

Civil *and* Environmental ENGINEERING

Educating
World-Class
Engineers

FALL 2014/SPRING 2015



U N D E R G R A D U A T E H A N D B O O K

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Introduction

Welcome to the Department of Civil and Environmental Engineering. We, the faculty and staff, want to do everything we can to make your studies productive and pleasant.

The main objective of the Civil Engineering program at Penn State is to provide the basic undergraduate education required for private practice and public service in civil engineering and/or continued formal education. Emphasis is placed on the fundamentals of civil engineering principles and design techniques. Students utilize the basic engineering science concepts needed for this major through required course work in several specialty areas (e.g., environmental, geotechnical and materials, structures, transportation, and water resources). Finally, through a series of elective courses, the students are able to choose an area of specialization for professional practice and/or graduate studies. Their area of specialization culminates in a capstone design experience. The overall objectives of the program are for the students to have:

- an ability to apply knowledge of mathematics, science and engineering;
- proficiency in at least four of the specialty areas within to Civil Engineering;
- an ability to pass the Fundamentals of Engineering exam;
- an ability to design a system, component, or process to meet desired needs;
- an ability to use the techniques, skills and modern engineering tools necessary for engineering practice;
- an ability to perform civil engineering design by means of design experiences integrated throughout the professional component of the curriculum;
- an ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the recognized major civil engineering areas;
- an ability to function on multi-disciplinary teams;

- an ability to identify, formulate, and solve engineering problems;
- an ability to communicate effectively;
- an understanding of professional and ethical responsibility;
- the broad education necessary to understand the impact of engineering solutions in a global and societal context;
- a knowledge of contemporary issues;
- can explain the basic concepts in management, business, public policy, and leadership; and can explain the importance of professional licensure;
- a recognition of the need for, and an ability to engage in life-long learning.

As a student, the ultimate responsibility for knowing and fulfilling the requirements for your degree rests with you. This handbook will:

- Familiarize you with the Department of Civil and Environmental Engineering.
- Provide you with a central source of information about the department and its programs. Telephone numbers and web page URLs are provided, when ever possible, for your convenience.
- Guide you through the requirements necessary to receive your degree.

We hope that you will use this handbook as a guide during your years in the Department of Civil and Environmental Engineering. You should read and become thoroughly familiar with its contents. The educational process necessitates change; therefore, this handbook must be considered informational and non-binding on the University. The University reserves the right to change the requirements and regulations contained in this handbook and to determine whether a student has satisfactorily met his/her requirements for graduation.

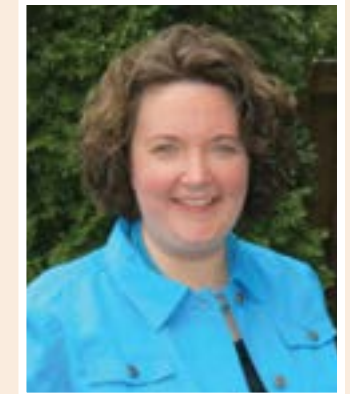
Faculty Photo Gallery



Swagata Banerjee Basu
Assistant Professor



Prasenjit Basu
Assistant Professor



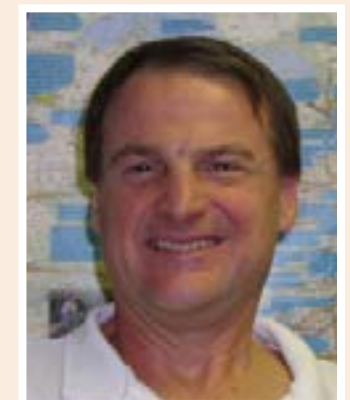
Katherine Blansett
PHRC Associate Director



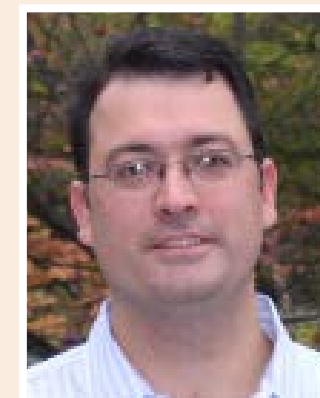
Rachel Brennan
Associate Professor
Undergraduate Program Officer



William Burgos
Professor
Graduate Program Officer



Fred Cannon
Professor



Eric Donnell
Associate Professor



Christopher Duffy
Professor



Hassan El-Chabib
Instructor

Faculty Photo Gallery



Norman Folmar
Instructor
Undergraduate Advisor



Vikash Gayah
Assistant Professor



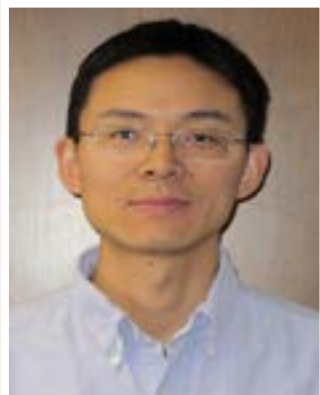
Christopher Gorski
Assistant Professor



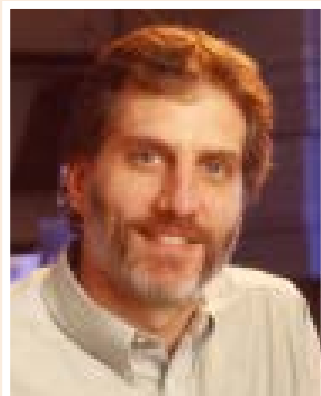
Peggy Johnson
Department Head
Professor



Jeffrey Laman
Professor



Xiaofeng Liu
Assistant Professor



Bruce Logan
Kappe Professor
Evan Pugh Professor



Maria Lopez de Murphy
Associate Professor



Alfonso Mejia
Assistant Professor

Faculty Photo Gallery



Ali Memari
Hankin Chair
Professor



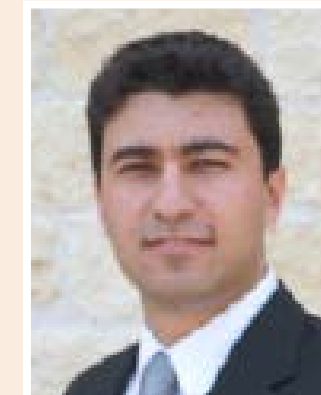
Martin Pietrucha
Professor



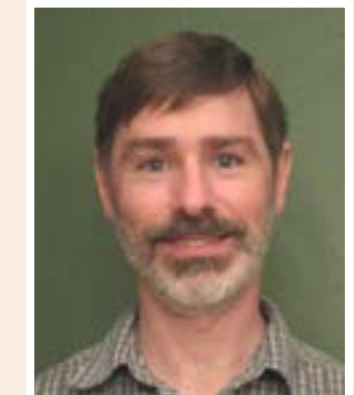
Tong Qiu
Assistant Professor



Aleksandra Radlinska
Assistant Professor



Farshad Rajabipour
Associate Professor



John Regan
Professor



Andrew Scanlon
Professor

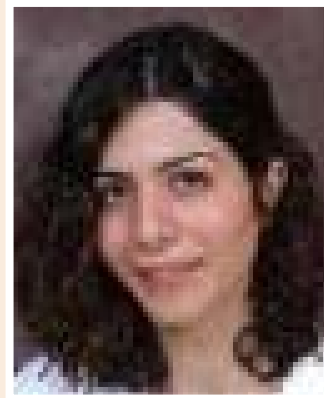


Venky Shankar
Professor



Chaopeng Shen
Assistant Professor

Faculty Photo Gallery



Parisa Shokouhi
Assistant Professor



Thomas Skibinski
Instructor
Director of Construction
Engineering Management



Shelley Stoffels
Associate Professor



Stephanie Velegol
Instructor



Gordon Warn
Associate Professor



Ming Xiao
Assistant Professor

Department Statistics

The administrative offices of the Civil and Environmental Engineering program are located on the second floor and faculty offices are located on the first and second floors of the Sackett Building.

Current Faculty	32
Spring 2014 Undergraduate Students (graduated)	118
Spring 2014 Graduate Students (graduated)	16
Fall 2014 Enrolled Undergraduate Students.....	404
Fall 2014 Enrolled Graduate Students	69



CE 342 & CE 447 field trip to Pegula Ice Arena

Staff Photo Gallery



LeAnn Anderson
Administrative Assistant



Amy Case
Staff Assistant



Tracy Dorman
PHRC Staff Assistant



David Faulds
Lab Supervisor



Heather Hamby
Undergrad Staff Assistant



Matt Hassinger
Engineering Aide



Bryan Heitzmann
*PHRC Training Ed
Development Specialist*



Judy Heltman
Grad Staff Assistant

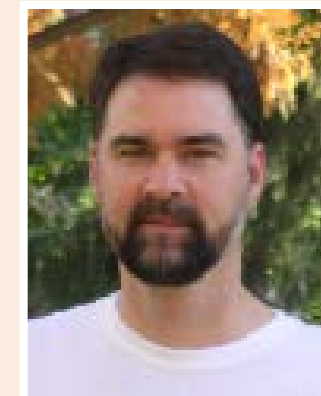


Christopher Hine
*PHRC Housing and Land
Development Specialist*

Staff Photo Gallery



Devon Johnson
Dept. Head Staff Assistant



David Jones
Project Assistant



Amy Long
Financial Staff Assistant



Sarah Lowe
PHRC Administrative Assistant



Peg VanOrnum
Computer Supp. Specialist



Heather Weikel
Staff Assistant



Robert White
Mgr Network & IS



Brian Wolfgang
*PHRC Housing
Systems Specialist*

Technical Areas & Faculty

Environmental Engineering

Environmental engineering focuses on engineering systems that ensure a high quality of human life and protect our environmental resources. These systems include diverse areas such as water quality control; contaminated soil remediation; issues associated with atmospheric pollution; and the design, construction and operation of water supply, wastewater treatment and solid and hazardous waste treatment systems.

