

CIVIL ENGINEERING UNDERGRADUATE HANDBOOK

FALL 2022

The Pennsylvania State University
University Park Campus

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1. Curriculum Updates

1.1 New course offerings

- [CE 397: Construction Cost Estimating](#). Methods and procedures for construction project estimating and bidding, including extracting quantities from drawings, classifying work in accordance with specifications, compiling and pricing estimates, preparing bids, and computer applications.
Technical Area: Construction
Pre- or Corequisite: CE 332
Typically offered: Fall and Spring
- [CE 397: Construction Scheduling](#). Methods and procedures for construction project scheduling, including work breakdown structures, activity duration estimates, scheduling logic, precedence networking, Gantt charts, CPM and PERT techniques, resource scheduling, schedule updating and reduction, and computer applications.
Technical Area: Construction
Pre- or Corequisite: CE 332
Typically offered: Fall
- [CE 397: Construction Safety and Risk Management](#).
Technical Area: Construction
Prerequisite: CE 332 and 5th semester standing
Typically offered: Spring
- [CE 402: Computing Methods for Civil and Environmental Engineering](#). Essential computing methods, implementations, and applications in civil and environmental engineering. Basic programming with Python, scientific and technical visualization, root finding, interpolation and curve fitting, direct and iterative solution of linear equation systems, numerical integration, numerical differentiation, and numerical solution of ordinary differential equations.
Technical Area: Relevant to all areas
Prerequisite: CMPSC 200 or CMPSC 201 or CMPSC 121 or CMPSC 131; *Concurrent:* MATH 251
Typically offered: Fall (but temporarily offered in Spring 23 instead of Fall 22)
- [CE 438W: Construction Engineering Design Capstone](#). Geotechnical reports, material specifications, quality control, equipment, estimation, scheduling, design details, excavations, foundations, retaining walls, formwork, and pavements. This course provides an overview of a comprehensive construction project with significant soils work.
Technical Areas: Construction, Geotechnical and Materials Engineering
Prerequisites: CE 432
Typically offered: Spring
Note: This course replaces CE 439W: Geotechnical and Materials Engineering Design Capstone, which will no longer be offered at University Park.

- **CE 497: Construction Equipment and Methods.** Major construction equipment and selected construction methods for civil and structural systems, including appropriate equipment based on operational parameters, principles of construction productivity measurement and analysis, process design, and discrete event simulation.
Technical Area: Construction
Prerequisite: CE 332
Typically offered: Fall
- **CE 497: Legal Aspects of Civil Engineering and Construction.**
Technical Area: Construction
Prerequisite: CE 332 and 7th semester standing
Typically offered: Spring
- **CE 497: Energy Use, Climate Change, and Our Engineered Infrastructure.** Methods to quantify energy use in understandable units; energy analysis of transportation, homes, and industry; identification and quantification of greenhouse gas emissions; basics of climate change; renewable energy growth; energy storage; and environmental and climate justice.
Technical Area: Environmental
Prerequisite: None
Typically offered: Fall and Spring
Notes: This course replaces CE 371: Water and Wastewater Treatment, which will no longer be offered at University Park. This course can be used to fulfill the “2 out of 3 Civil Engineering electives requirement” for Environmental (See §3.2.5).

1.2 Courses no longer offered

CE 371: Water and Wastewater Treatment, CE 439W: Geotechnical and Materials Engineering Design Capstone, and CE 441: Structural Design of Foundations will no longer be offered at the University Park campus.

1.3 New prerequisite changes

The Department of Civil & Environmental Engineering is currently relaxing the prerequisite requirements for several courses to decrease enrollment problems for students. Note that students will need to file a prerequisite override request (in LionPath) before they can register (instructions in §2.2.1), as the Department’s changes have not yet been implemented in LionPath.

