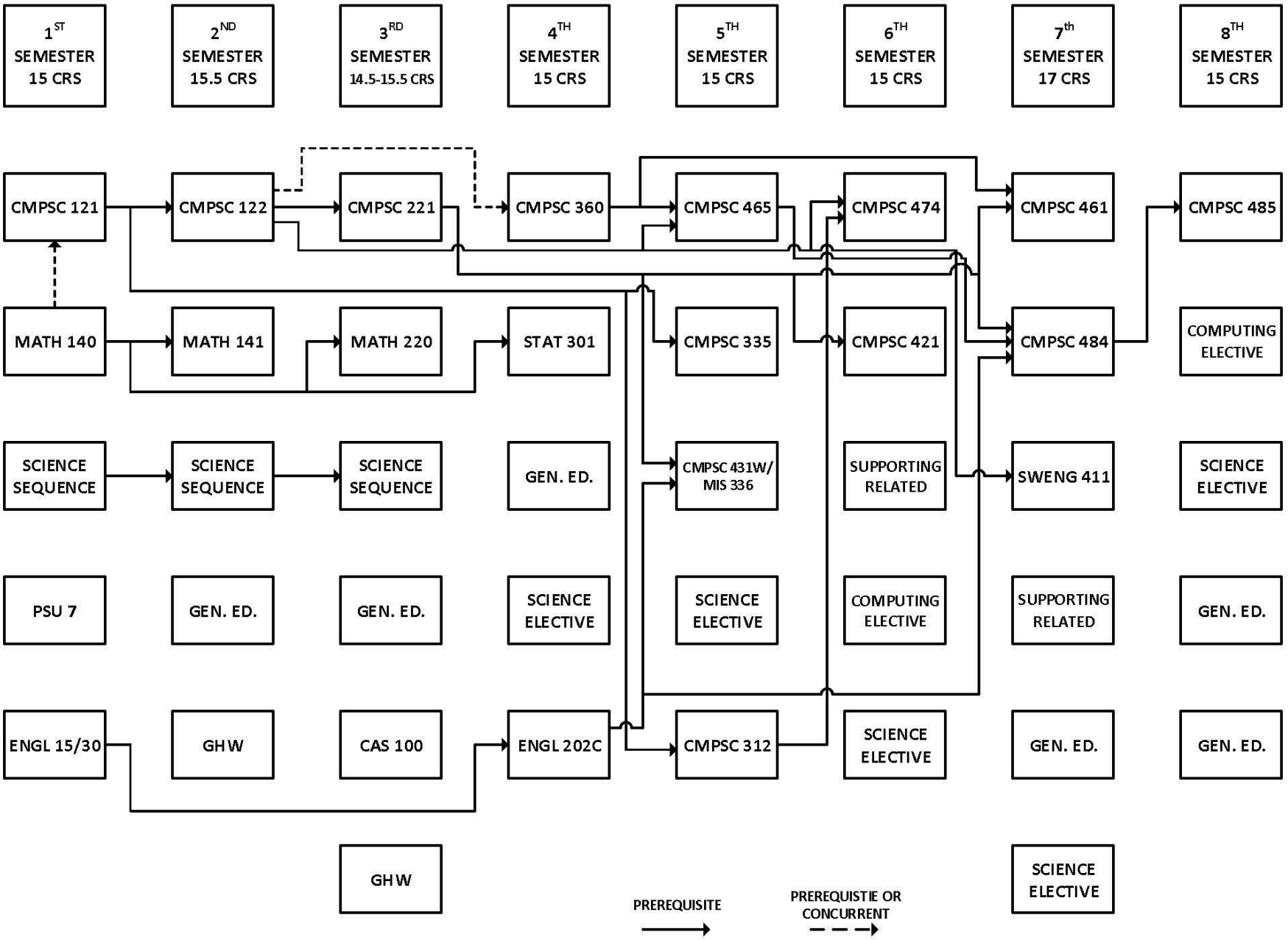
[5] Students may select courses from CMPSC 312 or higher, CMPEN or SWENG courses.

[6] All 300 and 400-levcel courses in CMPSC (including CMPSC 494 – Research, CMPSC 495 – Internship, and/or CMPSC 496 – Independent Study), GAME, MIS, MATH, STAT, BIOL, CHEM, PHYS, ACCTG, ECON, FIN, PSYCH and ROTC.

[7] If STAT 301 is not offered, students should schedule STAT 318 in its place.

[W] A course that satisfies the University Writing Across the Curriculum requirements.

COMPUTER SCIENCE (CMPBC)



Electrical Engineering

Chair:
Dr. Thomas Hemminger
814-898-6479
tlh5@psu.edu

Program Description:
This major provides students with a strong foundation in electrical engineering through a combination of classroom study, projects and laboratory experience. Analysis and design of electrical and computer 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 and mathematics core, students pursue their interest in electrical engineering by studying the principles of electrical circuits and microelectronics, digital and computer systems, control and communications systems and electromagnetic fields and waves. Students obtain and a broad-based electrical engineering education that is specialized through the selection of technical elective courses. The student will be required to analyze and solve a significant electrical engineering design problem during the senior year.

The educational objectives of the Electrical Engineering program are to produce graduates, who within three years of graduation are able to:

1. be employed as a practicing engineer in fields such as design, research, development, testing, manufacturing, operations and service systems;
2. assume positions of leadership and responsibility within an organization; and
3. progress through advanced degree or certificate programs in engineering, business, and other professionally related fields.

This program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC of ABET), 415 North Charles Street, Baltimore, MD 21201, Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Electrical Engineering major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in CHEM 110, MATH 140, MATH 141 and PHYS 211. These courses must be completed prior to exceeding 59 total enrolled credits.

Academic Plan – Electrical Engineering (EEBC)

Effective Requirement Year Fall 2018

Semester 1	Credits	Semester 2	Credits
EDSGN 100s Introduction to Engineering Design † [1]	3	CHEM 110 (GN) Chemical Principles I *#†	3
ENGL 15/30 (GWS) Rhetoric and Composition or Honors ‡†	3	CHEM 111 (GN) Experimental Chemistry I †	1
MATH 140 (GQ) Calculus With Analytic Geometry *‡#†	4	CMPSC 201 (GQ) Computer Programming for Engineers [2]	3
PHYS 211 (GN) General Physics: Mechanics *#†	4	MATH 141 (GQ) Calculus With Analytic Geometry II *‡#†	4
General Education Course	3	PHYS 212(GN) General Physics: Electricity & Magnetism †	4
		General Education Course (GHW)	1.5
Total Credits	17	Total Credits	16.5
Semester 3	**Credits**	**Semester 4**	**Credits**
CAS 100 (GWS) Effective Speech ‡†	3	Elective Couse † [3]	3
CMPEN 270 Introduction to Digital Systems * [2]	4	EE 312 Electrical Circuit Analysis *	3
EE 210 Circuits & Devices * [2]	4	MATH 220 (GQ) Matrices *†	2
EMCH 211 Statics	3	MATH 230 Calculus & Vector Analysis *	4
MATH 250 Ordinary Differential Equations *	3	PHYS 214 (GN) General Physics: Wave Motion/Quantum Physics †	3
		General Education Course	3
Total Credits:	17	Total Credits:	17
Semester 5	**Credits**	**Semester 6**	**Credits**
EE 310 Electronic Circuit Design I *	4	ECON 102/104 Intro. Micro/Macro Economics Analy & Policy	3
EE 316 Introduction to Embedded Microcontrollers *	3	EE 313 Electronic Circuit Design II *[4] [W]	4
EE 352 Signals and Systems: Continuous and Discrete-Time *	4	EE 331 Electromagnetic Fields and Waves *	3
ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3	EE 380 Introduction to Linear Control Systems *	3
STAT 301 Statistical Analysis I * [4]	3	EE 383 Signals and Controls Laboratory *	1
		General Education Course (GHW)	1.5
Total Credits:	17	Total Credits:	15.5
Semester 7	**Credits**	**Semester 8**	**Credits**
EE 360 Communications Systems I *	3	EE 401 Electrical Design Projects *	3
EE 387 Energy Conversion *	3	Technical Elective(300,400-level) *	3
EE 400 Engineering Design Concepts *	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
Total Credits:	15	Total Credits:	15

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 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). Foundation 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.

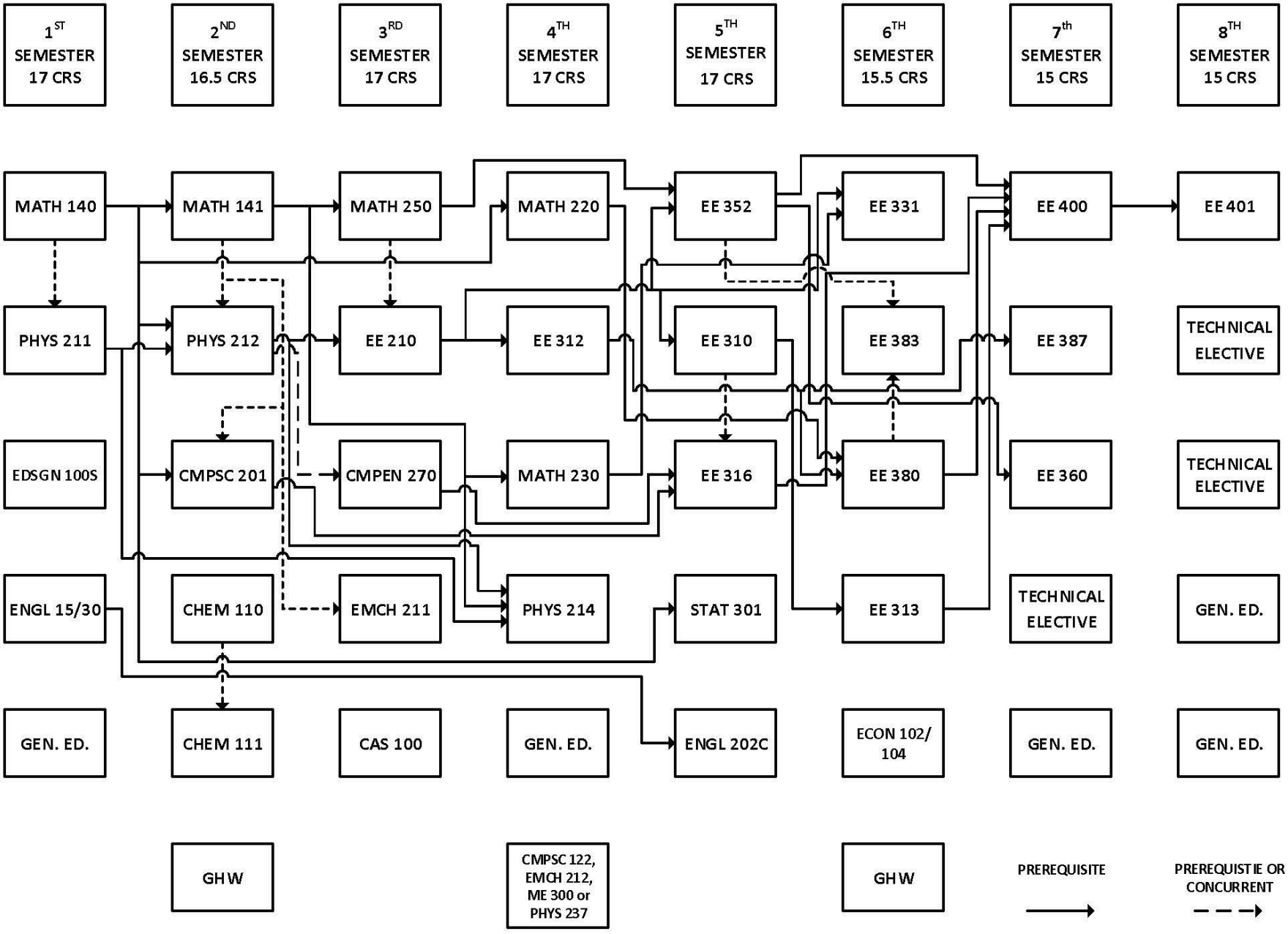
Program Notes:

- 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 EE, CMPEN and SWENG courses.

Academic Advising Notes:

[1] Course will satisfy First-Year Seminar requirement.
[2] EE 210, CMPEN 270 and CMPSC 201 must be completed prior to the junior year to ensure that fall semester junior year prerequisites are met.
[3] Students should take one of the following courses: CMPSC 122, EMCH 212, ME 300 or PHYS 237. Students planning on taking the FE Exam are advised to take ME 300.
[4] If STAT 301 is not offered, students should schedule STAT 318 in its place.
[W] A course that satisfies the University Writing Across the Curriculum requirements.

ELECTRICAL ENGINEERING (EEBC)



School-Approved Electives for Electrical Engineering

Technical electives allow students to choose areas of interest to explore. Technical electives come in two categories, primary and secondary. Primary technical electives are those courses offered to Electrical and Computer Engineering majors which are not required for the Electrical Engineering major. PHYS 414 is considered a primary technical elective. Secondary technical electives are offered outside your home department and provide you a broader latitude. **Students must complete at least two (2) primary technical electives, and at most, one (1) secondary technical elective. Courses listed below as asynchronous are offered as needed when the appropriate faculty member is available.**

*Exceptions to the above policy will be granted to students who **successfully** complete a minor in one of the areas listed in the Academic Minors part of this Handbook.*

Primary Technical Electives

Any 300 or 400-level SWENG course
Any 300 or 400-level EE course that is not already required for the major
Any 300-400-level CMPEN course not already required for the major
PHYS 414, Solid State Physics

Secondary Technical Electives

Course	Credits	Name	Offered
EE 395	Variable	Internship	Fall/Spring
EE 495	Variable	Internship	Fall/Spring
CMPSC 461	3	Programming Language Concept	Fall
CMPSC 471	3	Introduction to Compiler Construction	Spring
ECON 481	3	Business Forecasting Techniques	Spring
ECON 485	3	Econometric Techniques	Fall
IE 302	3	Engineering Economy	Fall/Spring
MATH 455	3	Introduction to Numerical Analysis I	Fall
MATH 456	3	Introduction to Numerical Analysis II	Spring (Even Years)
MGMT 409	3	Project Management for Engineers	Fall/Spring
PSYCH 444	3	Engineering Psychology	Fall
PHYS 458	4	Intermediate Optics	Every Other Year

Electrical and Computer Engineering Technology

Chair:
Mr. David Loker
814-898-6478
drl3@psu.edu

Program Description:
This major prepares graduates for careers in such varied areas as electronics, microprocessors, computer hardware and software, communications, instrumentation and control, and power. The major consists of two options, one in Electrical Engineering Technology and the other in Computer Engineering Technology. Both options provide education in applied mathematics, physics, electrical and electronic circuit analysis and design, microprocessors, instrumentation and quality control. The Electrical Engineering Technology option provides specialty education in control theory, communication systems, and power systems. The Computer Engineering Technology option provides specialty education in software development, embedded computer systems, and networking. Both options in the major culminate with a capstone design project involving an actual design or manufacturing problem, often sponsored by industry. Graduates may qualify as engineering technologists working side-by-side with engineers, scientists, and other skilled workers in these capacities. Occupations include electrical and electronic systems design, embedded systems, automation and process control, software design and testing, field service, application engineering, system integration, quality control and technical sales and service.