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Technical Areas & Faculty

Geotechnical and Materials Engineering

The Geotechnical and Materials Engineering program includes several important disciplines of Civil Engineering associated with the characterization, behavior, design and management of natural particulate materials, infrastructure materials and pavements. **Geotechnical engineering** incorporates the characterization and behavior of natural particulate materials for the development of engineered systems and includes the study of soil mechanics, geochemistry, soil mineralogy, soil dynamics and foundation design. **Materials Engineering** involves the design and development of construction materials to meet specific properties and performance criteria. In addition to mechanical properties, durability, sustainability, and cost of materials are of paramount importance and must be optimized. Materials of interest include portland cement concrete, asphalt concrete, fiber-reinforced composites, metals, wood, and aggregates. **Pavement Engineering** includes the characterization, design and analysis of pavements -- the selection and specification of appropriate materials, layer thickness, surface conditions, and drainage features for the needed traffic and environmental conditions.

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Technical Areas & Faculty

Structural Engineering

Structural engineering involves the analysis and design of buildings, bridges, dams, tunnels and other structures considering the loads, wind forces, earthquake shocks, and materials as well as the proposed methods of construction.

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Technical Areas & Faculty

Surveying/Civil Engineering

The College of Engineering at Penn State University has recently approved a new concurrent Surveying and Civil Engineering degree. This 5-year program will allow students to earn a bachelor of science degree in Surveying and Civil Engineering. Its graduates can become licensed both as a professional land surveyor and professional engineer in all fifty states. "By obtaining both degrees, graduates of this program expand their career opportunities by being able to function more flexibly in engineering and surveying firms where both areas of expertise are often in demand," said Dr. Charles D. Ghilani, Professor of Engineering and Surveying Program Chair at Penn State Wilkes-Barre. "We expect that demand for the initially limited number of graduates in this program will encourage attractive starting salaries." Students enrolled in this program will spend three years at Penn State Wilkes-Barre, and finish their final two years at the University Park Campus. The Wilkes-Barre campus has offered the 4-year degree in surveying since 1994. Their graduates are highly sought after and, in the last ten years the campus has boasted a 100% job placement rate for surveying graduates. For more information, call the Penn State Wilkes-Barre Admissions Office at 570-675-9238 or e-mail: wbadmissions@psu.edu.

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Technical Areas & Faculty

Transportation Engineering

Transportation engineering focuses on transportation problems related to the movement of people or goods from place to place, the control of traffic, the development of better means of transportation, the concern for greater safety at higher speeds, and the planning and design of facilities to accommodate the increased volume of people and materials. Because of the geometric nature of the layout of transportation ways, engineering measurement theory is of great importance to this division.

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Technical Areas & Faculty

Water Resources Engineering

Water resources engineering involves the application of fluid mechanics to the design, analysis, and operation of hydraulic systems with an emphasis on river flow, floods, sedimentation, dams, etc. Hydraulic projects include such structures as reservoirs, dams, spillways, stilling basins, culverts, canals, pipelines, navigation locks, dikes, floodwalls and levees. Hydrology and water resources focus on the application of hydraulic principles and statistical methods in estimating water quantities due to rainfall-runoff for the design of water supply and flood control facilities. The determination of reservoir size and the capacity of storm drainage systems are also included.

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How Do I . . .

Determine which courses will fulfill my degree requirements?

To check on your degree requirements and progress, access your degree audit in eLion: www.elion.psu.edu. Review each line for pluses and minuses and course selections.

Drop a class?

To add and drop courses you must go to eLion: www.elion.psu.edu. After the schedule adjustment period has ended, you must complete an Add/Drop form (late drop or late add), and take it to the department that is offering the course. If you miss the late drop deadline, you will need to file a petition to request a retroactive course drop from the University Faculty Senate. eLion is available throughout the semester.

Get into a class that is full?

Students cannot be added to classrooms that are filled to room capacity. If enrollment does not exceed the room capacity, you should try to obtain the instructor's permission to enroll in the class, using an Add/Drop form. If the instructor signs the form, take it to the department that is offering the course to schedule the class.

Get a grade changed?

If you disagree with a grade you have received for a course, speak with the instructor. Take whatever supporting material you may have to support the change of grade with you. If this does not resolve the matter, see the department head. But remember only instructors are authorized to assign grades.

Meet with my Adviser?

Your Adviser's name is available in eLion. Check your Adviser's office door for posted office hours. Knock on the door, email, and/or call.

Get access to the computer lab?

If you experience difficulties with the card swipe access, please see Mr. Robert White, 206F Sackett; 863-0512.

Change my major?

Go to 208 Hammond Building and request a change of major form. Complete and return the form to Dr. Christine Masters, assistant dean for academic support and global programs, College of Engineering. Consult the undergraduate academic officer in the requested major for departmental support.

Schedule a World Campus course?

Visit Penn State On Line at <http://www.worldcampus.psu.edu/>, for an application and course selections.

Get involved with a student organization?

Go to general meetings and express an interest. General meetings are usually held at the beginning of the fall semester to recruit new members. Most groups publicize these meetings by posting notices university-wide. CEE student organizations post notices on the bulletin boards on the second floor of Sackett. Also available is an ASCE Student Lounge in 105 Sackett.

Degree Requirements

Civil Engineering Program Information

For the B.S. degree in Civil Engineering, a minimum of **130 credits** is required. This baccalaureate program in Civil Engineering is accredited by the Engineering Accreditation Commission of ABET, Inc., 111 Market Place Suite 1050, Baltimore, Maryland 21202-4012; telephone 410-347-7700 or www.abet.org

Effective Fall Semester 2010

GENERAL EDUCATION: 45 credits (27 of these 45 credits are included in the REQUIREMENTS FOR THE MAJOR.) (See description of General Education in front of Bulletin.)

FIRST-YEAR SEMINAR: (Included in REQUIREMENTS FOR THE MAJOR)

UNITED STATES CULTURES AND INTERNATIONAL CULTURES: (Included in GENERAL EDUCATION course selection)

WRITING ACROSS THE CURRICULUM: (Included in REQUIREMENTS FOR THE MAJOR)

REQUIREMENTS FOR THE MAJOR: 112 credits (This includes 27 credits of General Education courses; 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.)

	Scheduling Recommendation			
	Semester Standing			
	1-2	3-4	5-6	7-8
PRESCRIBED COURSES (71 credits)				
CHEM 110 GN(3) ^[1] , CHEM 111 GN(1), E MCH 211(3) ^[1] , EDSGN 100(3), MATH 140 GQ(4) ^[1] , MATH 141 GQ(4) ^[1] , PHYS 211 GN(4) ^[1]	x	-	-	-
E MCH 212(3) ^[1] , E MCH 213(3) ^[1] ; STAT 401(3), GEOSC 001(3), MATH 220 GQ(2), MATH 251(4) ^[1] ; PHYS 212 GN(4) ^[1]	-	x	-	-
C E 310(3) ^[1] , C E 321(3) ^[1] , C E 332(3) ^[1] , C E 335(3) ^[1] , C E 336(3) ^[1] , C E 340(3) ^[1] , C E 360(3) ^[1] , C E 370(3) ^[1] ENGL 202C GWS(3)	-	-	x	-
ADDITIONAL COURSES (32 - 35 credits)				
First-Year Seminar, C E 100S or elective (1)	x	-	-	-
ENGL 015 GWS(3) or ENGL 030 GWS(3)	x	-	-	-
CAS 100A GWS(3) OR CAS 100B GWS(3)	-	x	-	-
CMPSC 200(3) or CMPSC 201(3) or CMPSC 202(3)	-	x	-	-
ECON 102 GS, or ECON 104 GS, or ECON 014 GS(3)	-	x	-	-
M E 201(3) or CH E 220(3) ^[30]	-	-	x	-
C E 337(1) or C E 475(4) ^[+]	-	-	x	-
E E 211(3) or 212(3) ^[30]	-	-	-	x
Select 9 additional credits from the following: ^[#]				
C E 341(3), C E 342(3), C E 371(3), C E 422(3), C E 423(3), C E 432(3), C E 435(3), C E 436(3), C E 437(3), C E 441(3), C E 447(3), C E 461(3), C E 462(3), C E 475(3), C E 476(3), 479(3)	-	-	x	x
Select 3 credits of C E 400-level design courses from the following: C E 410W, C E 421W, C E 438W, C E 439W, C E 448W, C E 465W, C E 472W	-	-	x	x
SUPPORTING COURSES AND RELATED AREAS (9 credits)				
Select 9 credits of technical elective from C E 300 level courses, C E 400 level courses, or department list	-	-	-	x

[1] A student enrolled in this major must receive a C or better, as specified in Senate Policy 82-44.