CE 335 Engineering Mechanics of Soils	<i>Previously:</i> <i>Now:</i>	Pre: EMCH 210; Pre or Co: GEOSC001 Pre: EMCH 210 or 213; Pre or Co: GEOSC001
CE 336 Materials Science for Civil Engineers	<i>Previously:</i> <i>Now:</i>	Pre: EMCH 210; Pre or Co: STAT 401 Pre: EMCH 210 or 213; Pre or Co: STAT 401 or IE 424
CE 340 Structural Analysis	<i>Previously:</i> <i>Now:</i>	Pre: EMCH 210 Pre: EMCH 210 or 213
CE 410 Sustainable Res. Land Develop.	<i>Previously:</i> <i>Now:</i>	Pre: CE 332 and AE 372 Pre: CE 332 or AE 372
CE 421W Transportation Design	<i>Previously:</i> <i>Now:</i>	Pre: CE 321 Pre or Co: CE 321
CE 422 Transportation Planning	<i>Previously:</i> <i>Now:</i>	Pre: 3 credits in probability or statistics Pre: STAT 401 or IE 424
CE 423 Traffic Operations	<i>Previously:</i> <i>Now:</i>	Pre: CE 321 Pre or Co: CE 321
CE 436 Construction Engineering Materials	<i>Previously:</i> <i>Now:</i>	Pre: CE 336 and STAT 401 Pre: CE 336 and (STAT 401 or IE 424)
CE 448W Advanced Structural Design	<i>Previously:</i> <i>Now:</i>	Pre: CE 342 and CE 441; Pre or Co: ENGL 202C Pre: CE 342 (CE 341 is recommended, but not required)
CE 465W Water Resources Capstone Course	<i>Previously:</i> <i>Now:</i>	Pre: CE 461; Pre or Co: CE 462 Pre: CE 461 or CE 462
CE 472W Environ. Engr. Capstone Design	<i>Previously:</i> <i>Now:</i>	Pre: CE 370 and CE 371 Pre: CE 370
CE 475 Water Quality Chemistry	<i>Previously:</i> <i>Now:</i>	Pre: CE 370 and CHEM 110 and CHEM 111 Pre: CE 370

CE 476
Solid and Hazardous Waste

Previously: Pre: CE 370 and CE 371
Now: Pre: CE 370

CE 479
Environ. Microbiology for Engineers

Previously: Pre: CE 370 and CHEM 111
Now: Pre: CE 370

2. Advising Resources

2.1 Important contacts

- [College of Engineering Advising Center - https://advising.engr.psu.edu/](https://advising.engr.psu.edu/)
Office: 208 Hammond Building
Email: adviser@engr.psu.edu
Office phone: (814) 863-1033
- [Mr. Brent Hockenberry](#) Department Undergraduate Program Assistant
Office: 218 Sackett Building
Email: blh5621@psu.edu
Office phone: (814) 867-0470
- [Dr. William Burgos](#) Department Undergraduate Program Coordinator
Office: 115 Sackett Building
Email: wdb3@psu.edu
Office phone: (814) 863-0578

2.2 How-to Guide

2.2.1 Register for a course without meeting the prerequisites

In some cases, a student may need to register for a course if (1) they do not meet all the prerequisite requirements, (2) the prerequisites in LionPath are outdated, or (3) LionPath fails to recognize that the student has met the prerequisite requirements. In these cases, a student must submit a prerequisite override request using these steps below. [Note that students will not be automatically enrolled if the prerequisite override request is approved. They will still need to enroll in the course after approval.](#)

- Go to the Student Home Base at <https://www.lionpath.psu.edu/>
- Click on the “Enrollment” button
- Click request Prerequisite Override from the left-hand menu
- Complete form and submit

A step-by-step guide can be found at <https://lionpathsupport.psu.edu/student-help/> by clicking the “Requesting a Prerequisite Override (doc)” link.

2.2.2 Viewing your Academic Requirements Report

The best way for students to evaluate their progress towards graduation and determine what courses they need to take is to view their Academic Requirements Report (radio button below Degree Planning and Progress) in LionPath. Details on how to view and interpret your Academic Requirements Report can be found at <https://lionpathsupport.psu.edu/student-help/> (scroll down to “Running a Degree Audit (video)”).

2.2.3 File an e-petition to have a course appear on a degree audit

In certain cases, the University Registrar's Academic Requirements Report will not recognize when an eligible course satisfies a degree requirement. In such cases, students will need to file an electronic petition (e-petition) to the College to initiate the approval process. A *New Substitution* form can be started at <https://coursesub.psu.edu/Student/Home.aspx>. Common acceptable substitutions include:

- 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 two courses in Health and Wellness; or 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 (previously: 3-6-9).*
- First year seminar: EDSGN 100 and EDSGN 130 are acceptable substitutions. If student attended campus with no first-year seminar (FYS), the student would need to petition one unused credit for missing FYS credit. *Be aware that the student will need one additional credit.*
- EMCH 210 instead of EMCH 211 + EMCH 213: Substitution petition. *Be aware that the student will need one additional credit.*
- MATH 250 plus MATH 252 in place of MATH 251.
- IE 424 in place of STAT 401. IE 424 cannot be used as a technical elective.
- ROTC: petition 3 cr. for ME 201 and 3 cr. for GA, GH, or GS; must have 18 credits in the program before petitioning.
- CMPSC 121, CMPSC 131, or ESC 261M instead of CMPSC 200 or 201.
- Technical Electives: petition anything not on the approved list.
- Transfer credits: general transferred credits that don't automatically count as direct transfers.