The educational objectives of the Penn State Behrend Electrical and Computer Engineering Technology program are to produce graduates who, within three years of graduation are able to:

1. be employed in fields of engineering such as design, research, development, applications, testing, manufacturing, processing, safety, quality, and technical sales or service:
    a. for B.S. degree recipients, as an engineer or engineering technologist
    b. for A.S. degree recipients, as a technician or technologist or designer or engineering assistant
2. achieve positions of increased responsibility (technical and/or supervisory) within an organization; and
3. progress through advanced degree or certificate programs or participate in continuing education in engineering, business, and/or other professionally related fields.

This program is accredited by the Engineering Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ETAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Electrical and Computer Engineering Technology major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in MATH 81 or MATH 26, MATH 82 or MATH 22, MATH 83 or MATH 140, and PHYS 250. These courses must be completed prior to exceeding 59 total enrolled credits.

Academic Plan – Electrical and Computer Engineering Technology (ECET)
CMPET Option

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
EET 2 Introduction to Engineering Technology † [1]	1	CMPET 5 Engineering Methods in Engineering Technology	1
EET 101 Electrical Circuits I	3	CMPET 117 Digital Electronics *	3
EET 109 Electrical Circuits Laboratory I	1	CMPET 120 Digital Electronics Laboratory	1
ENGL 15 or 30(GWS) Rhetoric and Composition or Honors ‡†	3	EET 114 Electrical Circuits II *	4
MATH 81 (GQ) Technical Mathematics I *‡#†	3	EET 118 Electrical Circuits Laboratory *	1
General Education Course	3	MATH 82 (GQ) Technical Mathematics II *‡#†	3
General Education Course (GHW)	1.5	PHYS 250 (GN) Introductory Physics I *#†	4
Total Credits:	15.5	Total Credits:	17
Semester 3	**Credits**	**Semester 4**	**Credits**
CMPET 211 Embedded Processors and DSP	3	CAS 100 (GWS) Effective Speech ‡†	3
EET 212 Op Amp and Integrated Circuit Electronics [2]	4	CHEM 110 (GN) Chemical Principles †	3
EET 214 Electric Machines and Energy Conversion	3	CHEM 111 (GN) Experimental Chemistry †	1
EET 215 Electric Machines and Energy Conversion Lab	1	EET 275 Introduction to Programmable Logic Controllers	3
MATH 83 (GQ) Technical Calculus *#†	4	EET 280 System Integration Project	1
General Education Course	3	EGT 119 Intro to CAD for Electrical and Computer Engineering	2
		MATH 210 Calculus with Engineering Technology Application	3
Total Credits:	18	Total Credits:	16
Semester 5	**Credits**	**Semester 6**	**Credits**
CMPET 301 Algorithmic Processes for Electrical Systems *	3	CMPET 333 Computer Networking *	3
EET 341 Measurements and Instrumentation *	3	CMPET 355 Intermediate Microprocessors & Microcomputers *	3
ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3	ECON 102 or 104(GS) Intro. Micro-Macroeconomics Analy. & Policy †	3
MATH 211 Intermed. Calc & Diff Equations	3	EET 315 Linear and Discrete System Analysis *	3
General Education Course	3	General Education Course	3
		General Education Course (GHW)	1.5
Total Credits:	15	Total Credits:	16.5
Semester 7	**Credits**	**Semester 8**	**Credits**
CMPET 456 Advanced Microprocessors, High Level Interfacing *	3	EET 490 Electrical and Computer Engineering Technology Senior Design Projects * [2]	3
CMPET 457 Software Engineering *	3	QC 450 Quality Control and Quality Improvement *	3
EET 480 Electrical and Computer Engineering Technology Systems Senior Seminar *	1	Technical Elective (300,400-level) *	3
MGMT 409 Project Management for Engineers *	3	General Education Course	3
Technical Elective (300,400-level) *	3	General Education Course (GN)	2
Technical Elective (300,400-level) *	3		
Total Credits:	16	Total Credits:	14

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 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). Foundation 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.

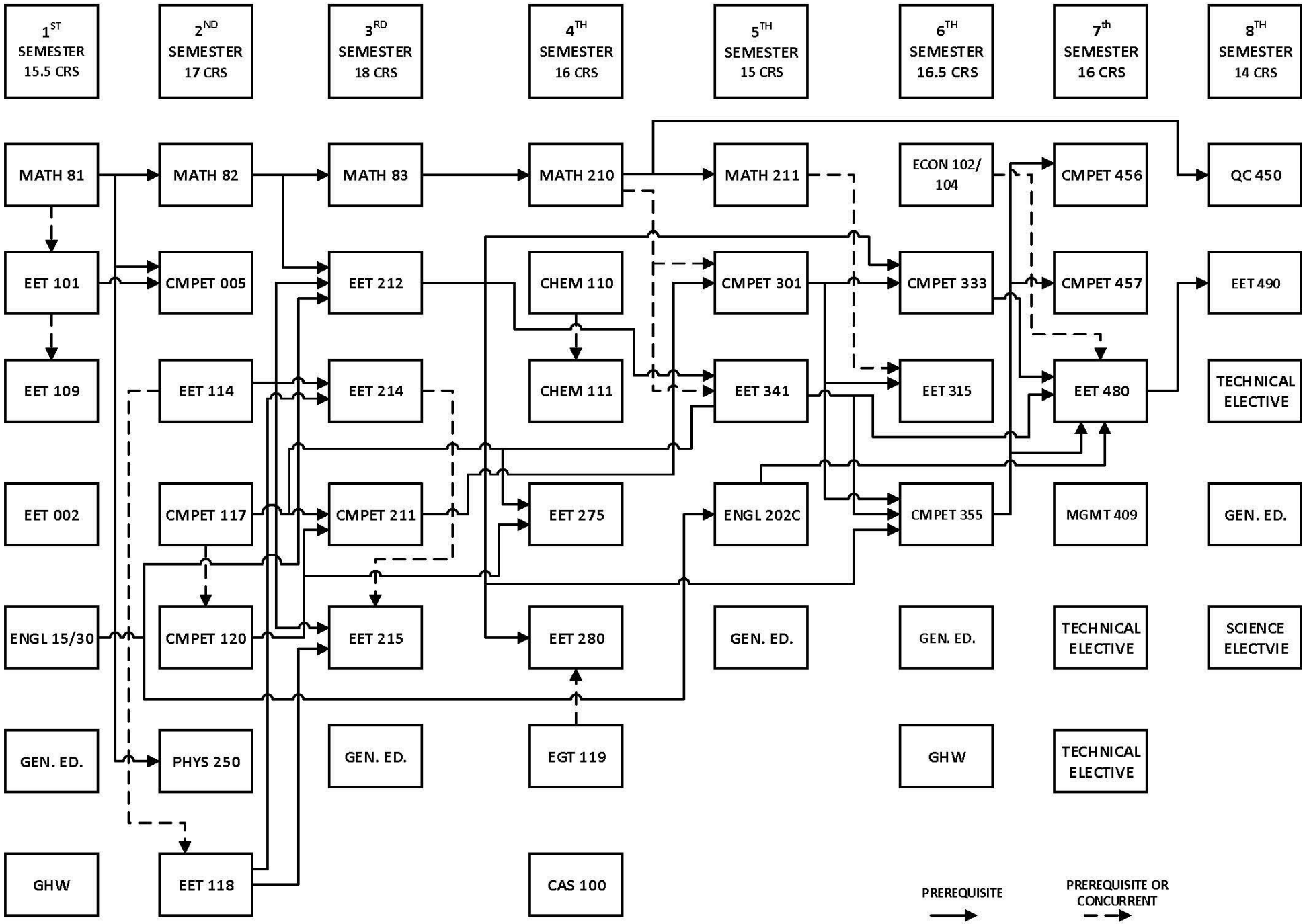
Program Notes:

- 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 EET and CMPET courses.
- Permissible Math substitutions: MATH 26 instead of MATH 81, MATH 22 instead of MATH 82, MATH 140 instead of MATH 83.
- If ENGL 15 is full, schedule a General Education Course, 2nd semester ENGL 15, 3rd semester CAS 100, and 4th semester PHYS 250.

Academic Advising Notes:

[1] Course will satisfy First-Year Seminar requirement.
[2] Course will satisfy Writing Across the Curriculum requirement.

ELECTRICAL AND COMPUTER ENGINEERING TECHNOLOGY (ECET) - COMPUTER ENGINEERING TECHNOLOGY (CMPET) OPTION



Academic Plan – Electrical and Computer Engineering Technology (ECET)
EET Option
Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
EET 2 Introduction to Engineering Technology † [1]	1	CMPET 5 Engineering Methods in Engineering Technology	1
EET 101 Electrical Circuits I	3	CMPET 117 Digital Electronics *	3
EET 109 Electrical Circuits Laboratory I	1	CMPET 120 Digital Electronics Laboratory	1
ENGL 15 or 30(GWS) Rhetoric and Composition or Honors ‡†	3	EET 114 Electrical Circuits II *	4
MATH 81 (GQ) Technical Mathematics I *‡#†	3	EET 118 Electrical Circuits Laboratory *	1
General Education Course	3	MATH 82 (GQ) Technical Mathematics II *‡#†	3
General Education Course (GHW)	1.5	PHYS 250 (GN) Introductory Physics I *#†	4
Total Credits:	15.5	Total Credits:	17
Semester 3	**Credits**	**Semester 4**	**Credits**
CMPET 211 Embedded Processors and DSP	3	CAS 100 (GWS) Effective Speech ‡†	3
EET 212 Op Amp and Integrated Circuit Electronics [2]	4	CHEM 110 (GN) Chemical Principles †	3
EET 214 Electric Machines and Energy Conversion	3	CHEM 111 (GN) Experimental Chemistry †	1
EET 215 Electric Machines and Energy Conversion Lab	1	EET 275 Introduction to Programmable Logic Controllers	3
MATH 83 (GQ) Technical Calculus *#†	4	EET 280 System Integration Project	1
General Education Course	3	EGT 119 Intro to CAD for Electrical and Computer Engineering	2
		MATH 210 Calculus with Engineering Technology Application	3
Total Credits:	18	Total Credits:	16
Semester 5	**Credits**	**Semester 6**	**Credits**
CMPET 301 Algorithmic Processes for Electrical Systems *	3	CMPET 355 Intermediate Microprocessors & Microcomputers *	3
EET 341 Measurements and Instrumentation *	3	ECON 102 or 104(GS) Intro. Micro-Macroeconomics Analy. & Policy †	3
ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3	EET 315 Linear and Discrete System Analysis *	3
MATH 211 Intermed. Calc & Diff Equations	3	EET 330 Wireless Communications Systems *	3
General Education Course	3	General Education Course	3
		General Education Course (GHW)	1.5
Total Credits:	15	Total Credits:	16.5
Semester 7	**Credits**	**Semester 8**	**Credits**
EET 416 Fluid and Thermal Design in Electrical Systems *	3	EET 490 Electrical and Computer Engineering Technology Senior Design Projects * [2]	3
EET 440 Applied Feedback Controls *	3	QC 450 Quality Control and Quality Improvement *	3
EET 480 Electrical and Computer Systems Senior Seminar *	1	Technical Elective (300,400-level) *	3
MGMT 409 Project Management for Engineers *	3	General Education Course	3
Technical Elective(300,400-level) *	3	General Education Course (GN)	2
Technical Elective(300,400-level) *	3		
Total Credits:	16	Total Credits:	14

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 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). Foundation 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.

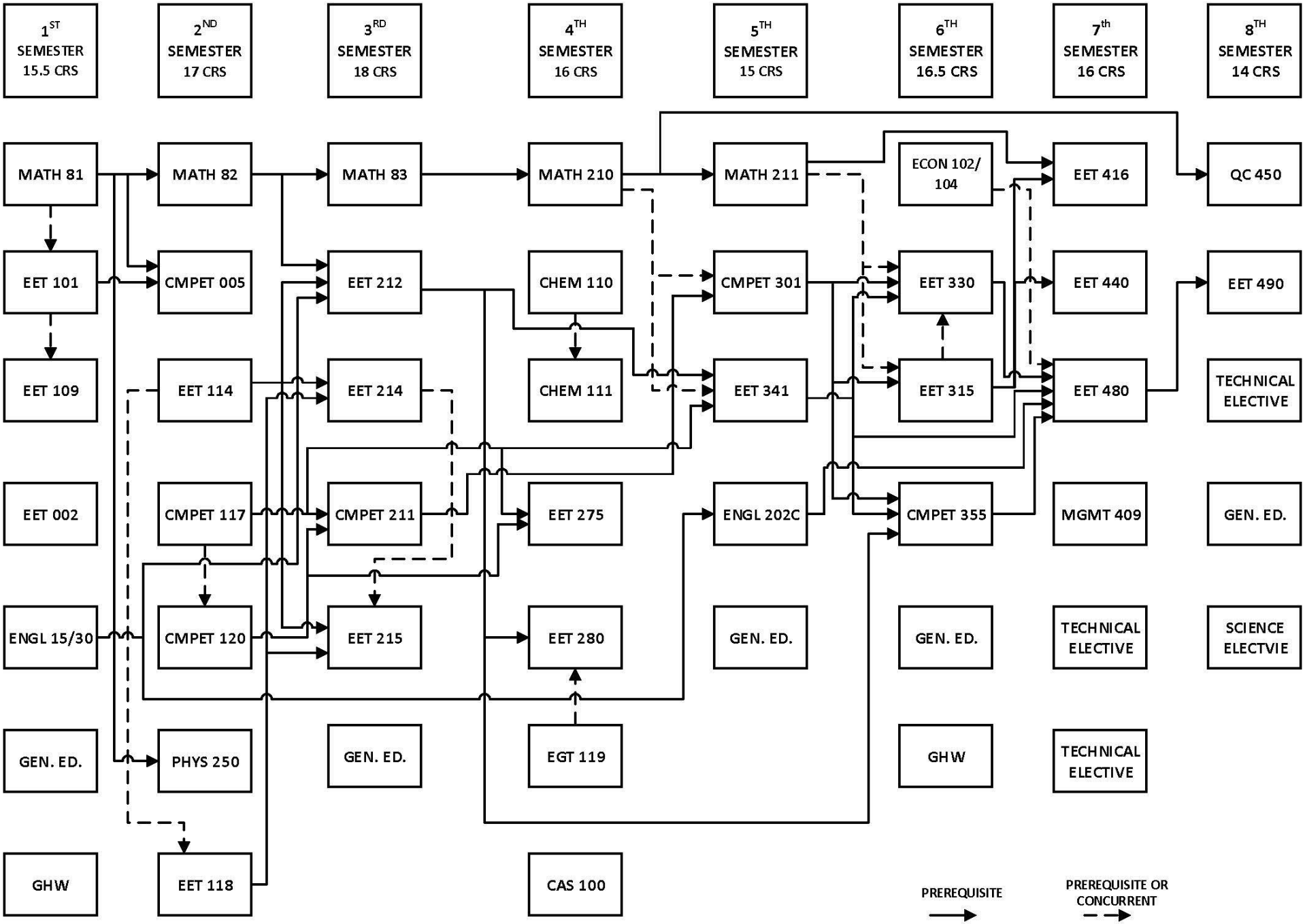
Program Notes:

- 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 EET and CMPET courses.
- Permissible Math substitutions: MATH 26 instead of MATH 81, MATH 22 instead of MATH 82, MATH 140 instead of MATH 83.
- If ENGL 15 is full, schedule a General Education Course, 2nd semester ENGL 15, 3rd semester CAS 100, and 4th semester PHYS 250.