[30] Students may substitute 6 credits of ROTC for 3 credits of GHA and 3 credits of M E 201 or E E 211/212.

[+] If C E 475 is taken, one credit goes toward lab requirement and remaining three go towards C E or general technical electives.

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

Degree Requirements

Capstone Design Course

One C E 400-level course must be a design course (C E 410W, 421W, 448W, 465W, 472W, and 439W/497W). No substitutions are permitted. Please refer to course offerings for a brief description of these courses, as well as when they are typically offered and required prerequisites.

Departmental List Of Approved Technical Electives

A student may select 9 credits of C E 3xx or 4xx or courses from the following lists for possible technical electives.

A E	Architectural Engineering	432, 470, 475, 476
CHEM	Chemistry	402, 425, 450
CO-OP**	Complete 1 credit each of	ENGR 295A/I, 395A/I, 495A/I
ECON	Economics	432, 490
ENGR*	Engineering *	425, 493
E R M	Environmental Resource Management	411, 412
FOR	Forestry	470
GEOEE	Geo Environmental Engineering	408
I H S	Industrial Health and Safety	400, 420
IST	Information Sciences and Technology	402, 441, 461, 462
METEO	Meteorology	448
STAT	Statistics	414, 415, 416, 418
SCM	Supply Chain Management	423

* A maximum of 6 credits for students pursuing the Engineering Leadership or Engineering Entrepreneurship Minors; a maximum of 3 credits otherwise. Students in the minors may use: ENGR 310, 407, 408, 409, 411.

Any 400-level course in:

ACS	Acoustics	GEO SC	Geosciences
AER SP	Aerospace Engineering	I E	Industrial Engineering
B E	Biological Engineering	MAT SE	Materials Science and Engineering
BIO E	Bioengineering	M E	Mechanical Engineering
CH E	Chemical Engineering	MIN E	Mineral Engineering
CSE	Computer Science and Engineering	MN PR	Mineral Processing
EDSGN	Engineering Design	MNG	Mining
E E	Electrical Engineering	NUC E	Nuclear Engineering
E MCH	Engineering Mechanics	P N G	Petroleum and Natural Gas Engineering
E SC	Engineering Science	SUR	Surveying
ENVE	Environmental Engineering		
F SC	Fuel Science		

**A student may use a 3-credit sequence of ENGR 295, 395, 495 Cooperative Education to substitute for one 3-credit technical elective.

Note: Other courses require approval prior to scheduling.

Degree Requirements

General Education

Your program also requires that you meet the University's General Education requirements. You have the most flexibility in meeting the requirements for the Arts, Humanities, and Social Sciences (AHS) and Health and Physical Activity (GHA) requirements. You must take 18 AHS credits; 3 of which include the required ECON course. Generally, you will need to take 6 credits in each of the 3 areas (GA, GH, and GS). Courses are listed in the General Education category on the Undergraduate Degree Bulletin (<http://bulletins.psu.edu/undergrad/generaleducation/>). If you entered Penn State after summer 2005, you must complete both the US Cultures (US) and International Cultures (IL) requirements. These are most efficiently done by having one of the AHS courses count as both AHS and US or IL.

C or Better Courses

To fulfill graduation requirements, you must earn a C grade or better in the following courses (33 credits): E MCH 211, 212, 213, and C E 310, 321, 332, 335, 336, 340, 360 and 370. **In addition, you must complete these courses with a C grade or better in order to schedule courses for which these are prerequisites.**

GPA

A cumulative GPA of 2.00 or better is required for graduation. If your cumulative GPA drops below 2.00, you may be dropped for poor scholarship. If you are dropped as a degree candidate, the College of Engineering requires that all deficiencies be removed before you can be re-enrolled in the major. When half of your deficiencies are removed, you may pursue enrolling in DUS. For more information, see your academic Adviser.

Lab Requirement

The civil engineering curriculum requires that students complete one C E lab. Students can choose from C E 337 or C E 475 to meet this requirement.

Writing Across the Curriculum

Baccalaureate degree students who entered the University after spring 1990 must complete at least 3 credits of writing-intensive courses prior to graduation. These courses must be selected from approved writing-intensive courses offered within the major or college of enrollment.

Degree Requirements

This table shows one way to complete the civil engineering program requirements in four regular academic years. However, very few students will be able to follow the program exactly as shown. There are many ways to meet these degree requirements. Please use the table of course offerings to carefully plan your program of study. **You must be flexible and prepared to deal with full sections and scheduling conflicts.**

Example Program Schedule

1st Semester		2nd Semester	
First-Year Seminar (C E 100S or elective)	1	CHEM 111 Experimental Chemistry	1
• CHEM 110 <i>Chemical Principles</i>	3	ECON 102 or 104 GS	3
EDSGN 100 Engineering Design	3	• MATH 141/141E <i>Calculus II</i>	4
ENGL 015 or 030 Rhetoric & Comp	3	• PHYS 211 <i>Mechanics</i>	4
• MATH 140/140E <i>Calculus I</i>	4	GA, GH or GS course (or ENGL 15/30)	3
GA, GH or GS course	3	Health & Physical Activity (GHA)	1.5
	17		16.5
3rd Semester		4th Semester	
CAS 100A/B Effective Speech	3	CMPSC 200/201/202 Programming	3
+ E MCH 211 <i>Statics</i>	3	+ E MCH 212 <i>Dynamics</i>	3
GEOSC 001 Physical Geology	3	+ E MCH 213/213D <i>Strength of Materials</i>	3
• MATH 251 <i>Ord. & Partial Diff. Equ.</i>	4	Math 220 Matrices	2
• PHYS 212 <i>Electric. & Magnetism</i>	4	STAT 401 or I E 424	3
	17	GA, GH or GS course	3
			17
5th or 6th Semester		5th or 6th Semester	
+ C E 310 <i>Surveying</i>	3	+ C E 321 <i>Highway Engineering</i>	3
+ C E 332 <i>Prof Econ & Const</i>	3	+ C E 335 <i>Mechanics of Soils</i>	3
+ C E 336 <i>C E Materials</i>	3	+ C E 370 <i>Environmental Engineering</i>	3
+ C E 337 <i>C E Materials Lab</i>	1		
+ C E 340 <i>Structural Analysis</i>	3	ENGL 202C Technical Writing	3
+ C E 360 <i>Fluid Mechanics</i>	3	M E 201 Intro to Thermal Science	3
	16	Health & Physical Activity (GHA)	1.5
			16.5
7th Semester		8th Semester	
*C E 3XX/4XX C E Elective	3	*C E 3XX/4XX C E Elective	3
*C E 3XX/4XX C E Elective	3	C E 4XXW Capstone Design	3
E E 211 or 212 Electronic Measuring Sys.	3	Technical Elective (see dept. list)	3
Technical Elective (see dept. list)	3	Technical Elective (see dept. list)	3
GA, GH or GS course	3	GA, GH or GS course	3
	15		15
TOTAL NUMBER OF CREDITS - 130			

- Courses listed in **boldface italic** type require a grade of C or better for entrance into this major.
 - + Courses listed in **boldface type** require a grade of C or better for graduation in this major.
 - * C E Electives must be selected from two of the three remaining technical areas in the program – Structures (X40), Hydrosystems (X60), and Environmental (X70).
- A student may use a 3-credit sequence of ENGR 295, 395, 495 Cooperative Education to substitute for one 3 credit technical elective.
A student may use a 1-credit ENGR 195 Professional Internship on a case-by-case basis. See Undergraduate Coordinator.

Civil Engineering students may petition to use a maximum of 6 credits of ROTC (grade C or better), 3 credits may be applied to GHA and 3 credits towards M E 201 or E E 211/212 course work. No credits may be used in this manner unless the student has fulfilled all ROTC requirements.

Degree Requirements

Environmental Engineering Program Schedule

Recommended Course Program for Undergraduates

(there are other course programs that may meet the requirements—discuss these options with your adviser)

5th Semester		6th Semester	
C E 310 Surveying	3	C E 332 Prof Econ & Const	3
C E 336 Materials Science for Civil Eng	3	C E 335 Engineering Mechanics of Soils	3
C E 360 Fluid Mechanics	3	C E 340 Structural Analysis	3
C E 370 Environmental Engineering	3	C E 371 Water/Wastewater Treatment	3
M E 201 Intro to Thermal Science	3	ENGL 202C Technical Writing	3
	15	Total Credits	15
7th Semester		8th Semester	
C E 461 Water Resources Engineering	3	* ² B E 302 Transport Processes for Biological Sys	3
C E 472W Environmental Engineering Design	3	C E 321 Highway Engineering	3
C E 479 Environmental Microbiology	3	* ¹ C E 475 Water Quality Chemistry	4
E E 211 or 212 Electronic Measuring Systems	3	*C E 476 Solid/Hazardous Waste	3
AHS	3	AHS	3
Health & Physical Activity (GHA)	1.5	Total Credits	16
	16.5		

*Technical Elective— could be replaced with other C E 3xx or C E 4xx courses or other departmental approved courses.

¹C E 475: 1 credit of C E 475 meets the lab requirement and 3 credits satisfy a technical elective; the lab requirement may also be met instead with C E 337.