For course transfers from another university, use the Penn State Transfer Credit Tool.¹ This tool will determine if another course is an exact match for a Penn State course. If so, you will need to ask the other institution to send Penn State documents confirming completion of that class. When processed, these courses will be automatically included in the correct location in your Academic Requirements Report. If your course is not an exact match, you will need to submit a New Transfer Review form.²

¹https://public.lionpath.psu.edu/psc/CSPRD/EMPLOYEE/SA/c/PE_AD077.PE_AD077_TRN_CRD_T.GBL?Page=PE_AD077_MAIN_SRCH&Action=U&

² <https://coursesub.psu.edu/Student/Home.aspx>

3. Degree Requirements

Students must earn 127 credits to complete the B.S. degree in Civil Engineering. A complete list of the required courses can be found in the links in §3.1.

3.1 Useful resources

- The entrance to CE major requirements:
<https://bulletins.psu.edu/undergraduate/colleges/engineering/civil-engineering-bs/#howtogetintext>
- A complete list of the degree requirements for a B.S. in Civil Engineering:
<https://bulletins.psu.edu/undergraduate/colleges/engineering/civil-engineering-bs/#programrequirementstext>
- Instructions on how to access a student’s degree audit:
<https://lionpathsupport.psu.edu/student-help/> (scroll down to “Degree Audit”).

3.2 Requirements

3.2.1 General Education

The CE program requires that students meet the University’s General Education requirements. Students have the most flexibility in meeting the requirements for the Arts, Humanities, and Social Sciences (AHS) and Health and General Wellness (GHW) requirements. Students must take 18 AHS credits; 3 of which include the required ECON course. Generally, a student will need to take 6 credits in each of the 3 areas (GA, GH, and GS). General Education requirements are in the Undergraduate Degree Bulletin.³ Students must complete both the US Cultures (US) (3cr) and International Cultures (IL) (3cr) requirements. These are most efficiently done by having one of the AHS courses count as both AHS and US or IL. Students must also complete Integrative Studies either by taking 6 credits of Inter-Domain courses or by taking 6 credits of Linked courses from the same linkage, in different Knowledge Domains, to fulfill the requirement.

³ <https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>

3.2.2 C or Better Courses

To fulfill graduation requirements, students must earn a C grade or better in the following courses:

CHEM 110	Chemical Principles I
EDSGN 100	Cornerstone Engineering Design
EMCH 211	Statics
EMCH 212	Dynamics
EMCH 213	Strength of Materials
ENGL 202C	Effective Writing: Technical Writing
MATH 140	Calculus with Analytic Geometry I
MATH 141	Calculus with Analytic Geometry II
MATH 251	Ordinary and Partial Differential Equations (or MATH 250 + MATH 252)
PHYS 211	General Physics: Mechanics
PHYS 212	General Physics: Electricity and Magnetism
CAS 100(A or B)	Effective Speech
ENGL 15 (or 30H)	Rhetoric and Composition
CE 310	Surveying
CE 321	Highway Engineering
CE 332	Professionalism, Economics & Construction Project Delivery
CE 335	Engineering Mechanics of Soils
CE 336	Materials Science for Civil Engineers
CE 340	Structural Analysis
CE 360	Fluid Mechanics
CE 370	Introduction to Environmental Engineering

3.2.3 Cumulative GPA minimum

A cumulative GPA of 2.00 or better is required for graduation. If the cumulative GPA drops below 2.00, the student may be dropped for poor scholarship. If the student is dropped as a degree candidate, the College of Engineering requires that all deficiencies be removed before they can be re-enrolled in the major. When half of the deficiencies are removed, the student may pursue enrolling in Division of Undergraduate Studies (DUS).

3.2.4 Laboratory Requirement

The Civil Engineering curriculum requires that students select one CE lab in addition to the prescribed ones. Students can choose from CE 337 or CE 475 to meet this requirement. For the 4-credit CE 475 course, 1-credit is counted towards this lab requirement and 3-credits are counted towards a technical elective.

3.2.5 Technical Elective Requirements

Students must take 18 credits of technical elective credits. Six (6) credits must be earned by taking 2 courses among the three categories below. [The 2 courses must be taken from different lists \(i.e., this requirement is commonly referred to as the “2 out of 3 requirement”\).](#)

- Structural Engineering (CE 341, 342, or 447)
- Water Resource Engineering (CE 461 or 462)
- Environmental Engineering (CE 473, 475, 476, 479, or [497⁴](#))

The other 12 credits may be taken from any CE 3xx or 4xx courses not being used to meet other curricular requirements as technical electives. Of these 12 credits, at least 3 credits must be a CE course.