Academic Advising Notes:

[1] Course will satisfy First-Year Seminar requirement.
[2] Course will satisfy Writing Across the Curriculum requirement.

ELECTRICAL AND COMPUTER ENGINEERING TECHNOLOGY (ECET) ELECTRICAL ENGINEERING TECHNOLOGY (EET) OPTION



School-Approved Electives for Electrical and Computer Engineering Technology

Electrical Engineering Technology Option		
Course	**Credits**	**Title**
CMPET 333	3	Computer Networking
CMPET 456	3	Advanced Microprocessors, High Level Interfacing
CMPET 457	3	Software Engineering

Computer Engineering Technology Option		
Course	**Credits**	**Title**
EET 330	3	Wireless Communication Systems
EET 416	3	Fluid and Thermal Design in Electrical Systems
EET 440	3	Applied Feedback Controls

Electrical or Computer Engineering Technology Options		
Course	**Credits**	**Title**
EET 395 *	1-3	Computer Networking
EET 397 *	1-3	Special Topics
EET 458	3	Digital Signal Processing
EET 461	3	Power Electronics
EET 475	3	Intermediate Programmable Logic Controllers
EET 495 *	1-3	Internship
EET 496 *	1-3	Independent Studies
EET 497 *	1-3	Special Topics

* Requires prior approval from the Electrical and Computer Engineering Technology Department Chair

Upon approval by the Department Chair, students may be allowed to select technical elective courses from other disciplines.

Industrial Engineering

Chair:
Dr. Dipo Onipede
814-898-6521
ouo1@psu.edu

Program Description:
Industrial engineering is a broad based and versatile discipline that involves the design, analysis and improvement of systems and processes. Students build a foundation of science, mathematics, economics and engineering principles that prepares them to take a systems point of view in solving a wide variety of problems. Industrial engineers are involved in the design, development and improvement of systems and processes such as manufacturing, inventory control, quality control, facilities planning and logistics. Industrial engineers also apply their skills and knowledge in fields such as health care, retail, utilities, information systems, financial and other services industries. Industrial engineers continuously interact with people at all levels from process operators to senior management and so they need to have excellent communication skills.

Industrial engineers have a "big-picture" perspective and bring people, resources, equipment and technologies together to improve systems and processes. Industrial engineers work to reduce costs, increase efficiency/productivity, assure quality and satisfy customer expectations. They are trained in identifying and solving a wide variety of problems using their broad-based skills. As companies across all industries are increasingly striving to control costs and maximize efficiencies, the versatile skill set of industrial engineers opens doors for numerous career opportunities in virtually every sector of the economy. Recent occupational outlook surveys show strong and growing demand for industrial engineers.

The curriculum at Penn State Behrend provides students with strong technical expertise and problem-solving skills that will allow graduates to function successfully in a wide variety of professional settings. During the program, students will also have the opportunity to choose electives in manufacturing systems engineering, engineering service systems or engineering information systems. Industrial engineers may be interested in certificates or minors available from Penn State Behrend's collaborative business/engineering environment such, as the Operations and Supply Chain Management minor.

The educational objectives of Behrend's Industrial Engineering program are to produce graduates, who within three years of graduation are able to:

1. be employed as a practicing engineer in fields such as design, research, development, testing and manufacturing, operations and service systems
2. assume positions of leadership and responsibility within an organization;
3. progress through advanced degree or certificate programs in engineering, business and other professionally related fields.

The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Industrial Engineering major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in CHEM 110, MATH 140, MATH 141 and PHYS 211. These courses must be completed prior to exceeding 59 total enrolled credits.

Academic Plan – Industrial Engineering (IESBC)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
CHEM 110 (GN) Chemical Principles I *#†	3	CMPSC 200 (GQ) Programming for Engineers MATLAB †	3
CHEM 111 (GN) Experimental Chemistry I †	1	ECON 102 or 104 (GS) Intro. Micro-Macroeconomics Analy. & Policy †	3
EDSGN 100S Introduction to Engineering Design †	3	MATH 141 (GQ) Calculus with Analytic Geometry *‡#†	4
ENGL 15 or 30 (GWS) Rhetoric and Composition or Honors ‡†	3	PHYS 211 (GN) General Physics: Mechanics *#†	4
MATH 140 (GQ) Calculus With Analytic Geometry I *‡#†	4	General Education Course	3
General Education Course	3		
Total Credits:	17	Total Credits:	17
Semester 3	**Credits**	**Semester 4**	**Credits**
CAS 100 (GWS) Effective Speech ‡†	3	EMCH 213 Strength of Materials *	3
EMCH 211 Statics *	3	MATH 250 Differential Equations	3
MATH 220 (GQ) Matrices *†	2	Course from Approved List [4]	3
MATH 231 Calc. of Several Variables	2	Course from Approved List [4]	3
PHYS 212 (GN) General Physics: Electricity & Magnetism †	4	Science Elective [3]	3
General Education Course	3		
Total Credits:	17	Total Credits:	15
Semester 5	**Credits**	**Semester 6**	**Credits**
IE 302 Engineering Economy * [1]	3	ENGL 202C (GW) Effective Writing: Technical Writing ‡†	3
IE 305 Product Design, Specification & Measurement * [1]	3	IE 306 Machining Process Design & Analysis * [2] or IE 311 Principles of Solidification Processing * [2]	3
IE 322 Probabilistic Models in IE * [1]	3	IE 323 Statistical Methods * [2]	3
IE 327 Introduction to Work Design * [1]	3	IE 330 Engineering Analytics * [2]	3
MATSE 259 Materials, Properties & Processing	3	IE 405 Deterministic Models in Operations Research * [2]	3
General Education Course (GHW)	1.5	General Education Course (GHW)	1.5
Total Credits:	16.5	Total Credits:	16.5
Semester 7	**Credits**	**Semester 8**	**Credits**
IE 418 Human/Computer Interface Design * [1]	3	IE 453 Simulation Modeling for Decision Support * [2]	3
IE 425 Intro to Operations Research * [1]	3	IE 460 Service Systems Engineering * [2]	3
IE 470 Manufacturing System Design & Analysis * [1]	3	IE 480 Capstone Design Course * [2]	3
Specialization Course * [1] [A]	3	Specialization Course * [2] [B]	3
General Education Course	3	General Education Course	3
Total Credits:	15	Total Credits:	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

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). Foundation 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.

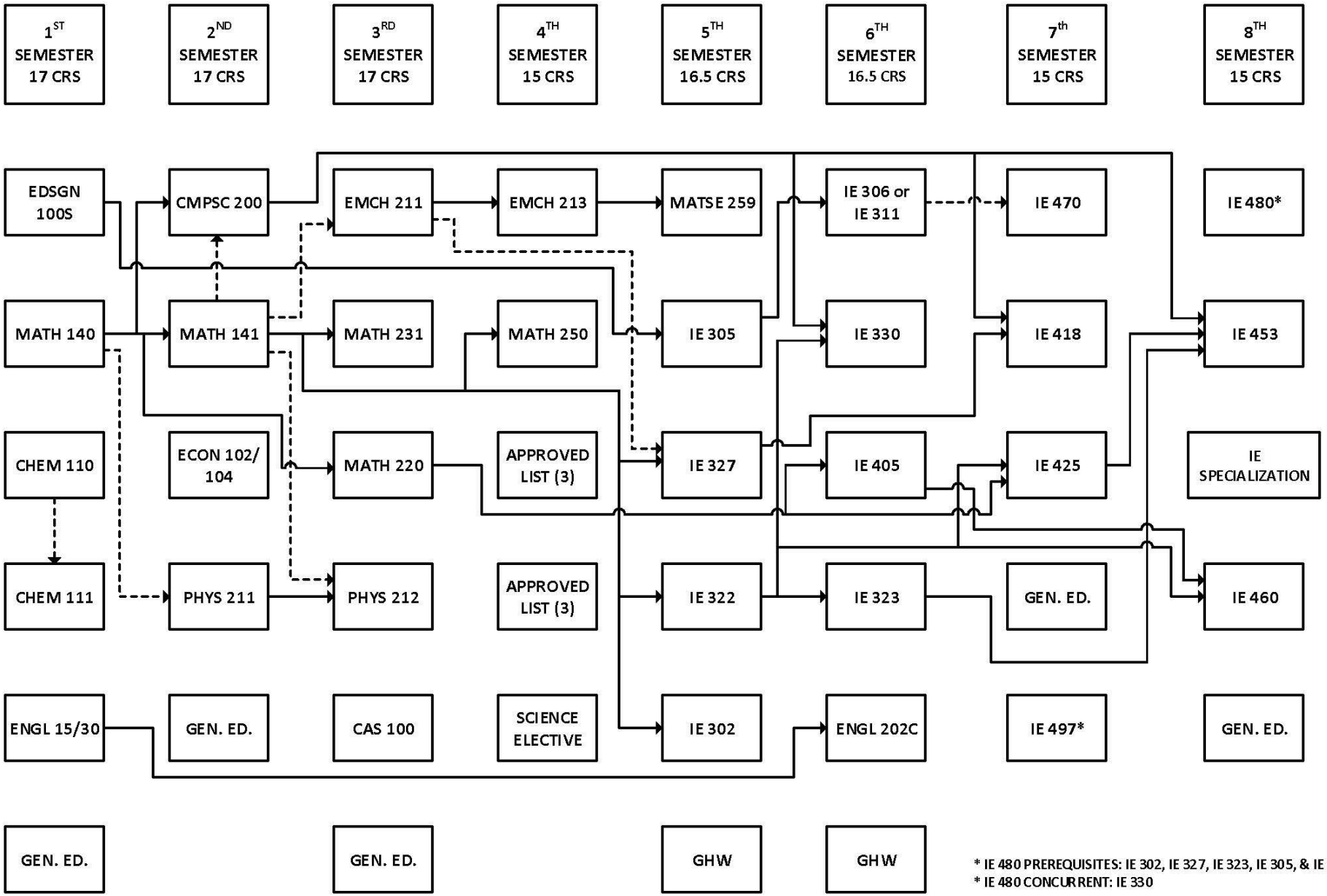
Program Notes:

- 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 IE courses.

Academic Advising Notes:

[1] Course is only offered in the **FALL SEMESTER**
[2] Course is only offered in the **SPRING SEMESTER**
[3] Select from BIOL 141, CHEM 112, MATH 311W, or PHYS 214 (will require 1 additional credit)
[4] - 3 credits from the following: CMPEN 271, EE 211 or EE 212
- 3 credits from the following: ME 300, EMCH 212, 3 credits from a minor upon completion of the minor as approved by the IE department, or 3 credits from any combination of co-op or internship. For those who complete the ROTC program, 3 ROTC credits may be used to substitute for this requirement and 3 ROTC credits may be used to substitute for the GHW requirement.
[A] Students should take IE 497 (**FALL SEMESTER ONLY**)
[B] Students should take IE 402 or IET 454 (both are **SPRING SEMESTER ONLY**)

INDUSTRIAL ENGINEERING (B.S.)



* IE 480 PREREQUISITES: IE 302, IE 327, IE 323, IE 305, & IE 405
* IE 480 CONCURRENT: IE 330

* IE 497 PREREQUISITES: IE 302, IE 323, & IE 405
* IE 497 PREREQUISITE OR CONCURRENT: IE 327

Interdisciplinary Business with Engineering Studies

Chair:
Dr. Diane Parente, School of Business
814-898-6436
dhp3@psu.edu

Program Description:
The Interdisciplinary Business with Engineering Studies (IBE) major provides students with an interdisciplinary program having 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 courses from a selection of "skill" modules, each designed to enable a student to function in a specific technically related business area. The modules provide an entry-level set of tools that will help graduates provide immediate value to their employer.

For the B.S. degree in Interdisciplinary Business with Engineering Studies, a minimum of 127 credits is required. Each student must earn at least a C or better in each 300- and 400-level course in both the Business and the Engineering Core as well as in ACCTG 211, BA 241 and BA 242 (or BA 243), ECON 102, ECON 104, MIS 204, SCM 200, MATH 140, MATH 141, MCHT 111 or EMCH 211, MCHT 213 or EMCH 213. EET 101 or EE 211, CMPET 117 or CMPEN 271, CMPSC 201, EGT 120.

Career Opportunities
The Academic and Career Planning Center (ACPC) assists students with the process of career and life planning through a full range of programs and services. You may schedule appointments with the ACPC staff to discuss issues including interests, skills, values and goal setting, as well as how to find career information, internships, full-time jobs and graduate schools. You are encouraged to utilize the services of the ACPC every year from your first semester to graduation.

The breadth offered by the IBE major is reflected in the diverse career paths of graduates possible in the industrial, retail, financial and academic sectors.

IBE graduates will typically enter the business side of technical companies. The type of jobs that may be appropriate for graduates from this program might be:

1. Technical/industrial sales
2. Technical business/product development
3. Technical support
4. Junior-level product or brand management
5. Production planners
6. Operations analysts
7. Purchasing agent in technical firm
8. Operations/production manager
9. Plant accountant in technical firms
10. Project manager

Academic Plan –Interdisciplinary Business with Engineering Studies (IBE)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
CHEM 110 (GN) Chemical Principles I †	3	CMPSC 201 (GQ) Programming for Engineers with C++ †	3
EDSGN 100S Introduction to Engineering Design	3	ECON 102 (GS) Introduction to Microeconomics *#†	3
ENGL 15/30 (GWS) Rhetoric and Composition or Honors #†	3	EGT 120 Introduction to Graphics and Solid Modeling *	3
MATH 140 (GQ) Calculus With Analytic Geometry I *#†	4	MATH 141 (GQ) Calculus With Analytics Geometry II *†	4
General Education Course [3]	3	General Education Course [3]	3
Total Credits:	16	Total Credits:	16
Semester 3	**Credits**	**Semester 4**	**Credits**
BA 241 Legal Environment of Business (2) AND BA 242 Social & Ethical Environment of Business (2)	4	ACCTG 211 Financial & Managerial Accounting *#	4
CAS 100 (GWS) Effective Speech †	3	ENGL 202C (GWS) Effective Writing: Technical Writing †	3
ECON 104 (GS) Introduction to Macroeconomics *†	3	MCHT 111 Mechanics for Technology Statics OR EMCH 211 Statics *	3
MIS 204 Introduction to Management Info Systems *	3	PHYS 212 (GN) General Physics: Electricity and Magnetism †	4
PHYS 211 (GN) General Physics: Mechanics †	4	SCM 200 Introduction to Stats for Business OR STAT 200 Elementary Statistics *#†	4
General Education Course (GHW)	1.5		
Total Credits:	18.5	Total Credits:	18
Semester 5	**Credits**	**Semester 6**	**Credits**
EET 101 Electrical Circuits *	3	FIN 301 Corporation Finance *	3
MCHT 213 Strength and Properties of Materials *	3	CMPET 117 Digital Electronics OR CMPEN 271 Introduction to Digital Systems *	3
MGMT 301 Basic Management Concepts *	3	ME 300 OR MET 330 Engineering Thermodynamics I OR Thermodynamics *	3
MKTG 301 Principles of Marketing *	3	International Business Course (IL) *	3
SCM 301 Supply Chain Management *	3	Module Elective	3
Total Credits:	15	Total Credits:	15
Semester 7	**Credits**	**Semester 8**	**Credits**
MGMT 410 Project Management *	3	MGMT 476 Product Realization Capstone *	3
MGMT 475 Strategic Product Development *	3	General Education Course [3]	3
General Education Course (GHW) [3]	1.5	General Education Course [3]	3
Module Elective	3	Module Elective	3
Module Elective	3	Module Elective	3
Total Credits:	13.5	Total Credits:	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 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). Foundation 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.