²B E 302: The Environmental Engineering Minor application website (http://enr.psu.edu/ce/env_minor.html) lists other courses that can meet this requirement.

Degree Requirements

Geoengineering and Materials Program Schedule

*Recommended Course Program for Undergraduates
(there are other course programs that may meet the requirements—discuss these options with your adviser)*

5th Semester			6th Semester		
C E 332	Prof Econ & Const	3	C E 310	Surveying	3
C E 335	Engineering Mechanics of Soils	3	C E 336	Materials Science for Civil Engrs	3
C E 337	C. E. Materials Lab	1	C E 341	Design of Concrete Structures	3
C E 340	Structural Analysis	3	C E 360	Fluid Mechanics	3
C E 370	Environmental Engineering	3	ENGL 202C	Technical Writing	3
M E 201	Intro to Thermal Science	3	Health & Physical Activity (GHA)		1.5
	Total Credits	16	Total Credits		16.5
7th Semester			8th Semester		
C E 321	Highway Engineering	3	C E 439W	Geotechnical and Materials	3
C E 435	Foundation Engineering	3		Engineering Design Capstone	
C E 436	Construction Engineering	3	*Technical Elective		3
or	Materials		*Technical Elective		3
C E 437	Engineering Materials for Sustainability	3	*Technical Elective		3
E E 211 or 212	Electronic Measuring Systems	3	AHS		3
AHS		3	Total Credits		15
	Total Credits	15			

*Technical Elective— one of the electives must be:

C E 371: Water and Wastewater Treatment
C E 461: Water Resources Engineering
C E 462: Open Channel Hydraulics

Possible External Technical Electives:

C E 421W: Transportation Design	GEOSC 483: Environmental Geophysics
C E 423: Traffic Operations	GEOSC 487: Analysis of Time Series
C E 432: Construction Project Management	GEOSC 488: An Introduction to Seismology
C E 441: Structural Design of Foundations	GEOSC 498A: Hazardous Waste Operations
E MCH 440: Nondestructive Evaluation of Flaws	MNG 401: Introduction to Mining Operations
E MCH 461: Finite Elements in Engineering	MNG 431: Rock Mechanics
GEOSC 470W: Introduction to Field Geology	MNG 445: Environmental Concerns in the Mining Industry

Degree Requirements

Structural Engineering Program Schedule

*Recommended Course Program for Undergraduates
(there are other course programs that may meet the requirements—discuss these options with your adviser)*

5th Semester			6th Semester		
C E 332	Prof Econ & Const	3	C E 310	Surveying	3
C E 335	Engineering Mechanics of Soils	3	C E 341	Design of Concrete Structures	3
C E 336	Materials Science for Civil Engrs	3	C E 360	Fluid Mechanics	3
C E 337	C. E. Materials Lab	1	ENGL 202C	Technical Writing	3
C E 340	Structural Analysis	3	M E 201	Intro to Thermal Science	3
C E 370	Environmental Engineering	3	Health & Physical Activity (GHA)		1.5
	Total Credits	16	Total Credits		16.5
7th Semester			8th Semester		
C E 321	Highway Engineering	3	C E 462	Open Channel Hydraulics	3
C E 342	Design of Steel Structures	3	C E 448W	Advanced Structural Design	3
C E 441	Structural Design of Foundations	3	E E 211 or 212	Electronic Measuring Systems	3
C E 447	Structural Analysis by Matrix	3	*Technical Elective		3
AHS		3	AHS		3
	Total Credits	15	Total Credits		15

*Technical Elective— could be replaced with other C E 3xx or C E 4xx courses or other departmental approved courses.

Degree Requirements

Transportation Engineering Program Schedule

Recommended Course Program for Undergraduates

(there are other course programs that may meet the requirements—discuss these options with your adviser)

5th Semester			6th Semester		
C E 310	Surveying	3	C E 321	Highway Engineering	3
C E 335	Engineering Mechanics of Soils	3	C E 332	Prof Econ & Const	3
C E 340	Structural Analysis	3	C E 336	Materials Science for Civil Engrs	3
C E 360	Fluid Mechanics	3	C E 337	C. E. Materials Lab	1
M E 201	Intro to Thermal Science	3	C E 370	Environmental Engineering	3
	Total Credits	15	ENGL 202C	Technical Writing	3
				Total Credits	16
7th Semester			8th Semester		
C E 422	Transportation Planning	3	C E 421W	Transportation Design	3
C E 423	Traffic Operations	3	C E 435	Foundation Engineering	3
*C E 436	Construction Engineering		**C E 3xx/4xx	C E Elective	3
	Materials	3	C E 462	Open Channel Hydraulics	3
E E 211 or 212	Electronic Measuring Systems	3	AHS		3
AHS				Total Credits	15
Health & Physical Activity (GHA)		3			
	Total Credits	16.5			

**Civil Engineering Elective— must be selected from:

C E 341: Design of Concrete Structures
 C E 342: Design of Steel Structures
 C E 371: Water and Wastewater Treatment

*Technical Elective— could be replaced with other C E 3xx or C E 4xx courses or other departmental approved courses.

Possible External Technical Electives:

SC&IS 420: Public Transportation
 STAT 4xx: Any 400-level course other than STAT 401
 I E 405: Linear Programming
 I E 408: Cognitive Work Design
 I E 425: Introduction to Operations Research
 M E 470: Fundamentals of Air Pollution
 PSYCH 444: Engineering Psychology
 IST 402: Emerging Issues and Technologies
 IST 441: Information Retrieval and Organization
 IST 461: Database Management and Administration
 IST 462: Database Modeling and Applications

Degree Requirements

Water Resources Engineering Program Schedule

Recommended Course Program for Undergraduates

(there are other course programs that may meet the requirements—discuss these options with your adviser)

5th Semester			6th Semester		
C E 310	Surveying	3	C E 332	Prof Econ & Const	3
C E 336	Materials Science for Civil Engrs	3	C E 335	Engineering Mechanics of Soils	3
C E 360	Fluid Mechanics	3	C E 340	Structural Analysis	3
C E 370	Environmental Engineering	3	C E 461	Water Resources Engineering	3
ENGL 202C	Technical Writing	3	¹ C E 475	Water Quality Chemistry	4
	Total Credits	15		Total Credits	16
7th Semester			8th Semester		
C E 371	Water & Wastewater Treatment	3	C E 321	Highway Engineering	3
C E 462	Open Channel Hydraulics	3	*C E 341	Design of Concrete Structures	3
E E 211 or 212	Electronic Measuring Systems	3	or C E 342	Design of Steel Structures	3
M E 201/CH E 220	Intro to Thermal Science	3	C E 465W	Water Resources Capstone	3
AHS		3	*Technical Elective		3
Health & Physical Activity (GHA)		1.5	AHS		3
	Total Credits	16.5		Total Credits	15

*Technical Electives—could be replaced with other C E 3xx or C E 4xx courses or other departmental approved courses.

¹C E 475: 1 credit of C E 475 meets the lab requirement and 3 credits satisfy a technical elective; the lab requirement may also be met instead with C E 337.

Possible External Technical Electives:

B E 301: Mathematical modeling of biological and physical systems
 B E 307: Principles of soil and water engineering
 B E 467: Design of stormwater and erosion control facilities
 GEOSC 452: Hydrogeology
 GEOEE 408: Contaminant hydrology
 METEO 448: Stormwater hydrology
 FOR 470: Watershed Management

CE Course Offerings, (Credits), Semester and Pre-Requisites

*Prerequisites in **bold** must be completed with a “C” or better before enrolling in the course.

C E 310:	SURVEYING (3) – Fundamental surveying measurements, traverse computations, coordinate geometry, mapping, GPS and GIS, circular and parabolic curves, earthwork, boundary surveys, CAD applications. Offered: FA, SP, SU
Pre-reqs:	EDSGN 100, MATH 141
C E 321:	HIGHWAY ENGINEERING (3) – Highway engineering principles, vehicle and driver characteristics; geometric and pavement design; highway drainage; traffic engineering, capacity and analysis and signal timing. Offered: FA, SP
Pre-reqs:	C E 310
C E 332:	PROFESSIONALISM, ECONOMICS & CONSTRUCTION PROJECT DELIVERY (3) – Introduction to engineering management process; economic analysis; pricing; contract documents; estimating; ethics; professional practice and engineering economy. Offered: FA, SP
Pre-reqs:	None
C E 335:	ENGINEERING MECHANICS OF SOILS (3) – Soil compositions, classification, subsurface exploration, ground water flow, stress analysis, compaction, soil behavior, bearing capacity, lateral earth pressure and slope stability. Offered: FA, SP
Pre-reqs:	E MCH 213 or E MCH 210;
Pre-req or Concurrent:	GEOSC 001
C E 336:	MATERIALS SCIENCE FOR CIVIL ENGINEERS (3) – Introduction to civil engineering materials; their structure and behavior; relationship between structure and behavior. Offered: FA, SP
Pre-reqs:	E MCH 213 or E MCH 210;
Pre-req or Concurrent:	STAT 401
C E 337:	CIVIL ENGINEERING MATERIALS LAB (1) – Materials: soils, aggregates, concrete, steel, wood and polymers. Offered: FA, SP
Pre-reqs:	C E 335 or C E 336 or concurrent
C E 340:	STRUCTURAL ANALYSIS (3) – Analysis of statically determinate and indeterminate trusses, beams and frames; reactions, axial forces, shears, moments, deflections. Introduction to influence lines. Offered: FA, SP, SU
Pre-reqs:	E MCH 213 or E MCH 210 and
Pre-req or Concurrent:	CMPSC 201 or 202
C E 341:	DESIGN OF CONCRETE STRUCTURES (3) – Design of reinforced concrete beams, slabs, and columns with emphasis on ultimate-strength methods; pre-stressed concrete; buildings and bridge applications. Offered: FA, SP
Pre-reqs:	C E 340 and
Pre-req or Concurrent:	C E 336