Alternatively, any 400-level courses from the following list can be used to meet the technical elective requirement. Students will still need to meet the prerequisites for courses offered in other Departments.

ACS	Acoustics
AERSP	Aerospace Engineering
AE	Architectural Engineering (except AE 401, 402, 403, 404, or 430)
ABE	Agricultural and Biological Engineering
BME	Biomedical Engineering
CHE	Chemical Engineering
CMPEN	Computer Engineering
COMPSC	Computer Science
CO-OP	Complete 1 credit each of ENGR 295A/I, 395A/I, 495A/I
CSE	Computer Science and Engineering
ECON	Economics
EDSGN	Engineering Design
EE	Electrical Engineering
EGEE	Energy and Geo-Environmental Engineering
EMCH	Engineering Mechanics
EME	Energy and Mineral Engineering
ENGR	Engineering
ENVE	Environmental Engineering
ENVSE	Environmental Systems
ERM	Environmental Resource Management
ESC	Engineering Science
FSC	Fuel Science
GEOG	Geography
GEOSC	Geosciences
IE	Industrial Engineering (except IE 424)
MATSC	Material Science and Engineering

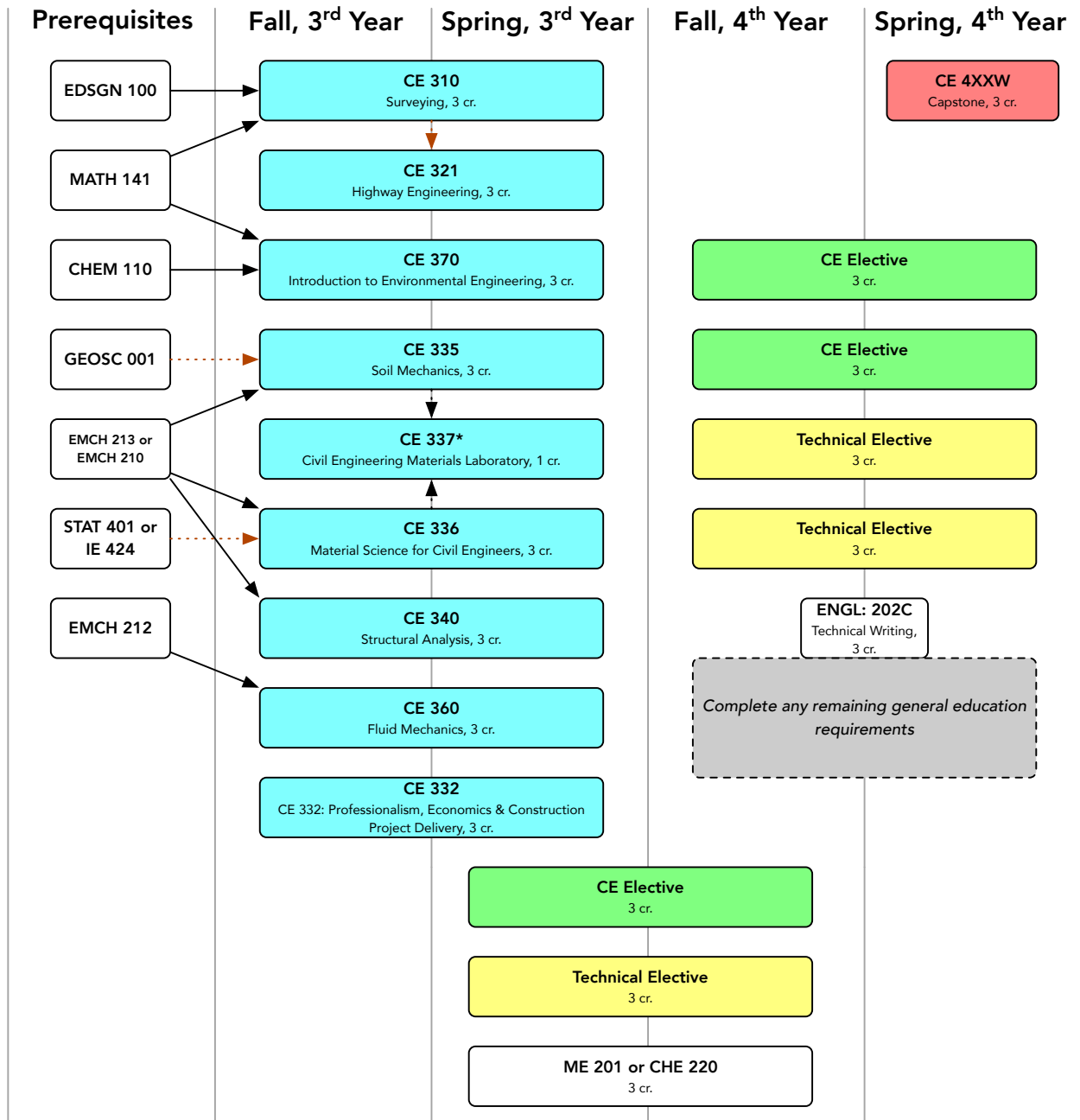
⁴ Students may use the CE 497: Energy Use, Climate Change, and Our Engineered Infrastructure to fulfil this requirement, but they must file an e-petition to have it count.