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 IE courses.

Academic Advising Notes:

[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 cannot 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 and Behavioral Sciences (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

Module List for the Interdisciplinary Business with Engineering Studies

Module 1 – Accounting/Finance (16 credits)

Course	Credits	Title
ACCTG 305	4	Financial Statements and Management Decisions
ACCTG 340	3	Cost Accounting
FIN 451	3	Intermediate Financial Management
Select six (6) credits in ACCTG or FIN at the 400-level		

Module 2 – School Approved (15 credits)

Please see Program Chair for a list of appropriate classes.

Module 3 – Operations & Supply Chain (15 credits)

Course	Credits	Title
SCM 445	3	Operations Planning & Control
SCM 455	3	Logistics Systems Analysis & Design
SCM 460	3	Purchasing & Material Management
Select two (2) of the following courses:		
ECON 485	3	Econometric Techniques
MKTG 485	3	Business to Business Marketing
MIS 404	3	Introduction to ERP
MIS 336	3	Database Management Systems

Module 4 – Technical Sales (15 credits)

Course	Credits	Title
SCM 465	3	E-Commerce
SCM 460	3	Purchasing & Material Management
MKTG 410	3	Personal Selling
Select two (2) of the following courses:		
MIS 404	3	Introduction to ERP
MKTG 440	3	Services Marketing
MKTG 485	3	Business to Business Marketing
SCM 455	3	Logistics Systems Analysis & Design

Module 5 – Product Design & Manufacture (16 credits)

Course	Credits	Title
IET 101	3	Manufacturing Materials & Process
IET 215	2	Production Design
IET 216	2	Mathematical Methods of Operations Research
EGT 121	3	Applied Solids Modeling
MET 306	3	Computer Aided Design
QC 450	3	Intro to Quality Control Engineering

Mechanical Engineering

Chair:
Dr. Yi (Elisa) Wu
Department Chair
814-898-6559
yxw22@psu.edu

Mr. Dean Lewis
Academic Coordinator
814-898-6692
dql11@psu.edu

Program Description:
Mechanical Engineering is one of the broadest, oldest and largest branches of engineering. It involves a wide range of activities including research, development, design, testing, manufacturing, production and operation. Mechanical Engineers work on products, such as automobiles, home appliances, spacecraft, rocket engines, air conditioning equipment, power plants and many types of instruments. A mechanical engineering education is also an excellent preparation for non-engineering careers, such as technical management, business law and sales.

The educational objectives of the Behrend Mechanical Engineering program are to produce graduates, who within three years of graduation are able to:

1. be employed as a practicing engineer in fields such as design, research, development, testing and manufacturing, operations and service systems;
2. assume positions of leadership and responsibility within an organization; and
3. progress through advanced degree or certificate programs in engineering, business and other professionally related fields.

A major emphasis of the Penn State Behrend Mechanical Engineering program is to give students a strong foundation in developing and solving engineering models (mathematical representations of physical systems). This is accomplished by introducing the basic mathematics in the early years of the program; demonstrating application of mathematics to engineering problems in the middle years and reinforcing the engineering application of mathematics in the later years. At the same time, it is necessary to bridge the gap between theory and practice. This is accomplished by having the students compare their models with experiment (physical or computational) or empirically derived equations or tables; make value judgements about the applicability of a particular model or equation; apply intuition and common sense to challenge the results of computer analysis; and have a working knowledge of standard engineering practice, including drafting, design, standards, specifications, synthesis, manufacturing methods and professional concepts. The program emphasizes quality of knowledge over quantity, reinforces basic concepts and techniques, and maintains high expectations. All students are required to analyze and solve a significant Mechanical Engineering design problem during their senior year.

The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Mechanical Engineering major at Penn State Behrend must have at least a 2.4* cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in CHEM 110, MATH 140, MATH 141 and PHYS 211. These courses must be completed prior to exceeding 59 total enrolled credits.

*Effective Summer 2016, students must apply when they have 44-59 cumulative credits (credits taken at Penn State and retained on the student's schedule, even if a grade of F was earned).

Academic Plan – Mechanical Engineering (MEBC)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
CHEM 110 (GN) Chemical Principles I *#†	3	CMPSC 200 (GQ) Programming for Engineers MATLAB †	3
CHEM 111 (GN) Experimental Chemistry I † [6]	1	ECON 102/104 (GS) Intro. Micro-Macroeconomics Analy. & Policy †	3
EDSGN 100S Introduction to Engineering Design † [3] [5]	3	MATH 141 (GQ) Calculus with Analytic Geometry *‡#†	4
ENGL 15/30 (GWS) Rhetoric and Composition or Honors ‡†	3	MATH 220 (GQ) Matrices *†	2
MATH 140 (GQ) Calculus With Analytic Geometry I *‡#†	4	PHYS 211(GN) General Physics: Mechanics *#†	4
General Education Course	3		
Total Credits:	17	Total Credits:	16
Semester 3	**Credits**	**Semester 4**	**Credits**
EMCH 211 Statics *	3	EE 211 Electrical Circuits and Power Distribution	3
MATH 230 Calculus and Vector Analysis	4	EMCH 212 Dynamics *	3
MATH 251 Ordinary and Partial Differential Equations *	4	EMCH 213 Strength of Materials *	3
PHYS 212 (GN) General Physics: Electricity & Magnetism †	4	ME 300 Engineering Thermodynamics *	3
General Education Course (GHW)	1.5	PHYS 214 General Physics: Wave Motion and Quantum Physics † [6]	2
		General Education Course	3
Total Credits:	16.5	Total Credits:	17
Semester 5	**Credits**	**Semester 6**	**Credits**
ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3	CAS 100 (GWS) Effective Speech ‡†	3
ME 320 Fluid Flow *	3	MATSE 259 Properties & Processing of Engineering Materials * [7]	3
ME 345W Instrumentation, Measurements, and Statistics * [4]	4	ME 357 System Dynamics *	3
ME 349 Intermediate Mechanics of Materials *	3	ME 365 Materials Testing Laboratory * [7]	1
ME 380 Machine Dynamics * [7]	3	ME 367 Machine Design *	3
		ME 410 Heat Transfer *	3
Total Credits:	16	Total Credits:	16
Semester 7	**Credits**	**Semester 8**	**Credits**
ME 448 Engineering Design Concepts * [1]	3	ME 449 Mechanical Design Projects * [2]	3
ME 468 Engineering for Manufacturing *	3	Program Elective (School Approved List) *	3
Lab Elective (300, 400-level) *	1	Program Elective (School Approved List) *	3
Program Elective (School Approved List) *	3	General Education Course	3
Program Elective (School Approved List) *	3	General Education Course	3
General Education Course	3	General Education Course (GHW)	1.5
Total Credits:	16	Total Credits:	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 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.

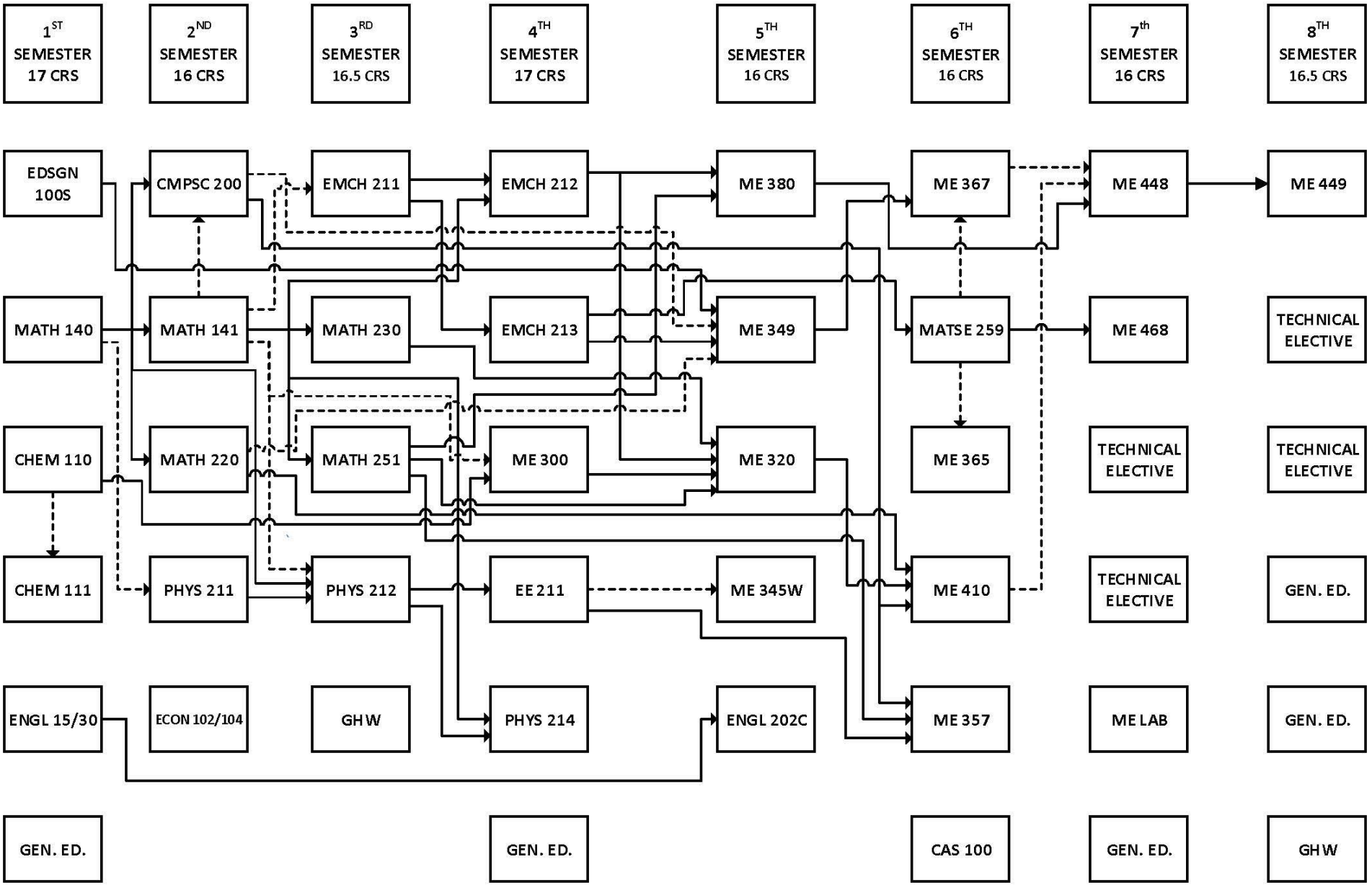
Program Notes:

- 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 ME courses.

Academic Advising Notes:

[1] The following course is only offered in the **FALL** semester: ME 448
[2] The following course is only offered in the **SPRING** semester: ME 449
[3] Course will satisfy First-Year Seminar requirement
[4] Course will satisfy Writing Across the Curriculum requirement
[5] Students starting at a location other than Penn State Behrend must take EDSGN 100 plus a seminar course
[6] Interested students may substitute BIOL 141 or CHEM 112 for both CHEM 111 and PHYS 214
[7] ME 380 or the combination of MATSE 259 and ME 365 can be taken in either semester of the third year

MECHANICAL ENGINEERING (B.S)



School-Approved Electives for Mechanical Engineering

Mechanical Engineering students at Behrend are required to take four 3-credit courses and one 1-credit lab (13 total credits) of technical electives. The courses must be selected from one of the following two thematic areas:

Technical

Take one Lab Course:

ME 308	Fluid Flow and Heat Transfer Laboratory (fall and spring)
ME 465	Introduction to Manufacturing Laboratory (fall and spring)
ME 497A	Dynamic Systems and Vibrations Lab (spring)
ME 497B	Rapid Prototyping Lab (fall and spring)

Take two courses from Group 1:

ME 370	Vibration of Mechanical Systems (fall and spring)
ME 401	Refrigeration and Air Conditioning (spring)
ME 408	Energy Systems (spring)
ME 427	Aerodynamics for Mechanical Engineers (fall)
ME 428	Applied Computational Fluid Dynamics (spring)
ME 467	Applied Finite Element Analysis (fall and spring)
ME 469	Metallic Manufacturing Processes (spring)
ME 491	Bioengineering Applications of Mechanical Engineering (fall)

Take one course from Group 2:

Any course in Group 1	
IE 405	Deterministic Models in Operations Research (spring only)
MATH 412	Fourier Series and PDE's (fall only, odd years)
MATH 449	Applied Ordinary Differential Equations (spring only, odd years)
MATH 455	Introduction to Numerical Analysis (fall only)
MATH 456	Introduction to Numerical Analysis (spring only, even years)
MATH 482	Mathematic Methods of Operations Research (spring only, even years)
PHYS 400	Intermediate Electricity and Magnetism (fall only, even years)
PHYS 419	Theoretical Mechanics (spring only, even years)
PHYS 458	Intermediate Optics (spring only, odd years)
STAT 414	Introduction to Probability Theory (fall only, odd years)

Take one course from Group 3:

Any course in Group 1 or 2	
IE 302	Engineering Economy (spring preferred)
ME 494	Research Project*
ME 495	Internship*
ME 496	Independent Study*
ME 497	Special Topics*
MET 457	Lean Manufacturing
MGMT 409	Project Management for Engineers (fall and spring)
PSYCH 444	Engineering Psychology (fall, NOTE: requires PSYCH 100)
QC 450	Quality Control and Quality Improvement (spring)

*Selection of ME 494-ME 497 courses require written approval of the program coordinator.