CE Course Offerings, (Credits), Semester and Pre-Requisites

C E 342:	DESIGN OF STEEL STRUCTURES (3) – Design and analysis of structural steel tension members, beams, columns, beam-columns, composite beams and connections. Project and computer applications. Offered: FA, SP
Pre-reqs:	C E 336, C E 340
C E 360:	FLUID MECHANICS (3) – Mechanics of fluids; flow in conduits and around bodies, friction and energy loss, fluid measurements. Offered: FA, SP, SU
Pre-reqs:	E MCH 212
C E 370:	INTRODUCTION TO ENVIRONMENTAL ENGINEERING (3) – Nature and scope of environmental issues; air, water, land impacts; fundamentals and processes of pollution control. Offered: FA, SP
Pre-reqs:	CHEM 110; MATH 111 or MATH 141
C E 371:	WATER AND WASTEWATER TREATMENT (3) – Water treatment; water storage; design of water distribution and wastewater systems; pumping stations. Offered: FA, SP
Pre-reqs:	C E 360, C E 370
C E 399:	FOREIGN STUDIES (1-12) – Courses offered in foreign countries by individual or group instruction. Offered: FA, SP
Pre-reqs:	None
C E 410W:	SUSTAINABLE RESIDENTIAL SUBDIVISION DESIGN (3) – Residential subdivision process; site selection; conservation and neo-traditional design; utility design and layout; Best Management Practices for erosion and storm water. Offered: FA
Pre-reqs:	C E 332 or A E 372; seventh semester standing in C E or A E
C E 421W:	TRANSPORTATION DESIGN (3) – Design of streets and highway facilities; emphasis on geometric elements, intersections and interchanges, roadway drainage, and pavement design procedures. Offered: SP
Pre-reqs:	C E 321
C E 422:	TRANSPORTATION PLANNING (3) – Transportation systems planning, programming, and management; modeling and simulation data collection, analysis and forecasting. Offered: FA
Pre-reqs:	3 credits in probability or statistics
C E 423:	TRAFFIC OPERATIONS (3) – The highway capacity manual, concepts and analyses, freeway operations, signalized and unsignalized intersections, signal coordination, traffic impact studies. Offered: FA
Pre-reqs:	C E 321

CE Course Offerings, (Credits), Semester and Pre-Requisites

C E 432:	CONSTRUCTION PROJECT MANAGEMENT (3) – Fundamentals of project management, construction scheduling using the CPM technique, construction project pre-planning, and control of quality, safety, and costs. Offered: FA
Pre-reqs:	C E 332
C E 435:	FOUNDATION ENGINEERING (3) – Bearing capacity, settlement, and structural design of shallow foundations; lateral earth pressure; retaining and sheet-pile walls; introduction to deep foundations. Offered: FA
Pre-reqs:	C E 335 and
Pre-req or Concurrent:	C E 341
C E 436:	CONSTRUCTION ENGINEERING MATERIALS (3) – Design, production, application, specification, and quality control of construction materials unique to civil engineering. Offered: FA
Pre-reqs:	C E 336; STAT 401
C E 437:	ENGINEERING MATERIALS FOR SUSTAINABILITY (3) – Environmental impact of materials; life-cycle assessment; material selection to optimize performance; design, evaluation, and production of green construction materials. Offered: FA
Pre-reqs:	C E 336 or equivalent
C E 438:	CONSTRUCTION ENGINEERING (3) – Construction project integrating geo-technical reports; materials specifications; quality control; equipment; estimation; scheduling; design details; excavations, foundations, retaining walls, formwork, pavements. Offered: SP
Pre-reqs:	C E 432 and C E 435 or C E 436
C E 439W:	GEOTECHNICAL AND MATERIALS ENGINEERING DESIGN CAPSTONE (3) – Subsurface site evaluation; integrated design of retaining walls, foundations, pavements, and materials for airports, highways, dams, or other facilities. Offered: SP
Pre-reqs:	C E 435 and either C E 436 or C E 437
C E 441:	STRUCTURAL DESIGN OF FOUNDATIONS (3) – Design of concentrically and eccentrically loaded square, rectangular, and combined footings; analysis and design of mat foundations; retaining walls; piles caps; flexible retaining design, and caissons. Offered: FA
Pre-reqs:	C E 341
C E 447:	STRUCTURAL ANALYSIS BY MATRIX METHODS (3) – Analysis of truss and frame structures using flexibility and stiffness methods of matrix analysis; computer applications. Offered: FA
Pre-reqs:	C E 340
C E 448W:	ADVANCED STRUCTURAL DESIGN (3) – Wind, snow, seismic, bridge loads, and building design using steel, concrete and pre-stressed concrete; advanced steel connections. Capstone project; computer applications. Offered: SP
Pre-reqs:	C E 342, C E 441
Pre-req or Concurrent;	ENGL 202C

CE Course Offerings, (Credits), Semester and Pre-Requisites

C E 461:	WATER-RESOURCE ENGINEERING (3) – Qualitative and quantitative description of the hydrologic cycle, flood and drought frequency analysis, climate and land use change impacts, risk analysis and uncertainty, water resource management at regional, national and global scale. Offered: FA, SP
Pre-reqs:	C E 360
C E 462:	OPEN CHANNEL HYDRAULICS (3) – Open channel hydraulics for free surface flow in rivers, canals, steep chutes, transitions, and through bridges and culverts. Offered: FA, SP
Pre-reqs:	C E 360
C E 465W:	WATER RESOURCES CAPSTONE DESIGN (3) – Hydraulic design of river structures and open channels including super critical and spatially varied flow; hydrologic/hydraulic computer modeling; design project. Offered: SP
Pre-reqs:	C E 461 and
Pre-req or Concurrent:	C E 462
C E 472W:	ENVIRONMENTAL ENGINEERING CAPSTONE DESIGN (3) – Principles and design of unit operations for water; domestic and industrial wastewater treatment, equipment selection and application. Offered: FA
Pre-reqs:	C E 370, C E 371
C E 475:	WATER QUALITY CHEMISTRY (4) – Chemistry applicable to the understanding and analysis of water quality, pollution and treatment. Offered: SP
Pre-reqs:	C E 370, CHEM 110, CHEM 111
C E 476:	SOLID AND HAZARDOUS WASTES (3) – Characteristics and treatment of solid wastes and hazardous wastes. Offered: SP
Pre-reqs:	C E 370, C E 371
C E 479:	ENVIRONMENTAL MICROBIOLOGY FOR ENGINEERS (3) – Introductory microbiology for engineers; microbe structure, function, and diversity; environmental ecosystems; diagnostic labs. Offered: FA
Pre-reqs:	CHEM 111, C E 370; 7th semester standing
C E 494/H:	SENIOR THESIS/HONORS (1-9) – Students must have approval of a thesis Adviser before scheduling this course.
C E X96:	INDEPENDENT STUDIES (1-18) – Students must have the consent and approval of the instructor before scheduling this course.
C E X97:	SPECIAL TOPICS (1-9) – Students must have the consent and approval of the instructor before scheduling this course.
C E 499:	FOREIGN STUDIES (1-12) – Courses offered in foreign countries by individual or group instruction. Offered: FA, SP
Pre-reqs:	None

Environmental Engineering Minor

Effective Spring Semester 2011.

18 credits

A minor is available in Environmental Engineering and the requirements are shown on the *Baccalaureate Degree Programs Bulletin* (bluebook) at <http://bulletins.psu.edu/bulletins/bluebook/> and selecting Minor Programs from the menu.

This minor is designed to provide students in engineering, science, and other majors with a comprehensive study of environmental issues and the skills necessary to solve problems associated with environmental pollution. A certificate is awarded to students who complete the requirements of the minor.

For entrance into the minor, students must be at least fifth-semester and have completed CHEM 110, MATH 141, and PHYS 211.

The minor consists of 18 credits, at least 6 of which must be at the 400 level. A grade of C or better is required in all courses in the minor.

An online application is available at: http://www.engr.psu.edu/ce/env_minor.html.

REQUIREMENTS FOR THE MINOR: 18 credits (2 credits of engineering design are included.)