ME	Mechanical Engineering
METEO	Meteorology
MINE	Mineral Engineering
MNPR	Mineral Processing
MNG	Mining Engineering
NUCE	Nuclear Engineering
PNG	Petroleum and Natural Gas Engineering
STAT	Statistics (except STAT 401)
SUR	Surveying

Requests for other courses to count as a technical elective, outside of those listed below, will be considered by the Department Undergraduate Coordinator via an academic petition submitted through the University's Course Substitution Request System. The petition request must demonstrate the technical nature and a supporting connection to the department curriculum for the requested substitute course. Approval must be granted prior to scheduling the course.

3.3 Generic Civil Engineering 3rd and 4th year course plan

Courses that span two semesters can be taken in either semester.



→ Solid black arrows indicate prerequisite courses.
 - - - → Dashed orange arrows indicate courses that are pre- or corequisites.
 * If students take CE 475 (Water Quality Chemistry, 4 credits), 1 credit may replace CE 337, and 3 credits of CE 475 lecture may count as a CE elective.

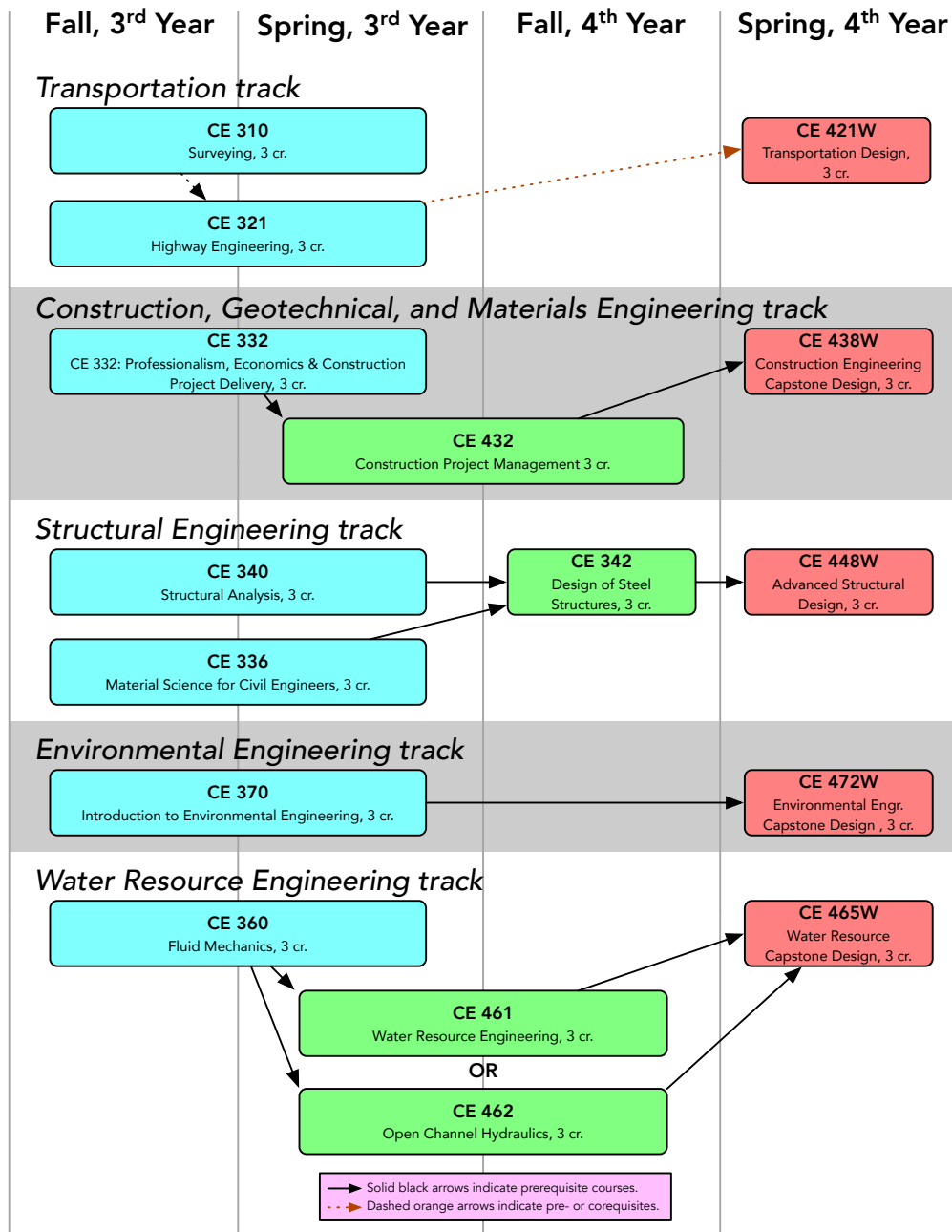
3.4 CE Capstone courses.