Engineering Management

Take one Lab Course:

ME 308	Fluid Flow and Heat Transfer Laboratory (fall and spring)
ME 465	Introduction to Manufacturing Laboratory (fall and spring)
ME 497A	Dynamic Systems and Vibrations Lab (spring)
ME 497B	Rapid Prototyping Lab (fall and spring)

Take the following two courses:

MGMT 409	Project Management for Engineers (fall and spring)
IE 302	Engineering Economy (spring preferred)

Take two additional courses from the following list:

IE 405	Deterministic Models in Operations Research (spring only)
MATH 482	Mathematic Methods of Operations Research (spring only, even years)
ME 370	Vibrations of Mechanical Systems (fall and spring)
ME 401	Refrigeration and Air Conditioning (spring)
ME 408	Energy Systems (spring)
ME 427	Aerodynamics for Mechanical Engineers (fall)
ME 428	Applied Computational Fluid Dynamics (spring)
ME 467	Applied Finite Element Analysis (fall and spring)
ME 469	Metallic Manufacturing Processes (spring)
ME 491	Bioengineering Applications of Mechanical Engineering (spring)

Students in the Engineering Management thematic who also complete either the Operations and Supply Chain Management minor or the Technical Sales minor may substitute 400-level SCM courses for the 6 additional credits of 400-level IE, MATH or ME courses.

Mechanical Engineering Technology

Chair:
Mr. Shannon Sweeney
814-898-6049
sks9@psu.edu

Program Description:
This major includes instruction in materials engineering, thermodynamics, heat transfer, hydraulics, finite-element analysis, materials, and the use of parametric solid modeling design packages, as well as supporting course work in mathematics and science. Oral and written communications are stressed, as is the ability to work within a team-oriented environment. The major culminates with a capstone design project involving an actual design or manufacturing problem sponsored by regional industry.

Graduates have qualified for careers in a wide variety of industries that design, analyze, manufacture or use mechanical systems. Careers include positions in applied product design, manufacturing process development, field service support, supervision of manufacturing facilities, tool and die design, quality control, plant supervision and management and technical sales.

The educational objectives of the Penn State Behrend Mechanical Engineering Technology Program are to produce graduations who, within three years of graduation are able to:

1. be employed in fields of engineering such as design, research, development, applications, testing, manufacturing, processing, safety, quality and technical sales or service:
    a. for B.S. degree recipients, as an engineer or engineering technologist
    b. for A.S. degree recipients, as a technician or technologist or designer or engineering assistant.
2. achieve positions of increased responsibility (technical and/or supervisory) within an organization; and
3. progress through advanced degree or certificate programs or participate in continuing education in engineering, business, and/or other professionally related fields.

The program is accredited by the Engineering Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ETAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Mechanical Engineering Technology major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in MATH 81 or MATH 26, MATH 82 or MATH 22, MATH 83 or MATH 140, and PHYS 250. These courses must be completed prior to exceeding 59 total enrolled credits.

Academic Plan – Mechanical Engineering Technology (METBC)

Effective Requirement Year Fall 2018

Semester 1	Credits	Semester 2	Credits
EGT 120 Introduction to Graphics & Solids Modeling	3	EGT 121 Applied Solid Modeling	3
ENGL 15 or 30 (GWS) Rhetoric and Composition or Honors ‡†	3	MATH 82 (GQ) Technical Mathematics II *‡#†]	3
IET 101 Manufacturing Materials, Processes, & Laboratory *	3	MCHT 111 Mechanics for Technology: Statics *	3
MATH 81 (GQ) Technical Mathematics I *‡#†	3	PHYS 250 (GN) Introductory Physics I *#†	4
PSU 7 First-Year Seminar	1	General Education Course	3
General Education Course	3		
Total Credits:	16	Total Credits:	16
Semester 3	**Credits**	**Semester 4**	**Credits**
IET 215 Production Design	2	CAS 100 (GWS) Effective Speech ‡†	3
MATH 83 (GQ) Technical Calculus *#†	4	CHEM 110 (GN) Chemical Principles I †	3
MCHT 213 Strength and Properties of Materials *	3	CHEM 111 (GN) Experimental Chemistry I †	1
MCHT 214 Strength and Properties of Materials Laboratory	1	EET 100 Electric Circuits, Power & Electronics	3
MET 107 Computer Applications for Tech.	3	IET 216 Production Design Laboratory	2
MET 206 Dynamics *	3	MATH 210 Calculus with Engineering Technology Application *#	3
		MET 320 Strength of Materials II *	3
Total Credits:	16	Total Credits:	18
Semester 5	**Credits**	**Semester 6**	**Credits**
Students whose last name begins with A-O take both: ENGL 202C (GWS) Technical Writing ‡† MET 341 Mechanical Measurements & Instrumentation *	 3 3	Students whose last name begins with A-O take: MET 415 Finite Element Analysis Application I * MET 306 Computer-Aided Design * MET 330 Thermodynamics *	 3 3 3
Students whose last name begins with P-Z take both: MET 306 Computer-Aided Design * MET 330 Thermodynamics *	 3 3	Students whose last name begins with P-Z take: ENGL 202C (GWS) Technical Writing ‡† MET 331 Heat Transfer * MET 341 Mechanical Measurements & Instrumentation *	 3 4 3
MATH 211 Intermediate Calc & Diff Equations w/ Applications †	3	MGMT 409 Project Management for Engineers *	3
MET 210 Machine Design *	3	General Education Course	3
PHYS 251 (GN) Introductory Physics II †	4	General Education Course (GHW)	1.5
Total Credits:	16	Total Credits:	16.5-17.5
Semester 7	**Credits**	**Semester 8**	**Credits**
Students whose last name begins with A-O take both: MET 331 Heat Transfer * MET 425 Finite Element Analysis Applications II *	 4 3	Students whose last name begins with A-O take: MET 432 Fluid Power *	3
Students whose last name begins with P-Z take both: MET 415 Finite Element Analysis Applications I * MET 432 Fluid Power *	 3 3	Students whose last name begins with P-Z take: MET 425 Finite Element Analysis Applications II *	3
MET 470 Materials Engineering * [1]	3	MET 485 Senior Industrial Project * [2]	3
MET 480 Senior Capstone * [1]	1	Technical Elective (300, 400-level) *	3
Technical Elective (300, 400-level) *	3	General Education Course	3
Arts (GA), Humanities (GH), or Social & Behavioral Science (GS)	3	General Education Course	3
		General Education Course (GHW)	1.5
Total Credits:	16-17	Total Credits:	16.5

Total Credits: 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 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). Foundation 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.

Program Notes:

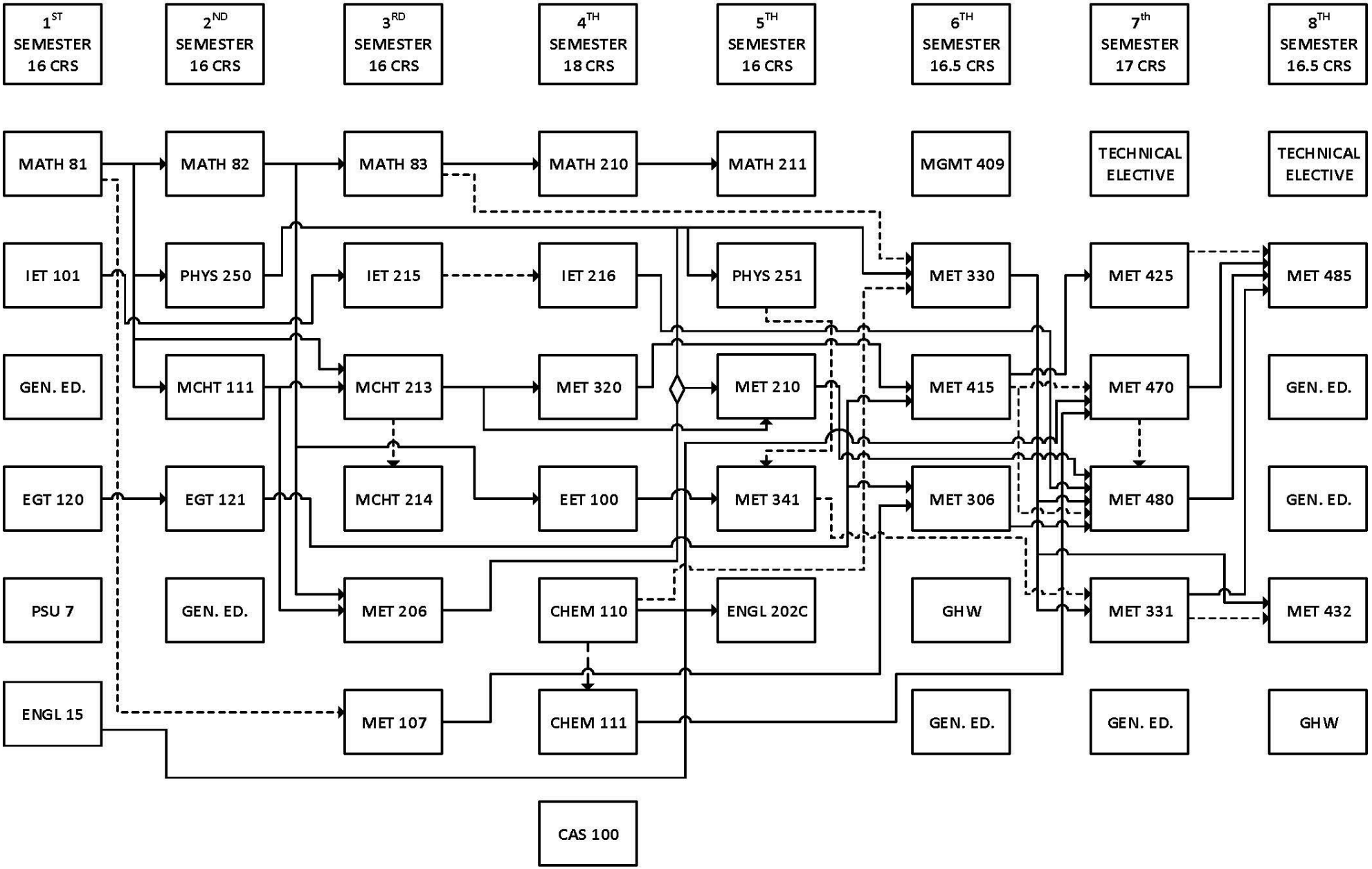
- Permissible math substitutions: MATH 26 instead of MATH 81, MATH 22 instead of MATH 82, and MATH 140 instead of MATH 83.
- Only students who have gone through the entrance to major (ETM) process and have been accepted into the MET or IBE major may register for junior and senior-level MET courses.

Academic Advising Notes:

[1] Course is only offered in the **FALL** semester.
[2] Course is only offered in the **SPRING** semester.

MECHANICAL ENGINEERING TECHNOLOGY (B.S)

PLAN A



PREREQUISITE

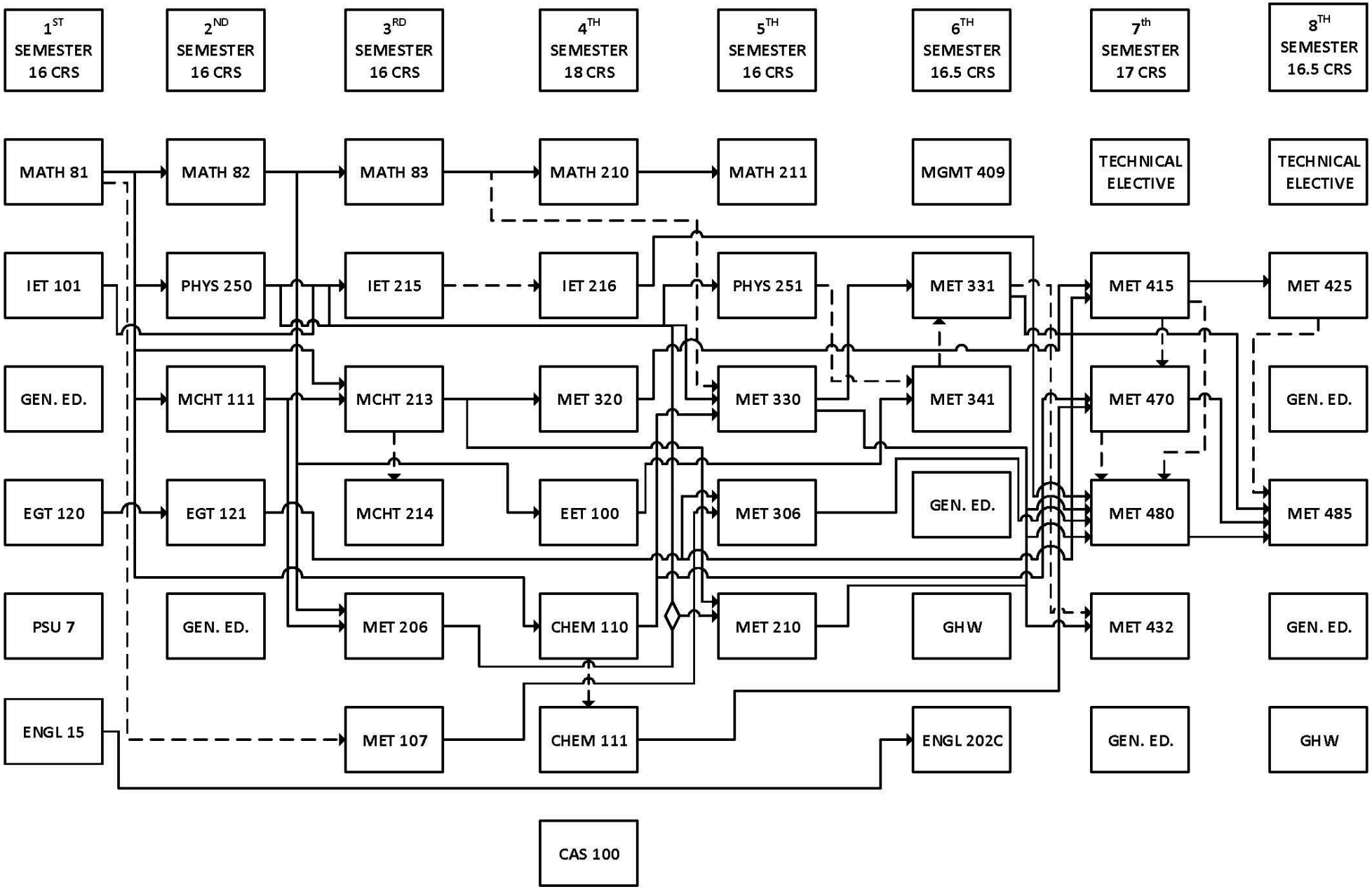
PREREQUISITE OR CONCURRENT

OR BRANCH

The first four semesters are the same for Plan A and Plan B

MECHANICAL ENGINEERING TECHNOLOGY (B.S)