	Scheduling Recommendation by Semester Standing			
	1-2	3-4	5-6	7-8
PRESCRIBED COURSE (3 credits) C E 370(3)	-	x	x	-
ADDITIONAL COURSES (15 credits) Select 3 credits from Chemistry and Biological Sciences: B E 308(3), C E 479 (3), CHEM 202(3), CHEM 210(3)	-	x	x	x
Select 0-3 credits from Process Engineering: B E 302(3), CH E 210(3), EGEE 302(3), MN PR 301(3), NUC E 430(3)	-	-	x	x
Select 3 credits from Applied Fluid Mechanics: AERSP 308(3), B E 467(4), C E 371(3), C E 462(3), CH E 330(3), EME 303(3), M E 320(3), METEO 454(3), or NUC E 431W(4)	-	-	x	x
Select 6-9 credits from Environmental Sciences and Design: B E 468(3), B E 477(3), C E 472W(3), C E 475(4), C E 476(3), CHEM 402(3), E R M 411(3), E R M 412(3), E R M 413W(3), E R M 447(3), E R M 450(3), EGEE/M E 430(3), EGEE 470(3), ENVSE 408 (3), F SC 431(3), GEOEE 427(3), GEOSC 452(3), M E 405(3), M E 433(3), NUC E 405(3), NUC E 420(3), NUC E 428(3), SOILS 420(3)	-	-	x	x

Procedures, Policies, and Rules

Some of the most commonly referenced applicable policies and procedures are briefly described below. Please check the appropriate University manuals (inside front cover) for more information.

Advising

Each student is assigned a faculty adviser in the department. **Your adviser is listed on your eLion degree audit.** While advisers are one of the most personal links you have with the University, please consider that:

- Faculty members have 20 or more advisees, major responsibilities in teaching, research, and service. When you have questions or need advice, take the initiative to see your adviser. **Be prepared with your questions and materials to make the most of both your adviser's and your time.**
- Because of the many duties of each faculty member, it is almost impossible for them to monitor closely the academic progress of each advisee. **Therefore, it is each student's responsibility to ensure that all graduation requirements are met.**

The Academic Programs staff monitors your student records. **Consult Dr. Folmar (nfolmar@engr.psu.edu) or Heather Hamby (hhamby@psu.edu) if you have questions about interpreting the contents of this manual, or about your records, petitions, and applications.** In case of an emergency, when your academic adviser is not available, you may contact the department's Undergraduate Advisor, Dr. Folmar; check his office door for office hours; or email him with your available hours for an appointment.

Degree Audits

Degree audits are used to track progress toward completion of degree requirements. The audit indicates program and graduation requirements that have been completed to date, as well as unfulfilled requirements. The department uses the degree audit to certify students for graduation. You can review and obtain a copy of your audit on line through eLion at <http://www.elion.psu.edu/>. Information on how to interpret your degree audit may be found on the Registrar's home page (<http://www.psu.edu/registrar/>) and the Degree Audit link. Please contact the Academic Programs staff concerning your degree audit report.

Sixth-Semester Audits

You are encouraged to review your degree audit with your faculty adviser to make sure you are making steady progress toward completing your degree requirements during your sixth semester of study. You should check the status of any petitions filed; anticipate any petitions that may need to be filed, and know the scheduling pattern for courses that may only be offered during one semester or those that require prerequisites.

Petitions

You may request exceptions to published degree requirements by filing an academic petition. The petition should contain a **clear and precise** statement of what type of exception you are requesting, a reasonable justification for the request, and **include appropriate supporting documentation.** Petitions are formal requests and should be discussed and endorsed by your adviser; students should then use the College of Engineering's on-line ePetition (<http://www.engr.psu.edu/e-petition/>) to submit the request.

Procedures, Policies, and Rules

To the greatest extent possible, petitions should be filed *before* the relevant course or other action is taken. Some petitions require only departmental approval; the dean or the University Faculty Senate must approve others. **Therefore, a petition may take anywhere from one week to several weeks for a final decision.**

To avoid any last minute changes in graduation plans, petitions should be submitted prior to the semester you activate your intent to graduate. Petitions submitted the semester in which you plan to graduate may not be reviewed or may be denied.

There are many reasons to file a petition. Perhaps you took a very similar course when you were on track for another major. Or, perhaps you have transfer or AP credits that were transferred as general credit to your Penn State record. Some of the petitions commonly seen in the department include:

Experiential GI or IL. Students may meet the former GI (prior to 2005), now the IL requirement with appropriate life experiences, such as study abroad or working in the Peace Corps.

Language Substitution. A language course at the 12th credit level or higher may be substituted for 3 credits of the AHS requirements but cannot be the only course in a category.

ROTC Credits. You may petition to use a maximum of 6 credits of ROTC (grade C or better), 3 credits may be applied to the general electives (GHA) and 3 credits towards M E 201 or E E 211/212 course work, **only if you have satisfied all ROTC program requirements.**

Technical Electives. The departmental list of approved technical electives may not always be reported correctly on your degree audit. If it is listed in Other Courses, you will need to submit a formal petition so that the department knows to adjust your degree audit.

500-Level Courses. Any senior with a 3.50 cumulative GPA may be admitted to a graduate-level course with only the consent of the instructor. Any senior with a 3.00 to 3.49 cumulative GPA may be admitted to 500-level courses by completing the Undergraduate Student to take 500-Level Courses form, obtaining all required signatures, and returning it to the Graduate School. Schreyer Scholars need not complete the form.

Degree Audit Adjustments

3-6-9 AHS Sequence. No formal petition is required for Civil Engineering students who wish to use a 3-6-9 sequence for Arts, Humanities and Social Sciences (AHS). Courses need to be taken in each of the three categories (taking 3 credits in one category, 3 credits in another and 12 credits in the remaining category will NOT meet graduation requirements).

While no formal petition is required, you must notify Heather Hamby (hhamby@psu.edu) to have your degree audit adjusted.

The Intercultural and International Competence (GI) course or US and IL and Economics 102 or 104 may overlap the AHS requirements.

Procedures, Policies, and Rules

Policy 83-80

University Faculty Senate Policy 83-80 Limitations on Source and Time for Credit Acquisition requires that (more info at <http://www.psu.edu/ufs/policies/>):

1. Every candidate for a degree shall earn as a degree candidate at least 36 of the last 60 credits required for a baccalaureate degree and at least 18 of the last 30 credits required for an associate degree in courses offered by the University or in cooperative degree programs that have been established by formal agreement and approved by the University Faculty Senate.
2. A candidate for a first baccalaureate degree shall earn the last 60 credits required for that degree within a total elapsed time of five calendar years, but an extension of time shall be granted for intervening military service.

Policy 49-20

Definition and expectations: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

To protect the rights and maintain the trust of honest students and support appropriate behavior, faculty and administrators should regularly communicate high standards of integrity and reinforce them by taking reasonable steps to anticipate and deter acts of dishonesty in all assignments (Senate Policy 44-40: Proctoring of Examinations). At the beginning of each course, it is the responsibility of the instructor to provide students with a statement clarifying the application of University and College academic integrity policies to that course.

Committee on Academic Integrity: Each College Dean (or Campus Executive Officer as determined by College policy) shall appoint a Committee on Academic Integrity made up of faculty, students, and academic administrators with faculty being the majority. This committee shall:

1. Promote expectations for academic integrity consistent with the definition in this policy.
2. Ensure fairness and consistency in processes and outcomes. To ensure University-wide consistency, College Committees will work with the Office of Judicial Affairs and the Office of the Provost of the University to develop procedures for handling and sanctioning dishonesty infractions.
3. Review and settle all contested cases in which academic sanctions are applied. If necessary, further disciplinary action will be taken by Judicial Affairs.
4. Record all cases of academic dishonesty within a college and report them to Judicial Affairs.

Safety

Appropriate safety procedures must be followed in the laboratories. Safety is everyone's responsibility in our teaching and research laboratories. As a student, you must follow the directions of your instructors, observe posted instructions carefully, and use common sense. Expedience is not an excuse for unsafe activities.

Each lab is equipped with a first-aid kit. David Faulds, CEE lab supervisor (865-4780) is the safety contact for the Department of Civil and Environmental Engineering. If an accident occurs, follow instructions and call **9-1-1** as quickly as possible. All incidents, however minor, should be reported to the department.

Simultaneous Degrees and Multiple Majors

Students must meet entry requirements for each major. University, college, and major requirements in effect at the time of entry to each degree program must be met. Applications are available in 208 Hammond Building.

Simultaneous degrees (Policy 60-20) combine no more than two degrees. A candidate for simultaneous baccalaureate degrees must earn at least 30 credits more than the number of credits required for the degree with the lower total credit requirement. Students receive one diploma for each degree.

Multiple majors (Policy 60-40) combine two or more majors leading to the same degree. There is no minimum credit requirement. It may be possible for a student to complete a multiple major with the number of credits required for the degree with the greatest total requirement. Students receive a separate diploma for each major for which requirements have been completed. The final academic record indicates the completion of the requirements for each major.

Auditing and Visiting Courses

Students must obtain written permission from the course instructor before formally scheduling a course for audit. To schedule an audit, students must process a registration drop/add form (available in 218 Sackett) or call the Registrar's office at 865-6357, prior to semester/session or during regular add/drop period. Students are cautioned that, as an auditor, they may be required to participate fully in class. Courses required for graduation cannot be audited. To visit a course, the student must obtain prior approval from the course instructor. Students receive no credit for visiting a course, and no record appears on the transcript.

Independent Studies/ Special Topics Courses C E X96/X97

Independent Studies and Special Topics courses are creative projects, including research and design, which are supervised on an individual basis and which fall outside the normal scope of formal courses. In certain cases, if the subject of the independent study or special topics is known far enough in advance, a specific title may be used. The specific title would appear on your transcript instead of the generic Special Topics or Independent Studies notation.