The department of Civil Engineering at the University Park campus currently offers five capstone courses (denoted with a “W” for writing intensive). [Capstone courses are only offered in the Spring Semester at the University Park campus.](#)

- [CE 421W: Transportation Design](#); Corequisite: CE 321 (offered in Fall and Spring)
- [CE 438W: Construction Engineering Capstone Design](#); Prerequisites: CE 432 (offered in Fall)
- [CE 448W: Advanced Structural Design](#); Prerequisite: CE 342 (offered in Fall). (CE 341 is recommended, but not required. It is offered in the Spring semester).
- [CE 465W: Water Resources Capstone Design](#); Prerequisite: CE 461 (offered Fall and Spring) or CE 462 (offered Fall and Spring)
- [CE 472W: Environmental Engineering Capstone Design](#); Prerequisite: CE 370 (offered Fall and Spring).

The course prerequisite progressions are shown on the next page.

3.5 Course progressions for each of the Capstone courses



4. CE Course Offerings and Prerequisites

Below is a complete list of the permanent CE courses currently offered at the University Park campus. Changes to prerequisites and corequisites that do not yet appear in LionPath are shown in [blue](#).

4.1 Core required CE courses (C or Better grade required, except CE 337).

CE 310 **SURVEYING (3)** – Fundamental surveying measurements, traverse computations, coordinate geometry, mapping, GPS and GIS, circular and parabolic curves, earthwork, boundary surveys, CAD applications.

Prereqs: EDSGN 100, MATH 141

Reg. Offering: Fall and Spring

CE 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.

Prereq: [CE 310](#)

Reg. Offering: Fall and Spring

CE 332 **PROFESSIONALISM, ECONOMICS & CONSTRUCTION PROJECT DELIVERY (3)** – Introduction to engineering management process; economic analysis; pricing; contract documents; estimating; ethics; professional practice and engineering economy.

Prereq: None

Reg. Offering: Fall and Spring

CE 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.

Prereq: [EMCH 213](#) or [EMCH 210](#); Coreq: [GEOSC 001](#)

Reg. Offering: Fall and Spring

CE 336 **MATERIALS SCIENCE FOR CIVIL ENGINEERS (3)** – Introduction to civil engineering materials; their structure and behavior; relationship between structure and behavior.

Prereq: [EMCH 213](#) or [EMCH 210](#); Coreq: [STAT 401](#) or [IE 424](#)

Reg. Offering: Fall and Spring

CE 337 **CIVIL ENGINEERING MATERIALS LAB (1)** – Materials: soils, aggregates, concrete, steel, wood and polymers. ([Note this course is required but does not require a C or better grade.](#))

Coreq: CE 335 or CE 336

Reg. Offering: Fall and Spring

CE 340 **STRUCTURAL ANALYSIS (3)** – Analysis of statically determinate and indeterminate trusses, beams and frames; reactions, axial forces, shears, moments, deflections. Introduction to influence lines.

Prereq: [EMCH 213](#) or [EMCH 210](#)

Reg. Offering: Fall and Spring

CE 360 **FLUID MECHANICS (3)** – Mechanics of fluids; flow in conduits and around bodies, friction and energy loss, fluid measurements.

Prereq: EMCH 212

Reg. Offering: Fall and Spring

CE 370 **INTRODUCTION TO ENVIRONMENTAL ENGINEERING (3)** – Nature and scope of environmental issues; air, water, land impacts; fundamentals and processes of pollution control.

Prereqs: CHEM 110; MATH 111 or MATH 141

Reg. Offering: Fall and Spring

4.2 Additional CE courses

General Civil Engineering courses (relevant to all areas)

CE 402 **COMPUTING METHODS FOR CIVIL AND ENVIRONMENTAL ENGINEERING.** Essential computing methods, implementations, and applications in civil and environmental engineering. Basic programming with Python, scientific and technical visualization, root finding, interpolation and curve fitting, direct and iterative solution of linear equation systems, numerical integration, numerical differentiation, and numerical solution of ordinary differential equations.