PLAN B



PREREQUISITE

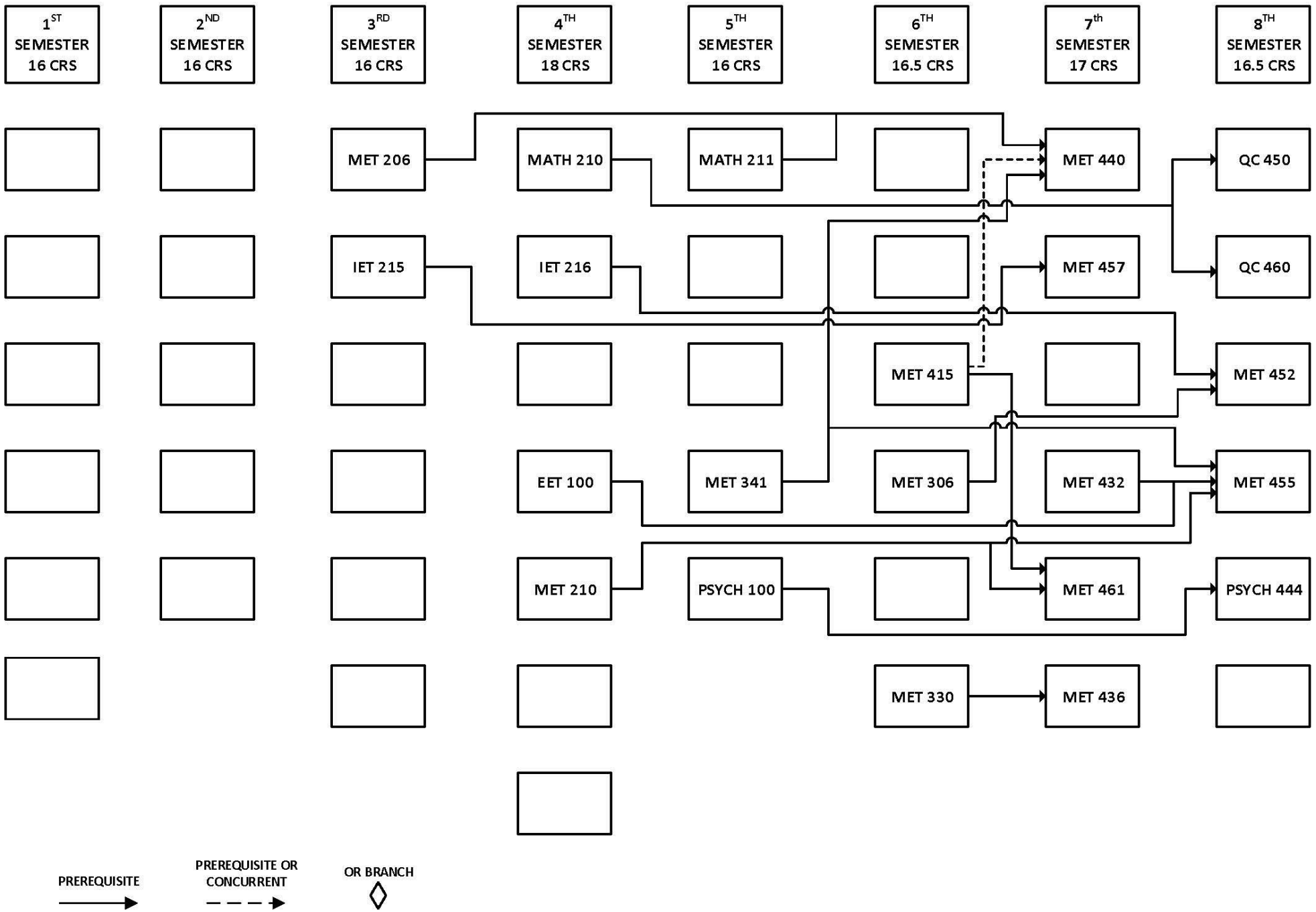
PREREQUISITE OR CONCURRENT

OR BRANCH

The first four semesters are the same for Plan A and Plan B

MECHANICAL ENGINEERING TECHNOLOGY (B.S)

Prerequisites for Technical Electives Effective Spring 2013



School-Approved Electives for Mechanical Engineering Technology

Technical Electives:

Course	Credits	Title
EET 497 [1]	1-3	Special Topics
MET 436	3	Energy Conservations Systems
MET 440	3	Vibrations for Technologists
MET 452	3	Rapid Prototyping
MET 455	3	Mechatronics
MET 457	3	Lean Manufacturing
MET 461	3	Advanced Machine Design
MET 495 [1]	1-3	Internship or Co-Op
MET 496 [1]	1-3	Independent Study
MET 497 [1]	1-3	Special Topics
PSYCH 444	3	Engineering Psychology
QC 450	3	Quality Control and Quality Improvement
QC 460	3	Introduction to Six Sigma

[1]Requires prior approval from the Mechanical Engineering Technology Department Chair

Business Electives:

Course	Credits	Title
IET 333	2	Engineering Economics for Technologists
MGMT 409	3	Project Management for Engineers
IE 302	3	Engineering Economy

Plastics Engineering Technology

Chair:
Mr. Jonathan Meckley
814-898-6147
jam135@psu.edu

Program Description:
This major prepares graduates with the knowledge and skills needed to provide high level engineering technology support to a wide variety of industrial, developmental, commercial, consulting and sales organizations dealing with the development, manufacturing and/or distribution of plastics related products, materials and technologies. The program emphasizes the integration of engineering and scientific principles, practical hands-on experience, and application of state-of-the-art computer technologies, business and management methods.

Graduates are qualified for positions in product development, part design, tooling design, R&D, processing, plant engineering, production control, technical sales and marketing in the plastics industry, and are provided a path to a wide variety of graduate degrees in engineering, science or business.

The educational objectives of the Penn State Behrend Plastics Engineering Technology Program are to produce graduates who, within three years of graduation are able to:

1. be employed in fields of engineering such as design, research, development, applications, testing, manufacturing, processing, safety, quality, and technical sales or service.
2. achieve positions of increased responsibility (technical and/or supervisory) within an organization; and
3. progress through advanced degree or certificate programs or participate in continuing education in engineering, business, and other professionally related fields.

The program is accredited by the Engineering Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (ETAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Plastics Engineering Technology major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in MATH 81 or MATH 26, MATH 82 or MATH 22, MATH 83 or MATH 140, and PHYS 250. These courses must be completed prior to exceeding 59 total enrolled credits.

Academic Plan – Plastics Engineering Technology (PLTBC)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
EGT 120 Introduction to Graphics & Solids Modeling	3	CHEM 110 (GN) Chemical Principles I *†	3
ENGL 15/30 (GWS) Rhetoric and Composition or Honors ‡†	3	CHEM 111 (GN) Experimental Chemistry I *†	1
MATH 81 (GQ) Technical Mathematics I *‡#†	3	EGT 121 Applied Solid Modeling	3
PLET 50 Computer Applications for Plastics Engr Tech *	2	MATH 82 (GQ) Technical Mathematics II *‡#†	3
PSU 7 First-Year Seminar	1	PHYS 250 (GN) Introductory Physics I *#†	4
General Education Course	3	General Education Course	3
General Education Course (GHW)	3		
Total Credits:	16.5	Total Credits:	17
Semester 3	**Credits**	**Semester 4**	**Credits**
CAS 100 (GWS) Effective Speech ‡†	3	MATH 210 (GQ) Calculus with Engineering Technology Applications *	3
MATH 83 (GQ) Technical Calculus *#†	4	MCHT 213 Strength & Properties of Materials *	3
MCHT 111 Mechanics for Technology: Statics *	3	PLET 206 Plastics Materials and Properties * [1]	3
PLET 205 Introduction to Plastics *	3	PLET 227 Plastics Processing & Statistical Methods *	4
PLET 222 Introduction to Plastics Processing *	4	PLET 232 Introduction to Part and Tool Design *	3
		PLET 235 Tool Design and Machining *	2
Total Credits:	17	Total Credits:	18
Semester 5	**Credits**	**Semester 6**	**Credits**
MATH 211 (GQ) Intermediate Calculus & Differential Equations with Applications	3	ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3
MGMT 409 Project Management for Engineers *	3	MET 418 Finite Element Analysis for Plastics Design *	3
PLET 304 Plastic Material Properties & Applications *	3	PLET 323 Packaging Processes *	3
PLET 330 Advanced Tooling & Rheology *	4	PLET 345 Heat Transfer *	2
PLET 366 Fluid & Thermal Sciences *	3	PLET 350 Design of Plastic Parts *	4
		PLET 494A Plastics Projects *	1
		General Education Course (GHW)	1.5
Total Credits:	16	Total Credits:	17.5
Semester 7	**Credits**	**Semester 8**	**Credits**
PLET 425 Automation for Plastic Processes *	2	PLET 494A Plastics Projects *	1
PLET 477 Novel and Emerging Technologies *	2	SCM 301 Supply Chain Management *	1
PLET 481 Plastic Product Development *	3	Technical Elective (300,400-level) *	3
PLET 494A Plastics Projects *	1	General Education Course	3
Technical Elective (300, 400-level) *	3	General Education Course	3
General Education Course	3	General Education Course	3
General Education Course (GN)	2		
Total Credits:	16	Total Credits:	16

Total Credits: 134

***** 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). Foundation 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.

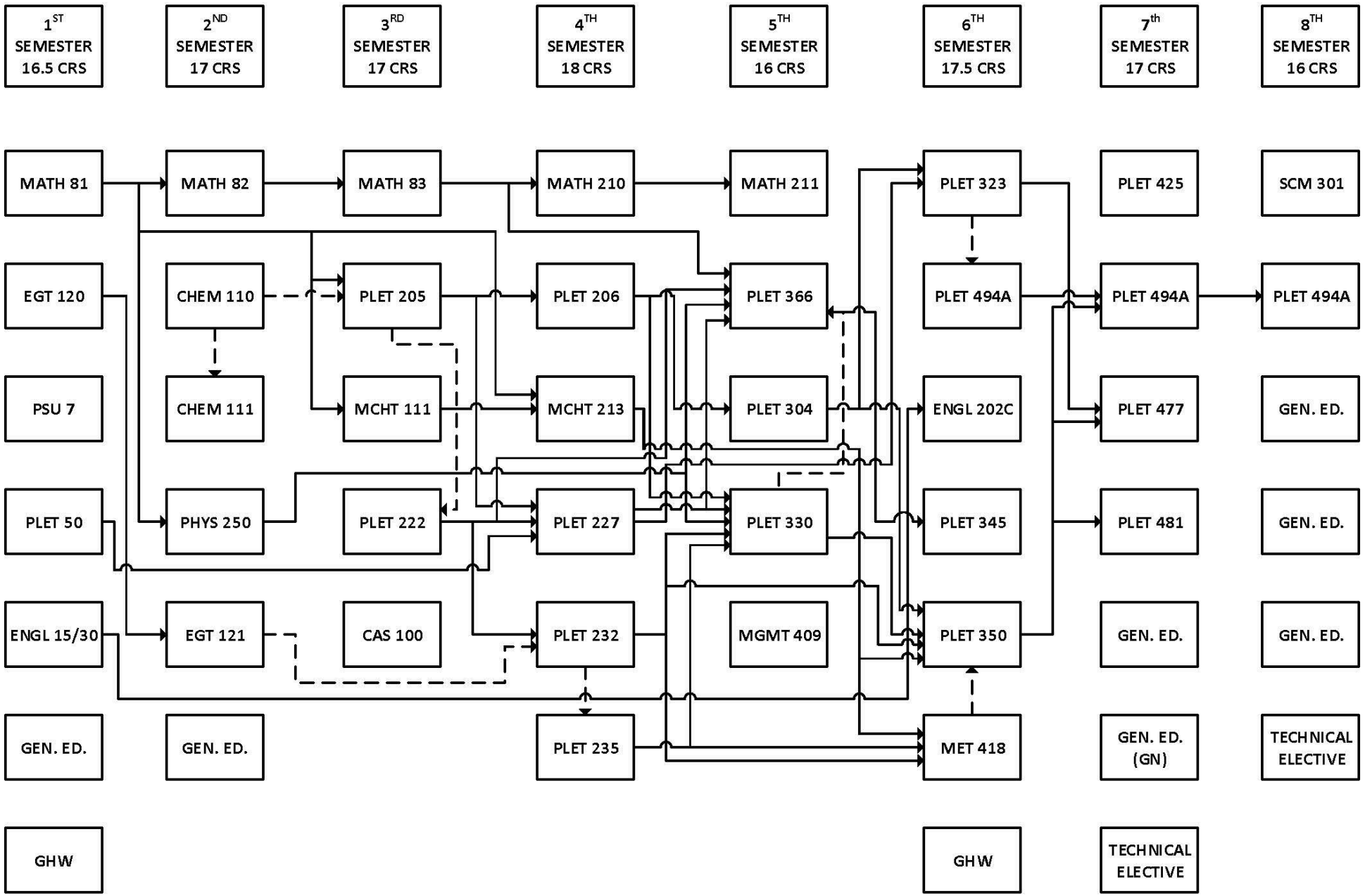
Program Notes:

- Permissible math substitutions: MATH 26 instead of MATH 81, MATH 22 instead of MATH 82, and MATH 140 instead of MATH 83.

Academic Advising Notes:

[1] Course will satisfy Writing Across the Curriculum requirement.

PLASTICS ENGINEERING TECHNOLOGY (B.S)



School-Approved Electives for Plastics Engineering Technology

Students in the PLET program must take three (3) technical electives.

One (1) of the three technical electives should be taken from the following list:

Course	Credits	Title
IE 302	3	Engineering Economy
MGMT	3	Any 300/400-level lecture course
MKTG	3	Any 300/400-level lecture course
CAS 404	3	Conflict Resolution and Negotiation
CAS 450	3	Group Communication Theory and Research
ECON	3	Any non-GS 300/400-level lecture course
MIS	3	Any 300/400-level lecture course
QC 450	3	Quality Control and Quality Improvement
QC 460	3	Introduction to Six Sigma
SCM	3	Any 300/400-level lecture course

Two (2)of the three technical electives should be taken from the following list:

Course	Credits	Title
PLET 462	3	Advanced Injection Molding
PLET 464	3	Plastics Failure Analysis
PLET 465	3	Advanced CAE for Plastics II
PLET 467	3	Secondary Operations
PLET 468	3	Rapid Commercialization
PLET 495 [1]	1-3	Internship or Co-Op*
PLET 496 [1]	1-3	Independent Studies
PLET 497 [1]	1-3	Special Topics

[1] Requires prior approval from the PLET Department Chair.

* A student taking a PLET department approved 3 credit Co-Op can substitute the Co-Op for one 3 credit technical elective. (Internships will not substitute as a technical elective)

Note:

Students taking a PLET department approved minor or certificate may be able to substitute their minor for some, or all, of their technical electives.

Non-Technical/Management Electives

Students should see a plastics faculty adviser regarding their non-technical/management elective requirements and course options.

Software Engineering

Chair:
Dr. Meng Su
814-898-6261
mus11@psu.edu

Program Description:
This major provides students with a strong foundation in software engineering through a 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 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 braod-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.

The educational objectives of the Software Engineering program are to produce graduates, who within three years of graduation are able to:

1. be employed as a practicing engineer in fields such as design, research, development, testing, and manufacturing;
2. assume positions of leadership and responsibility within an organization; and
3. progress through advanced degree or certificate programs in engineering, business, and other professionally related fields.

The program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (EAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700, www.abet.org.

Entrance to Major Requirement:
In addition to the Carnegie unit and minimum GPA requirements described by University policies, all students applying for entrance into the Software Engineering major at Penn State Behrend must have at least a 2.0 cumulative GPA by the time they reach a minimum of a third semester classification (44-59 total earned credits) and have completed, with a minimum grade of C in CHEM 110, MATH 140, MATH 141 and PHYS 211. These courses must be completed prior to exceeding 59 total enrolled credits.