If you would like to register for an independent study or special topics course, you need to obtain the written approval of a faculty member with the department before registering. For civil engineering courses, you must formalize the course with the Academic Programs staff.

Transfer Credits

You may request to use transfer credits to satisfy degree requirements by using the petition process. If you would like to take courses at another institution, you should first check to see if the course can be directly transferred as a PSU equivalent. If it is not then you should complete a transfer credit evaluation form *before* attending the other school. **Please check the transfer credit evaluation on-line at <http://admissions.psu.edu/academics/credit/> and with the Undergraduate Admissions Office for course equivalents and to obtain a transfer credit form.**

Opportunities and Options

Here are some of the many opportunities to enhance, develop, and have fun with your education.

American Concrete Institute (ACI)

The ACI (American Concrete Institute) student club is open to any student interested in concrete structures or materials. Each semester, student teams travel to the national convention for competitions in areas such as strongest cube, FRP beam, concrete bowling ball, and concrete egg protection device. Activities also include guest speakers from the concrete profession and certification opportunities. The ACI co-advisers are Drs. Farshad Rajabipour and Andrew Scanlon.

American Society of Civil Engineers (ASCE)

ASCE is the professional civil engineering society, with a student chapter open to freshmen and sophomores interested in the organization and all students enrolled in civil engineering. This organization was established to expand the college experience for students in civil engineering and aid in establishing the professional contacts that are so valuable to the practicing engineer. Student chapter members hold offices, secure speakers for chapter meetings, visit engineering works, attend professional meetings, present papers, and keep abreast of professional activities through ASCE publications. These activities stimulate early professional consciousness and prepare students for entry into the profession and into the American Society of Civil Engineers. Dr. Norm Folmar is the faculty adviser to the chapter.

Chapter activities include concrete canoe races and steel bridge competitions. How do you make concrete float? Join the committee that designs the concrete mix used in making the canoe, and then designs, builds, and races the canoe. Does constructing a bridge over imaginary water interest you? Join the steel bridge team to design, construct and test the load of 2,500 pounds on the bridge.

The Central Pennsylvania Section of ASCE offers \$1,000 scholarships to civil engineering students. Competition is open to students who are enrolled at Penn State, Bucknell or another school with permanent residence within the boundaries of the Central Pennsylvania Section. The application can be downloaded from http://www.asce-pa.org/members_scholarships.html.

For further information concerning the Penn State chapter please visit the Jeremy Herbstritt Student Lounge, 105 Sackett, or the Penn State ASCE web page <http://www.pennstateasce.com/>.

Bridges to Prosperity

Bridges to Prosperity seeks to build footbridges over impassable rivers in impoverished rural areas around the globe. The organization also educates members of these communities on the methodologies used for successful bridge design, construction, and maintenance in order to provide lifelong access to essential needs. Dr. Jeffrey Laman is the faculty adviser.

Chi Epsilon

Chi Epsilon is the national honor society for juniors and seniors enrolled in civil engineering. Membership is by invitation and is based on scholarship, character, practicality, and sociability. The purpose of this organization is to recognize and develop the fundamental characteristics of the successful civil engineer. Dr. John Regan is the faculty adviser.

Opportunities and Options

Earthquake Engineering Research Institute (EERI-PSU)

The national chapter of the EERI (<http://www.eeri.org/site/>) is a “nonprofit, technical society of engineers, geoscientists, architects, planners, public officials and social scientists” with the aim of reducing earthquake risk by advancing science, improving the understanding of the impact of earthquakes on society, and advocating comprehensive and realistic measures for reducing the harmful effects of earthquakes. Dr. Gordon Warn is faculty adviser.

Institute Of Transportation Engineers (ITE)

ITE is a professional organization of students who are interested in transportation and traffic engineering. A number of meetings are held each year, with representatives of transportation firms and agencies serving as guest speakers. Meetings are posted on the ITE bulletin board on the second floor of Sackett Building. The ITE co-advisers are Drs. Vikash Gayah and Martin Pietrucha.

National Association of Home Builders (NAHB)

The National Association of Home Builders (NAHB) Student Chapter is a focus for students interested in housing, light commercial construction, and development. It provides students with the opportunity to learn more about the housing industry. Students who are in the following majors are eligible for membership in the NAHB Student Chapter: Civil and Environmental Engineering, Architectural Engineering, Architecture, Landscape Architecture and Real Estate. There are a number of benefits, professional, academic, and social, to joining the student chapter. There are a number of scholarships available to students interested in housing and/or residential construction (http://www.engr.psu.edu/ce/divisions/residential/undergraduate_scholarships.html).

Any student interested in becoming an NAHB Student Chapter member should contact Dr. Ali Memari, Hankin Chair of Residential Building Construction or Tracy Dorman in 219 Sackett Building; 814-865-2341 or tdorman@engr.psu.edu.

Opportunities and Options

College Of Engineering Student Societies & Organizations

Office of Engineering Diversity Ms. Amy Freeman, Director, 208 Hammond Building,
Multicultural Engineering Program 865-7138, email mep@engr.psu.edu,
<http://www.engr.psu.edu/mep/>
Women in Engineering Program 863-1080, email wep@engr.psu.edu,
<http://www.engr.psu.edu/wep/>

Engineering and Applied Sciences Interest House <http://www.clubs.psu.edu/EASI>
Engineering Undergraduate Council <http://www.euc.psu.edu/>
Engineers for a Sustainable World <http://www.clubs.psu.edu/up/esw/>
International Association for the Exchange of Students
for Technical Experience <http://www.iaeste.psu.edu>
National Society of Black Engineers (NSPE) <http://www.engr.psu.edu/nsbe>
Society of Hispanic Professional Engineers (SHPE) <http://www.clubs.psu.edu/SHPE>
Society of Women Engineers (SWE) <http://www.engr.psu.edu/swe>
Tau Beta Pi (Honor Society) <http://www.clubs.psu.edu/up/tbp/>
Triangle Fraternity <http://www.psutriangle.org>

Engineering Cooperative Education

You can participate in the College of Engineering's Cooperative Education program beginning with the junior year. By alternating semesters of work and study, a year of work experience is accrued. Using the summer sessions before the junior year and during the senior years, it requires four and one-half years to earn a Bachelor of Science degree with a Certificate in Engineering Cooperative Education. Completion of three work assignments and a report for each assignment is required for certification. Continuing participation in the program is contingent upon satisfactory academic and work performance.

To obtain additional information on the Co-op program, you are encouraged to attend one of the workshops presented by the Engineering Career Resources & Employer Relations Office. The Engineering Career Resources & Employer Relations Office is located in 205 Hammond Building. (<http://www.engr.psu.edu/career>)

The cooperative education coordinator for our department is Dr. Norman Folmar. While you should consult your faculty adviser on academic matters, you should consult with the coordinator with regard to co-op. The coordinator will also grade your co-op reports.

Opportunities and Options

The Schreyer Honors College

The honors adviser for the department is Dr. Eric Donnell. If you are a Schreyer Scholar and were assigned to another adviser, please see Heather to change your adviser. Your honors adviser must approve your annual academic plan, independent study forms, provide suggestions for honors options, and help you apply for special programs, such as the Integrated Undergraduate-Graduate Program (IUG). They will also help you to find a thesis supervisor, and then serve as the second reader for your senior honors thesis.

Study Abroad (International Engineering Program)

A specific civil engineering program is conducted on an exchange basis between Penn State and the University of Leeds in Leeds, England. The University of Leeds is one of the largest universities in Great Britain and has one of the major academic libraries in the country. The Metropolitan District of Leeds is an important financial, commercial and cultural center with many interesting historical sites.

You can enroll at Leeds during the spring semester in a specially designed academic program consisting of lectures, design studies, directed field trips, and term reports. You must be able to complete 18 credits in civil engineering subjects while abroad. Courses completed at the University of Leeds satisfy the degree requirements for the Bachelor of Science in Civil Engineering at Penn State. Since you remain registered at Penn State while enrolled in the Leeds Program, no transfer of credit is necessary; all grades earned at Leeds count. For further information concerning the Penn State/Leeds Exchange Program, please contact Dr. Andrew Scanlon, program coordinator, or Heather Hamby in the Academic Programs office.

Many other international exchange programs exist where students can take courses that can be transferred to Penn State to meet major requirements while studying abroad in the fall and spring or summer. The College of Engineering, International Programs Office, provides a searchable database (<http://www.engr.psu.edu/international>) that allows a student in a College of Engineering major to find an appropriate program.

Information on other exchange programs can be found at the University Office of Global Programs, 410 Boucke Building, 865-7681 (<http://gpglobalea.gp.psu.edu/>).

Minors

A student may elect to take a minor in addition to a major at Penn State. A complete list may be found in the Baccalaureate Degree Programs Bulletin. Students must apply for a minor in the department in which the minor is offered. Students must satisfy all entrance requirements and prerequisites to the required courses.

The CEE Department offers a minor in Environmental Engineering; the minor requirements are listed on page 33.