Prereq CMPSC 200 or CMPSC 201 or CMPSC 121 or CMPSC 131; Coreq: MATH 251

Reg. Offering: Fall ([but temporarily offered in Spring 23 instead of Fall 22](#))

CE 410 **SUSTAINABLE RESIDENTIAL LAND DEVELOPMENT (3)** – Residential land development design process including conservation and green design approaches; site assessment; grading and earthwork; utility design and layout; and stormwater management.

Prereq: [CE 332](#) or [AE 372](#)

Reg. Offering: Fall

CE 411 **RESIDENTIAL CONSTRUCTION DESIGN PROJECT (1)** – Interdisciplinary teams will develop a complete design and investment package for a real life new residential or real estate development.

Prereq: fifth semester standing or higher

Reg. Offering: Fall

Construction Engineering Courses

CE 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.

Prereq: CE 332

Reg. Offering: Fall

CE 438W **CONSTRUCTION ENGINEERING DESIGN CAPSTONE.** Geotechnical reports, material specifications, quality control, equipment, estimation, scheduling, design details, excavations, foundations, retaining walls, formwork, and pavements. This course provides an overview of a comprehensive construction project with significant soils work.

Prereq: CE 432

Reg. Offering: Spring

Environmental Engineering Courses

CE 472W **ENVIRONMENTAL ENGINEERING CAPSTONE DESIGN (3)** – Principles and design of unit operations for water; domestic and industrial wastewater treatment, equipment selection and application.

Prereq: CE 370

Reg. Offering: Spring

CE 473 **ECOLOGICAL DESIGN OF REGENERATIVE AQUATIC SYSTEMS (3)** – This course begins with an introduction to natural wetlands, and then extends those fundamental ecological principles to the design of constructed wetlands for wastewater and mine water treatment. In the second half of the course, these ecological principles are applied to the design of a variety of aquaponics systems for fish and vegetable production.

Prereq: CE 370

Reg. Offering: Fall

CE 475 **WATER QUALITY CHEMISTRY (4)** – Chemistry applicable to the understanding and analysis of water quality, pollution and treatment.

Prereq: CE 370

Reg. Offering: Spring

CE 476 **SOLID AND HAZARDOUS WASTES (3)** – Characteristics and treatment of solid wastes and hazardous wastes.

Prereq: CE 370

Reg. Offering: Spring

CE 479 ENVIRONMENTAL MICROBIOLOGY FOR ENGINEERS (3) – Introductory microbiology for engineers; microbe structure, function, and diversity; environmental ecosystems; diagnostic labs.

Prereq: [CE 370](#)

Reg. Offering: Fall

Geotechnical and Materials Courses

CE 337 CIVIL ENGINEERING MATERIALS LAB (1) – Materials: soils, aggregates, concrete, steel, wood and polymers.

Coreq: CE 335 or CE 336

Reg. Offering: Fall and Spring

CE 434 GEOTECHNICAL ENGINEERING DESIGN (3) – Fundamental engineering geology, subsurface exploration including geophysical techniques, principles of shallow and deep foundation designs, slope stability, geosynthetics design, groundwater and drainage, and geotechnical earthquake engineering.

Prereq: CE 335

Reg. Offering: Summer

CE 435 FOUNDATION ENGINEERING (3) – Bearing capacity, settlement, and structural design of shallow foundations; lateral earth pressure; design of retaining and sheet-pile walls; and an introduction to deep foundations.

Prereq: CE 335

Reg. Offering: Fall

CE 436 CONSTRUCTION ENGINEERING MATERIALS (3) – Design, production, application, specification, and quality control of construction materials unique to civil engineering.

Prereqs: CE 336 and (STAT 401 or IE 424)

Reg. Offering: Fall

CE 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.

Prereq: CE 336

Reg. Offering: Spring

CE 438W CONSTRUCTION ENGINEERING DESIGN CAPSTONE. Geotechnical reports, material specifications, quality control, equipment, estimation, scheduling, design details, excavations, foundations, retaining walls, formwork, and pavements. This course provides an overview of a comprehensive construction project with significant soils work.