Academic Plan –Software Engineering (SEBC)

Effective Requirement Year Fall 2018

Semester 1	Credits	Semester 2	Credits
CHEM 110 (GN) Chemical Principles I *#†	3	CMPSC 122 Intermediate Programming *	3
CHEM 111 (GN) Experimental Chemistry I †	1	ECON 102/104 (GW) Intro. Micro/Macroeconomics Analy. & Policy †	3
CMPSC 121 (GQ) Introduction to Programming Techniques †	3	MATH 141 (GQ) Calculus with Analytic Geometry II *‡#†	4
ENGL 15/30(GWS) Rhetoric and Composition or Honors ‡†	3	MATH 220 (GQ) Matrices †	2
MATH 140 (GQ) Calculus with Analytic Geometry I *‡#†	4	PHYS 211 (GN) General Physics: Mechanics *#†	4
PSU 7 First-Year Seminar	1		
Total Credits:	15	Total Credits:	16
Semester 3	**Credits**	**Semester 4**	**Credits**
CAS 100 (GWS) Effective Speech ‡†	3	CMPEN 270 Digital Design: Theory and Practice * [2]	4
MATH 250 Ordinary Differential Equations	3	CMPSC 360 Discrete Mathematics for Computer Science * [2] **OR** SWENG 311 Object Oriented Software Design & Construction *	3
PHYS 212 (GN) General Physics: Electricity & Magnetism †	4	EE 210/211 Circuits & Devices or Circuits & Power Distribution	3
SWENG 311 Object Oriented Software Design & Construction * **OR** CMPSC 360 Discrete Mathematics for Computer Science * [2]	3	ENGL 202C (GWS) Effective Writing: Technical Writing ‡†	3
General Education Course	3	STAT 301 Statistical Analysis I *[3]	3
Total Credits:	16	Total Credits:	16
Semester 5	**Credits**	**Semester 6**	**Credits**
CMPEN 351 Microprocessors *	3	CMPSC 465 Data Structure & Algorithms *	3
CMPEN 441 Operating Systems *	3	SWENG 421 Software Architecture *	3
CMPSC 431W Database Management Systems * [1] **OR** MIS 336 Database Management Systems *	3	SWENG 431 Software Verification, Validation & Testing *	3
SWENG 411 Software Engineering *	3	SWENG 452 Embedded Real Time Systems * [1]	3
Technical Elective (300,400-level) *	3	General Education Course	3
General Education Course (GHW)	1.5		
Total Credits:	16.5	Total Credits:	15
Semester 7	**Credits**	**Semester 8**	**Credits**
CMPEN 461 Communications Network *	3	MGMT 301 Basic Management Concepts *	3
CMPSC 461 Programming Language Concepts *	3	SWENG 481 Software Engineering Project *	3
SWENG 480 Software Engineering Design *	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		
Total Credits:	16.5	Total Credits:	15

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.
- 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). Foundation 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.

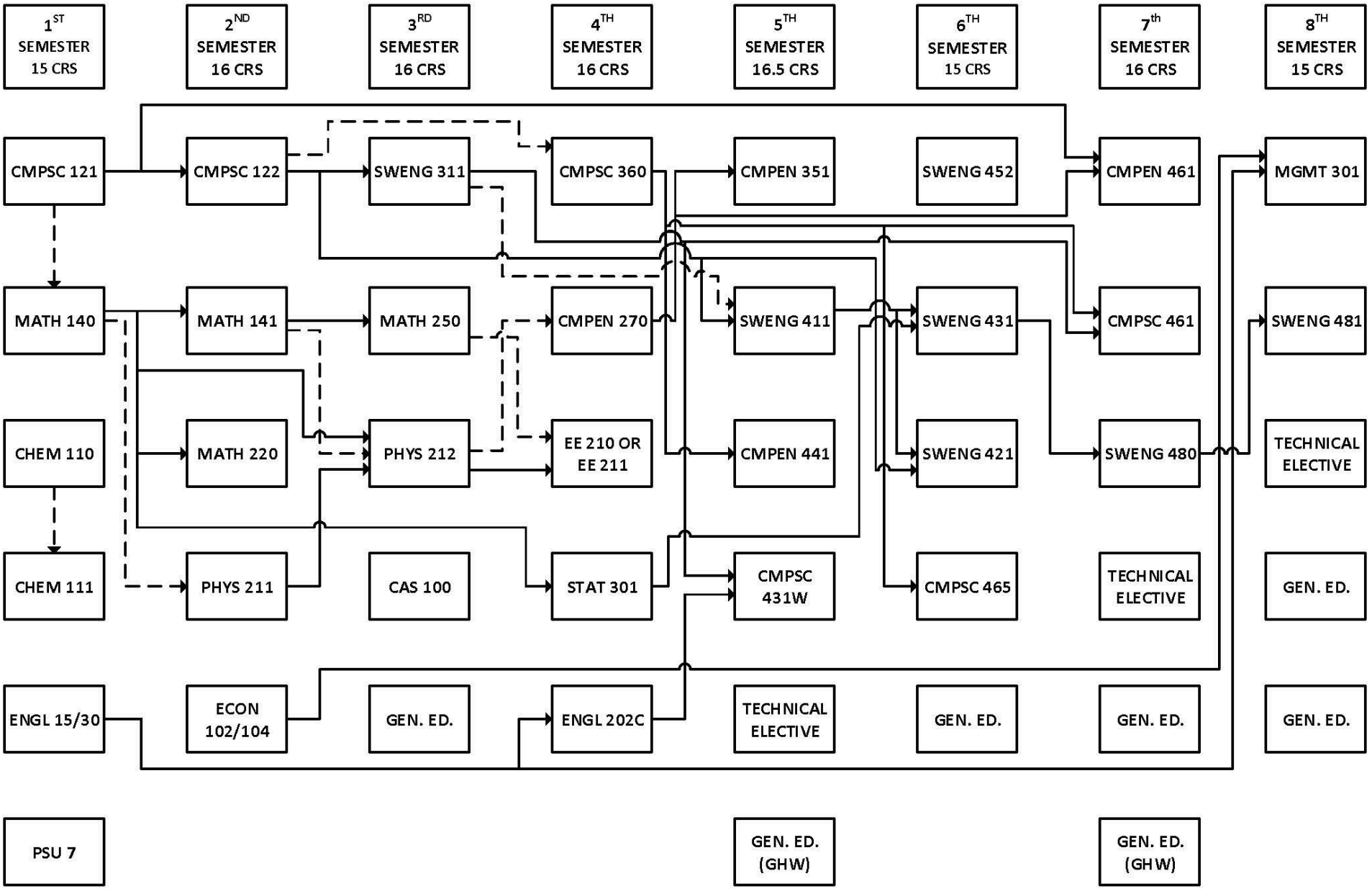
Program Notes:

- 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.

Academic Advising Notes:

[1] Course will satisfy Writing Across the Curriculum requirement.
[2] CMPEN 270 and CMPSC 360 must be completed prior to the junior year to ensure that fall semester junior year prerequisites are met.
[3] If STAT 301 is not offered, students should schedule STAT 318 in its place.

SOFTWARE ENGINEERING (B.S)



School-Approved Electives for Software Engineering

Technical electives allow students to choose areas of interest to explore. Technical electives come in two flavors, primary and secondary. Primary technical electives are those courses offered to CSSE majors which are not required for the Software Engineering major. Secondary technical electives are offered outside your home department and give you broader latitude. **Students must complete at least two primary technical electives, and, at most, one secondary technical elective.**

*Exceptions to the above policy will be granted to students who **successfully** complete a minor in one of the areas listed in the Academic Minors part of this Handbook.*

Primary Technical Electives

Any 300 or 400-level EE course
Any 300 or 400-level CMPEN course that is not already required for the major
Any 400-level CMPSC course not already required for the major
Any 300 or 400-level SWENG course not already required for the major

Course	Credits	Name
GAME 450	3	Advanced GAME Programming
GAME 480	3	GAME Development Project

Secondary Technical Electives

Course	Credits	Name	Offered
SWENG 395	Variable	Internship	Fall/Spring
SWENG 495	Variable	Internship	Fall/Spring
MIS 430	3	Systems Analysis	Fall/Spring
MIS 435	3	Systems Design and Implementation	Fall/Spring
MIS 445	3	Management Report Systems	Fall
MIS 470	3	Advanced Applications Development	Spring
MGMT 409	3	Project Management for Engineers	Fall/Spring
PSYCH 444	3	Engineering Psychology	Fall
ECON 481	3	Business Forecasting Techniques	Fall
ECON 485	3	Econometric Techniques	Fall
MATH 455	3	Introduction to Numerical Analysis I	Fall
MATH 456	3	Introduction to Numerical Analysis II	Spring (Even Years)
ENTR 430	3	Entrepreneurship & New Product Development	Fall

Associate Degree Information

This section contains the following information for each of the associate degree programs offered by the School of Engineering:

- Program Description
- Academic Plan
- List of the Approved Technical Electives

Electrical Engineering Technology Associate Degree

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 areas of electrical and electronic circuits, digital circuits, computers, electrical machinery and programmable logic controls. The program also articulates with Pennsylvania Department of Education-approved Tech Prep programs. Secondary students who have graduated from a program covered by a signed Penn State Tech Prep Articulation Agreement may be eligible for special admission procedures and/or advanced placement.

The educational objectives of the Electrical Engineering Technology Associate Degree program are to produce graduates, who within three years of graduation are able to:

1. be employed in fields of engineering such as design, research, development, applications, testing, manufacturing, processing, safety, quality, and technical sales or service:
    a. for B.S. degree recipients, as an engineer or engineering technologist
    b. for A.A. degree recipients, as a technician or technologist or designer or engineering assistant.
2. achieve positions of increased responsibility (technical and/or supervisory) within an organization; and
3. progress through advanced degree or certificate programs or participate in continuing education in engineering, business, and/or other professionally related fields.

Graduates of the Electrical Engineering Technology associate degree may qualify for admission to the baccalaureate degree majors in Electrical Engineering Technology or Computer Engineering Technology offered at Penn State Harrisburg, Capital College; the baccalaureate degree in Electrical and Computer Engineering Technology at Penn State Behrend; or the baccalaureate degree in Electro-Mechanical Engineering Technology offered at Penn State Altoona, Penn State Berks, Penn State New Kensington or Penn State York.

For the Associate in Engineering Technology degree in Electrical Engineering Technology, a minimum of 64 credits is required. The program is accredited by the Engineering Technology Accreditation Commission (ETAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700, www.abet.org.

Academic Plan – Electrical Engineering Technology (2EET)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
EET 101 Electrical Circuits I	3	EET 114 Electrical Circuits II *	4
EET 109 Electrical Circuits Laboratory I	1	EET 118 Electrical Circuits Laboratory *	1
EET 2 Introduction to Engineering Technology †	1	CMPET 117 Digital Electronics *	3
ENGL 15/30 (GWS) Rhetoric and Composition or Honors ‡†	3	CMPET 120 Digital Electronics Laboratory *	1
MATH 81 (GQ) Technical Mathematics I	3	CMPET 5 Engineering Methods in Engineering Technology	1
General Education Course	3	MATH 82 (GQ) Technical Mathematics II ‡†	3
		PHYS 250 (GN) Introductory Physics I †	4
Total Credits:	14	Total Credits:	17
Semester 3	**Credits**	**Semester 4**	**Credits**
CMPET 211 Embedded Processors and DSP	3	CAS 100 (GWS) Effective Speech ‡†	3
EET 212 Op Amp and Integrated Circuit Electronics	4	CHEM 110 (GN) Chemical Principles †	3
EET 214 Electric Machines and Energy Conversion	3	CHEM 111 (GN) Experimental Chemistry †	1
EET 215 Electric Machines and Energy Conversion Lab	1	EET 275 Introduction to Programmable Logic Controllers	3
MATH 83 (GQ) Technical Calculus ‡†	4	EGT 119 Intro to CAD for Electrical and Computer Engineering	2
General Education Course	3	General Education Course	3
		MATH 210 (GQ) Calculus with Engineering Technology Applications **OR** Natural Science Course (GN)	3
Total Credits:	18	Total Credits:	18

Total Credits: 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 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). Foundation 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.

Program Notes:

- MATH 81 (GQ)
    - The course is an entrance to major to the ECET baccalaureate major requirement. Student must obtain a quality grade of C or better for entrance into the ECET major.
- MATH 83 (GQ)
    - The course is an entrance to major course to the ECET baccalaureate major requirement. Student must obtain a quality grade of C or better for entrance into the ECET major.
- Math substitutions: MATH 26 instead of MATH 81, MATH 22 instead of MATH 82, MATH 140 instead of MATH 83.
- EET 212
    - Course will satisfy Writing Across the Curriculum requirement.

Mechanical Engineering Technology Associate Degree

This major helps graduates prepare for technical 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. This program also articulates with Pennsylvania Department of Education approved Tech Prep programs. Secondary students who have graduated from a program covered by a signed Penn State Tech Prep Articulation Agreement may be eligible for special admission procedures and/or advanced placement.

The educational objectives of the Mechanical Engineering Technology program are to produce graduates who, within three years or graduation are able to:

1. be employed in fields of engineering such as design, research, development, applications, testing, manufacturing, processing, safety, quality, and technical sales or service;
    a. for B.S. degree recipients, as an engineer or engineering technologist
    b. for A.S. degree recipients, as a technician or technologist or designer or engineering assistant
2. achieve positions of increased responsibility (technical and/or supervisory) within an organization; and
3. progress through advanced degree or certificate programs or participate in continuing education in engineering, business, and/or other professionally related fields.

Graduates of the Mechanical Engineering Technology associate degree 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 prgrams at Penn State Behrend; or the baccalaureate degree in Electro-Mechnical Engineering Technology offered at Penn State Altoona, Penn State Berks, Penn State New Kensington, or Penn State York.

For the Associate in Engineering Technology degree in Mechanical Engineering Technology, a minimum of 64 credits is required. The program is accredited by the Engineering Technology Accreditation Commission (ETAC of ABET), 111 Market Place Suite 1050, Baltimore, MD 21202-4012. Telephone: 410-347-7700, www.abet.org.

Academic Plan – Mechanical Engineering Technology (2MET)

Effective Requirement Term Fall 2018

Semester 1	Credits	Semester 2	Credits
EGT 120 Introduction to Graphics & Solids Modeling	3	EGT 121 Applied Solid Modeling	3
ENGL 15/30 (GWS) Rhetoric and Composition or Honors ‡†	3	IET 215 Production Design	2
First Year Seminar	1	MATH 82 (GQ) Technical Mathematics II *	3
IET 101 Manufacturing Materials, Processes and Lab *	3	MCHT 111 Mechanics for Technology: Statics *	3
MATH 81 (GQ) Technical Mathematics I *	3	PHYS 250 (GN) Introductory Physics I *	4
General Education Course	3	General Education Course	3
Total Credits:	16	Total Credits:	18
Semester 3	**Credits**	**Semester 4**	**Credits**
IET 216 Production Design Laboratory	2	CAS 100 (GWS) Effective Speech ‡†	3
MCHT 213 Strength & Properties of Materials	3	EET 100 Electric Circuits, Power, & Electronics	3
MCHT 214 Strength & Properties of Materials Lab	1	MET 210 Machine Design	3
MET 107 Computer Applications for Technology	3	PHYS 251 (GN) Introductory Physics II †	4
MET 206 Dynamic Machine Elements *	3	General Education Course	3
MET Track Elective	3		
MET Track Elective	3		
Total Credits:	18	Total Credits:	16

Total Credits: 68

***** 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). Foundation 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.