Opportunities and Options

Minors offered by the College of Engineering include:

Minor	URL
Agricultural and Biological Engineering	www.abe.psu.edu
Bioengineering	www.bioe.psu.edu/students/minor.html
Engineering Entrepreneurship	www.e-ship.psu.edu/
Engineering Leadership Development	www.eldm.psu.edu/
Engineering Mechanics	www.esm.psu.edu/programs/undergraduate/emch/
Environmental Engineering	www.engr.psu.edu/ce/env_minor.html
Nanotechnology	www.esm.psu.edu/programs/undergraduate/nano/
Product Realization	www.mne.psu.edu/simpson/PRM/
Science, Technology, and Society	www.sts.psu.edu/undergraduate/minors
Six Sigma	www.ie.psu.edu/Academics/Undergraduate/Minors/SixSigma.html

Certificate Programs offered by the College of Engineering include:

Certificate	URL
Engineering and Community Engagement Certificate	thc100@psu.edu
Engineering Design Certificate	www.engr.psu.edu/ed/designcertificate
Housing	www.engr.psu.edu/ce/housing_cert.html
International Engineering	www.engr.psu.edu/Departments/intlcertificate.aspx
Space Systems Engineering	www.engr.psu.edu/Departments/spacesys.aspx

Reserve Officers' Training Corps (ROTC)

ROTC Air Force, Army, Navy/Marines programs are available. You may petition to use a maximum of 6 credits of ROTC (grade C or better), 3 credits may apply to your GHA requirement and 3 credits towards M E 201 or E E 211/212 course work. **These credits may only be used if the student satisfied all ROTC program requirements.**

3-2 Program

In cooperation with several academic institutions in the Commonwealth, Penn State offers a 3-2 program in engineering. Following three years at the cooperating institution, the student transfers to Penn State for the final two years. To complete the civil engineering degree, students must successfully complete all civil engineering course requirements for a total, including transferred credits, of at least 130 credits. For the most part, 3-2 students only have to take technical courses at Penn State. Sequencing and scheduling of courses can pose problems if the program is not planned carefully. Students in the 3-2 program are advised by the Undergraduate Advisor, Dr. Folmar.

Opportunities and Options

Undergraduate Teaching Intern Program

You may wish to apply for an undergraduate teaching intern position if you have an interest in teaching. Teaching interns assist individual faculty in a particular course by presenting a lecture, grading papers, conducting help sessions, and being available to answer questions.

Applications are available each April for the following academic year. A few paragraphs on why you would like to teach and become an undergraduate teaching intern are required. Please see Heather in the Academic Programs office if you have an interest in this program.

Internships

If you are interested in employment while in school, an internship may be just what you are looking for. Specific internships are also available for summer. Many of these notices are available on our website in the Student Employment section. Students may earn credit for their internship experience by working with the College of Engineering's Engineering Career Resources and Employer Relations Office (<http://www.engr.psu.edu/career>). The use of internship credits (ENGR 195) are approved on a case-by-case basis. Please see the Undergraduate Coordinator.

Scholarships

If you are interested in entering the competition for a departmental scholarship, you must submit the necessary forms to be eligible. Complete the on-line Free Application for Federal Student Aid (FAFSA) form <http://www.fafsa.ed.gov/>, or go to the Office of Student Aid, 314 Shields Building. Also complete the departmental form <http://www.engr.psu.edu/ce/Academics/ScholarshipForm.htm> for undergraduate Civil Engineering students. **Both** forms must be on file to be considered for departmental scholarships.

The **Undergraduate Fellowships Office** provides information and guidance on applying for national scholarships. Students must be nominated by Penn State for these scholarships. Please visit the Undergraduate Fellowships Office, 11-A Grange Building, for consideration. Scholarships become available from other sources throughout the academic year. Visit the College of Engineering's Financial Aid and Scholarships page (<http://www.engr.psu.edu/CurrentStudents/Undergraduate/FinancialAid/>) or search bulletin boards for external agency scholarships. These scholarships usually require the student to supply a transcript, an essay and letters of reference.

Looking Ahead

Here are some great resources for making decisions about employment or pursuing graduate studies.

Professional Registration

The Fundamentals of Engineering (FE) Exam is the first step toward becoming a professional engineer. The FE exam is a computer-based exam commonly taken in the senior year followed by four years of practical experience, and a second exam in Engineering Principles and Practice (PE). Many firms recognize the professional engineer with salary increases and positions of increased responsibility. Professional registration is especially important for civil engineers because so much civil engineering work is in the public sector.

Year-round testing is available at approved Pearson VUE testing centers. Information on CBT and engineering licensure can be found at ncces.org. Registration for the exam is processed on-line at ncces.org. Information and downloadable forms can be found at Professional Credential Services, Inc. (PCS) <http://www.pcshq.com/>.

PCS will require an official transcript with degree conferred notation to release your final scores. The Department is not able to provide Official transcripts; these must be ordered from the **Registrar** (<http://www.registrar.psu.edu/>).

The **Professional Land Surveyor (PLS)** license is desirable for those wishing to practice in boundary surveying and land development design. For licensure in Pennsylvania, a civil engineering graduate with 10 credit hours of surveying course work must take the Fundamentals of Land Surveying Examination, followed by four years of practical experience and a second exam in the Principles and Practice of Land Surveying. Surveying courses that would fulfill the 10-credit requirement are available at the Wilkes-Barre campus.

Job Search

Many resources are available to you when you begin your search for full-time employment. Your resume will become an important piece of paper (or electronic data). Tips on writing a resume and cover letter can be found at <http://www.sa.psu.edu/career/>, the Career Services web site or from the University Learning Resource Center, The Writing Center, 220 Boucke Building. Career Services is located on campus at 101 Career Service Center, 865-2377. You will also find information about on-campus recruiting, interviewing and a variety of alumni services at the Career Services web site.

Postings from companies specifically looking for civil engineers are posted on our website (www.engr.psu.edu/ce).

You are encouraged to attend the various job fairs held on campus. Information on Career Days can be found on the website at www.engr.psu.edu. Career Days will be held at the Bryce Jordan Center. Professional dress is recommended and you should take many copies of your resume with you. You will be able to speak to representatives of a company that may want to hire you. The Student Chapter of the American Society of Civil Engineers (ASCE) host a career fair every fall and spring semester. Further information can be obtained from either the ASCE office or visit <http://www.pennstateasce.com/>.

Graduate Study

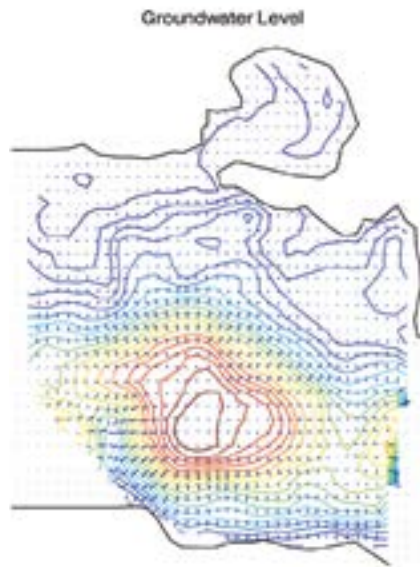
Perhaps you are interested in applying for graduate study? Apply early to schedule the Graduate Record Examination (GRE). Information can be obtained from <http://www.gre.org>.

How do you decide where to apply? You could consult with your Adviser about research specialty areas and courses that you might take in preparation for graduate school. Ask about opportunities elsewhere, as well as at Penn State. Each fall, the *American Society of Engineering Education* publishes a special issue devoted to graduate programs and opportunities. Many faculty members will have a copy of this publication, and it is also available in the Engineering Library. Petersons publishes a helpful printed graduate studies guide and a web page (<http://www.petersons.com>) with links to individual schools.

Penn State graduate applications are only available on-line. The Academic Programs staff can answer questions about graduate programs in civil and environmental engineering. Candidates must possess a baccalaureate degree from an accredited institution. Students with a junior-senior grade point average of 3.0 or above and appropriate course backgrounds may be considered for admission.

Applicants are required to provide the department with official transcripts of all their previous course work (in duplicate), a statement of objectives, and three letters of recommendation at the time of application. In addition, all applicants must submit scores from the General Graduate Record Examination Aptitude Test (verbal, quantitative, and analytical).

Admission is granted on a competitive basis to those presenting the strongest credentials. Applicants must complete the application process in order to be considered for financial aid. Fall admission is the most common start date. Applicants for fall admission who wish to be considered for financial aid are encouraged to have completed applications on file by January of the same year; applicants for spring admission who wish to be considered for financial aid are encouraged to have completed applications on file by June of the previous year. While applications are processed as they are received, these dates are used to discourage individuals from taking the later administrations of the GRE and TOEFL. Those who apply and are accepted early receive the best consideration when the first round of funding decisions is made at the end of March each year. Later admits are considered for support based on the availability of funding.



In collaboration with the NSF funded Shale Hills Critical Zone Observatory led by Penn State, civil and environmental engineers and scientists from Penn State and Technical University of Crete (Greece) are building integrated hydrologic models of the surface and groundwater resources of the White Mountains in western Crete. The research is attempting to evaluate the role of mountain precipitation and climate change on surface water and groundwater resources, and to assess the impact of soil degradation by over grazing in the watershed. The research is funded by the European Commission and the U.S. National Science Foundation. The investigators are Christopher Duffy (PSU), Nikos Nikolaidis (TUC), Xuan Yu (PSU), Daniel Moraitis (TUC), and Tim White (PSU).