Prereq: [CE 432](#)

Reg. Offering: Spring

Structural Engineering Courses

- CE 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.
Prereq: CE 340; Coreq: CE 336
Reg. Offering: Spring
- CE 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.
Prereqs: CE 336 and CE 340
Reg. Offering: Fall
- CE 447** **STRUCTURAL ANALYSIS BY MATRIX METHODS (3)** – Analysis of truss and frame structures using flexibility and stiffness methods of matrix analysis; computer applications.
Prereq: CE 340
Reg. Offering: Fall
- CE 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.
Prereq: CE 342 (taking CE 341 before or concurrently with CE 448W is highly recommended, but not required)
Reg. Offering: Spring

Transportation Engineering Courses

- CE 421W** **TRANSPORTATION DESIGN (3)** – Design of streets and highway facilities; emphasis on geometric elements, intersections and interchanges, roadway drainage, and pavement design procedures.
Pre- or Coreq: CE 321
Reg. Offering: Spring
- CE 422** **TRANSPORTATION PLANNING (3)** – Transportation systems planning, modeling, and management; data collection, analysis, and forecasting.
Pre- or Coreq: STAT 401 or IE 424
Reg. Offering: Fall

CE 423 **TRAFFIC OPERATIONS (3)** – The highway capacity manual, concepts and analyses, freeway operations, signalized and unsignalized intersections, signal coordination, traffic impact studies.

Pre- or Coreq: [CE 321](#)

Reg. Offering: Fall

Water Resource Engineering Courses

CE 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.

Prereq: CE 360

Reg. Offering: Fall and Spring

CE 462 **OPEN CHANNEL HYDRAULICS (3)** – Open channel hydraulics for free surface flow in rivers, canals, steep chutes, transitions, and through bridges and culverts.

Prereq: CE 360

Reg. Offering: Fall and Spring

CE 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.

Prereq: [CE 461](#) or [CE 462](#)

Reg. Offering: Spring

BE 467 **DESIGN OF STORMWATER AND EROSION CONTROL FACILITIES (3)** - This course equips students with the ability to design sediment and stormwater impoundments and erosion control structures used in agriculture and the development of the agricultural-urban interface. Predictive hydrology is presented along with an introduction to a hydrology-based model used in the land-development industry

Prereq: BE 307 or CE 461

Note this course is offered outside of CE. It can be used to count towards Technical Elective requirements according to §3.2.5.

5. Opportunities and Student Activities

American Concrete Institute (ACI)

The ACI (American Concrete Institute) student club is open to any student interested in concrete structures or materials. Along with the local ACI Pittsburg Chapter, the Chapter organizes ACI Grade I Certification training and promotes advanced concrete knowledge. Student teams have the resources to travel to the semi-annual Concrete Conventions and participate in student competitions. The ACI advisor is Dr. Aleksandra Radlińska.

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. The ASCE faculty advisor is Dr. Aleksandra Radlińska and the faculty practitioner advisor is Mr. Thomas Skibinski, P.E.

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 Concrete Canoe team advisor is Mr. Thomas Skibinski, and the Steel Bridge team advisors are Mr. Thomas Skibinski and Dr. Pinlei Chen.

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/>.

CEE Alumni Mentoring Program

The program connects CEE Alumni mentors with current students on a one-to-one relationship for guidance, information, and networking related to the student's professional development. Registration required to match an Alumni with a student: <http://www.cee.psu.edu/alumni/mentor/registering.aspx>.

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. The faculty advisor is Dr. Jay Regan.

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 advisor.

Engineering Cooperative Education

Students 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, students 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 117 Hammond Building. (<http://www.engr.psu.edu/career>). The cooperative education coordinator for our department is Dr. William Burgos. The coordinator will also grade the co-op reports.

Engineers for a Sustainable World

Engineers for a Sustainable World (ESW) is an international nonprofit network of students and professionals united by their shared vision for technical sustainability. By working with ESW, our members gain both the technical and professional skills to tackle the world's biggest problems by participating in the design, construction, and implementation of solutions for their local community. The Penn State student chapter advisors are Dr. Rachel Brennan and Dr. John Gershenson.

Engineers in Action

Engineers in Action is a service organization that strives to bring together students of all backgrounds to revitalize communities by designing and constructing pedestrian footbridges over impassable rivers. During the rainy seasons, many communities do not have safe means to cross flooding rivers separating them from their markets, healthcare, and education. Isolation caused by impassable rivers is a root cause of poverty all over the world which is why EIA’s mission is to empower today’s students to become

tomorrow's global leaders by designing and building bridges with under-served communities. The faculty advisor is Mr. Brian Naberezny.

Engineers Without Borders

The national chapter of the EWB-USA (<http://www.ewb-usa.org>) is an international nonprofit organization that supports community-driven development programs worldwide through the design and implementation of sustainable engineering projects, while fostering responsible leadership. The Penn State student chapter advisor is Dr. Jay Regan.

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 advisor is Dr. Vikash Gayah.

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 206 B Sackett Building; 814-865-2341 or tdorman@engr.psu.edu.

Study Abroad

Studying abroad is a great way to gain international experience either with academic credit, internships or service-learning opportunities. For details on programs, applying and other opportunities of studying abroad, visit Global Penn State at <https://global.psu.edu/>. The faculty advisor is Dr. William Burgos.