Program Notes:

- Permissible Math substitutions: MATH 26 instead of MATH 81, MATH 22 instead of MATH 82, MATH 140 instead of MATH 83.

School-Approved Electives for Mechanical Engineering Technology (2MET)

May Include No More Than 8 credits from the following list:

Course	Credits	Title
AET 297 [1]	1-3	Special Topics
CHEM 101	3	Introductory Chemistry
CHEM 110	3	Chemical Principles I
CHEM 111	1	Experimental Chemistry I
CMPSC 101	3	Introduction to C++ Programming
EDSGN 210	2	Tolerancing and Spatial Models
EET 114	4	Electrical Circuits II
EET 118	1	Electrical Circuits Laboratory
EGT 201	2	Advanced Computer Aided Drafting
EGT 297 [1]	1-9	Special Topics
IET 105	2	Economics of Industry
IET 109	3	Inspection and Quality Control
IET 297	1-3	Special Topics
IST 110	3	Information, People, and Technology
IST 210	4	Organization of Data
IST 220	3	Networking and Telecommunications
IST 250	3	New Media and the Web
MATH 141	4	Calculus with Analytic Geometry II
MATH 210	3	Calculus with Engineering Technology Applications
MET 281	4	Elementary Thermo- and Fluid Dynamics
MET 297 [1]	1-3	Special Topics
MET 306	3	Computer-Aided Design
MET 320	3	Strength of Materials
MET 330	3	Thermodynamics
MET 341	3	Mechanical Measurement and Instrumentation
PHYS 150	3	Technical Physics I
MGMT 301	3	Basic Management Concepts
STAT 200	4	Elementary Statistics
SUR 111	3	Plane Surveying

Upon approval of the College of Engineering, students may be allowed to select technical elective courses from other disciplines.

[1] Requires prior approval from the Mechanical Engineering Technology Department Chair

Certificate Information

This section contains information for each of the engineering certification programs offered by the School of Engineering.

- Medical Plastics Certificate
- Plastics Processing Certificate

Medical Plastics Certificate

Plastics play a critical role in a growing medical industry. A significant portion of medical devices, prosthetics, implants, tools and packaging of devices and products are dependent on plastics. Many of products could not exist, or cost would be excessive, without plastics. Medical plastics is a subset of the larger plastics industry and represents a strong growth area. Medical plastics usage is expected to increase approximately 7% per year over at least the next five years. Medical plastics also represents a large opportunity for domestic plastics manufacturers as there is a general resistance to outsourcing this production due to concerns over the quality and safety of third-world suppliers.

The following courses are required to obtain the certificate (14 credits):

1. BISC 004 – Human Body Form and Function (3 credits)
   OR
   MICRB 106 – Elementary Microbiology (3 credits) **AND** MICRB 107 – Elementary Microbiology Laboratory (1 credit)

2. PLET 380 – Medical Plastics Industry Overview (1 credit): This introductory course will provide students with an overview of the medical plastics industry and the implications of designing and manufacturing products in a regulated environment. Topics such as an introduction to the FDA, device levels, quality control methods, and current events relating to plastics in medical devices will be covered.

3. PLET 481 – Plastics Product Development (3 credits): Covers product/business development process including researching user needs, writing specifications, testing requirements, concept creation and selection, working with industrial design, marketing, and finance.

4. PLET 482 – Medical Product Development (1 credit): This course is taught in parallel with PLET 481 and shares a common semester project. In this course, students learn specific documentation and design requirements for plastics medical devices. Topics such as design, history files, marketing requirement documents, product requirement documents, standard medical device components, and medical packaging requirements are covered.

5. PLET 483 – Advanced Materials in Medical Applications (3 credits): Topics include plastics materials in medical applications and devices. This focus is on the properties that are important to medical devices such as chemical resistance, sterilization and biocompatibility. A broad range of polymers are reviewed including commodity resins, such as polyolefins, engineering resins such as polycarbonates, acrylics, nylons and advanced polymers including polysulfones, polyetherether ketones and aramids. The synthesis, production and sterilization, biocompatibility and FDA regulatory requirements. The effect of additives, stabilizers, fillers and blends will also be reviewed.

6. PLET 484 – Medical Manufacturing Methods (3 credits): This course provides instruction in the methods and practices used in the manufacturing of plastic devices in the medical industry. The course includes both manufacturing and regulatory requirements.

If you are interested in obtaining this certificate, please see your academic adviser or contact the Plastics Engineering Technology Department Chair, Mr. Jonathan Meckley (jam135@psu.edu).

Plastics Processing Certificate

This 16-17 credit certificate program is designed to provide students with an understanding of the basics of the materials and processes used to produce plastics parts. Students learn modern processing techniques and testing methods for plastics.

The following courses are required to obtain the certificate:

1. PLET 50 – Computer Applications for Plastic Engineering Technology (2 credits): Programming spreadsheets for the solution of technical problems, internet access for background and support information, formatting professional reports, creating presentations.

   OR

   MET 107 – Computer Applications for Technologists (3 credits): Programming spreadsheets, databases and presentation software for solutions of technical problems; introduction to languages allowing creation of program macros.

   OR

   EDSGN 100S – Introduction to Engineering Design (3 credits): Introduction to engineering design processes, methods, and decision making using team design projects; design communication methods including graphical, verbal and written.

2. PLET 205 – Introduction to Plastics (3 credits): Introduction to the plastics industry including fundamentals aspects of plastics materials and processing; introduces the chemical influence on mechanical and flow properties of plastic materials.

3. PLET 206 – Plastic Materials and Properties (3 credits): Coverage of the most common commercial plastics including their additives, fillers, and fibers; includes common physical tests used to determine material characteristics; writing intensive.

4. PLET 222 – Introduction to Plastics Processing (4 credits): Introduction to plastics processing methods, materials, tooling, design, and equipment. Safe operation and practices are emphasized.

5. PLET 227 – Plastics Processing & Statistical Methods (4 credits): Study of advanced issues in plastics processing, such as design of experiments and SPC/SQC will be covered.

If you are interested in obtaining this certificate, please see your academic adviser or contact Mr. Bradley Johnson (bgj1@psu.edu).

Internship and Co-Operative Education

Our programs offer the opportunity for students to obtain practical experience while in school. Experiences that qualify may also be applied for academic credit. Internships are typically summer experience or experiences where a student works and goes to school at the same time. Co-operative education is where you alternate semesters between working each and school, and extend your time to graduation, typically to requiring five years to complete. In order to obtain employment for a co-op or internship, you should sign up for the services at the Penn State Behrend Academic and Career Planning Center.

Each of our academic programs have different requirements and practices that they apply for interns and co-ops and they are outlined in this section.

Work and Study

Students should be aware that obtaining an engineering education is a full-time job. Normally, full-time students in our school take 16-17 credits per semester and have demanding scheduled with design projects and lab work. We recommend that students who have to work during the school year, reduce their credit load by 3 credits for every ten hours per week they are working. For example, students who are working ten hours per week should limit themselves to 14 credit per semester; students working twenty hours per week should limit themselves to 12 credits per semester (the minimum credit load to be considered a full-time student).

Please visit the Current Students web page on the School of Engineering website to find out the details of individual internships and co-operative programs for your major.

Academic Minors

Students have the opportunity to pursue a number of minors offered at Penn State Behrend. You should consult with your academic adviser if you are interested in pursuing a minor program of study. A complete listing of the available minors can be found in the Penn State Behrend website. The School of Engineering minor programs are:

- Computer Engineering
- Computer Science
- Game Development

Computer Engineering (CENBC)

This program of study provides graduates with a strong background in computer engineering. Upon completion of the minor, graduates will have developed an understanding of the operation and design of computers, accomplished through a combination of classroom study, computer-related projects, and laboratory experience. Analysis and design of computer hardware and software systems are stressed. The program requires completion of mandatory courses in analog and digital circuits, microprocessors, transistor logic, and computer programming. Students complete the minor by selecting technical electives in computer hardware and software engineering.

A grade of C or better is required for all courses in the minor.

Minor Requirements (24 credits):

PRESCRIBED COURSES (11 credits) :

- EE 210 (4) Circuits and Devices
- EE 310 (4) Electronic Circuit Design I
- EE 316 (3) Introduction to Embedded Microcontrollers

ADDITIONAL COURSES (13 credits):

- CMPSC 201 (3) or CMPSC 202 (3) Programming for Engineers with C++
- CMPEN 271 (3) & CMPEN 275 (1) Introduction to Digital Systems and Digital Design Laboratory*
- Select two (2) of the following:
    - CMPEN 352 (3) Embedded Systems Design
    - CMPEN 411 (3) VLSI Digital Circuits
    - CMPEN 431 (3) Introduction to Computer Architecture
    - CMPEN 441 (3) Operating Systems
    - CMPEN 461 (3) Communication Networks
    - CMPSC 450 (3) Concurrent Scientific Programming
    - SWENG 411 (3) Software Engineering

* CMPEN 270 (4) can be taken as a substitute for CMPEN 271 and CMPEN 275.

Computer Science (CSCBC)

The Computer Science minor is designed to allow students in any Behrend major to establish a strong conceptual framework in computer science, so they can apply computer science methods and techniques to their primary field of study. Computing has become a critical aspect of most disciplines. This minor provides students with the opportunity to develop computing expertise, which can then be applied to their field of study, thus enhancing job placement opportunities after graduation or better preparing the student to pursue graduate work in computing intensive sub-disciplines of their major.

A grade of C or better is required for all courses in the minor.

Minor Requirements (18 credits):

PRESCRIBED COURSES (9 credits) :

- CMPSC 122 (3) Intermediate Programming [1]
- CMPSC 360 (3) Discrete Mathematics for Computer Science
- CMPSC 465 (3) Data Structures and Algorithms

ADDITIONAL COURSES (3 credits):

- Select one (1) of the following:
  - CMPSC 221 (3) Object Oriented Programming with Web-Based Applications
  - CMPSC 312 (3) Computer Organization and Architecture
  - SWENG 311 (3) Object-Oriented Software Design and Construction

SUPPORTING COURSES AND RELATED AREAS (6 credits):

- Select six (6) credits of 400-leve (below 490) CMPSC courses

[1] CMPSC 121 and MATH 140 are prerequisites for CMPSC 122

Game Development (GAMBC)

As one of a growing number of interdisciplinary programs at Penn State Behrend, students can now opt to enroll in a minor in Game Development. The Game Development minor is designed to augment any degree at Behrend, and fits nicely into a four-year schedule, augmenting student learning and marketability, and aiding in the completion of general education credits. Topics in Game Development available at Penn State Behrend cover topics reaching from Programming and Artificial Intelligence, to Design and Mechanics.

The minor consists of 18 total credits:

- GAME 220, GAME 250 (6 credits of required introductory courses)
- 3 credits of GAME Breadth courses at the 100 and 200-levels or PSYCH 244
- 6 credits of Depth courses at the 400-level, and
- GAME 480 (3 credits of Capstone Senior Project)

Students can take these courses in any year of enrollment, but they are designed to be taken in ascending order, as many courses require a prerequisite.

Courses offered:

- **PSU 007**: First-Year Seminar (Game-Focused)
- **Introductory**:
    - **GAME 220**: Introduction to Game Design (GA)
    - **GAME 250**: Technical Game Development (GQ)
- **Breadth:**
    - **GAME 140**: Gaming and Interactive Media (GS) (also as COMM 190)
    - **GAME 160N:** Introduction to Video Game Culture (GA; GH; US) (also as CMLIT 191)
    - **GAME 251:** 2D Web Game Development (GQ)
    - **PSYCH 244:** Psychology of Human Factors Engineering (GS)
- **Depth:**
    - **GAME 420:** Advanced Game Design
    - **GAME 434:** Psychology of Gaming (also as PSYCH 434)
    - **GAME 450:** Advanced Game Programming
    - **GAME 460:** Video Game Literature Students (also as CMLIT 490)
    - **GAME 495:** Senior Internship
- **Capstone:**
    - **GAME 480:** Game Development Senior Project

Popular Minors

There are popular minors outside the School of Engineering that are of interest for engineering students. Those minors are housed in the three other schools at Penn State Behrend. The other popular minors are:

Black School of Business:

- Applied Economics (APECN)
- Management Information Systems (MISBC)
- Management (MANGT)
- Operations and Supply Chain Management (OPSCM)
    - A business minor specifically for engineers
- Technical Sales (TCHSL)
    - A business minor specifically for engineers

School of Science:

- Mathematics (MTHBC)
- Physics (PHYBC)

School of Humanities and Social Sciences:

- Civic and Community Engagement (CIVCM)

Undergraduate Engineering at Penn State

There are a number of engineering and engineering technology baccalaureate and associate degree programs available at different locations in the Penn State system. They are listed on the following pages by the location and college of offering.

Baccalaureate Degrees

Penn State Altoona
Division of Business, Engineering, and Information Sciences & Technology
3000 Ivyside Park
Altoona, PA 16601

- Electro-Mechanical Engineering Technology
- Rail Transportation Engineering

Penn State Berks
Division of Engineering, Business and Computing
Tulpehocken Road
P.O. Box 7009
Reading, PA 19601

- Electro-Mechanical Engineering Technology
- Mechanical Engineering

Penn State Harrisburg
School of Science, Engineering, and Technology
777 West Harrisburg Pike
Middletown, PA 17057

- Civil Engineering
- Computer Science
- Electrical Engineering
- Electrical Engineering Technology
- Mechanical Engineering
- Mechanical Engineering Technology
- Structural Design and Construction Engineering Technology

Penn State University Park
College of Earth and Mineral Sciences
116 Deike Building
University Park, PA 16802

- Energy Engineering
- Environmental Systems Engineering
- Materials Science and Engineering
- Mining Engineering
- Petroleum and Natural Gas Engineering

Penn State University Park
101 Hammond Building
University Park, PA 16802

- Aerospace Engineering
- Architectural Engineering
- Biological Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Computer Science
- Data Sciences
- Electrical Engineering
- Engineering Science
- Industrial Engineering
- Mechanical Engineering
- Nuclear Engineering

The Pennsylvania State University is committed to the policy that all persons shall have equal access to programs, facilities, admission, and employment without regard to personal characteristics not related to ability, performance, or qualifications as determined by University policy or by state or federal. Authorities. The Pennsylvania State University does not discriminate against any person because of age, ancestry, color, disability or handicap, national origin, race, religious creed, sec, sexual orientation, or veteran status. Direct all inquiries regarding the nondiscrimination policy to the Affirmative Action Office, The Pennsylvania State University, 328 Boucke, University Park, PA 16802, 814-863.0471.