

RENSSELAER POLYTECHNIC INSTITUTE

School of Engineering

**CIVIL AND  
ENVIRONMENTAL  
ENGINEERING**

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**HANDBOOK**  
Fall 2015

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# Department of Civil and Environmental Engineering

<http://www.cee.rpi.edu>

## **Welcome**

This handbook should assist students in understanding the role of Civil and Environmental Engineers and how best to navigate their degree at Rensselaer.

## **Civil Engineering Program**

Civil engineers are involved in providing the physical infrastructure that supports civilization, including shelter, transportation, water supply and waste disposal and/or recycling. Constructed facilities, their planning, analysis, design, construction, maintenance and operation, are the forte of civil engineering. Civil engineers use computational tools, engineered and natural materials and human creativity to design, construct and maintain the physical infrastructure, which supports the quality of life of the Earth's population.

For the individual who has a strong interest in innovative planning, design and construction, civil engineering offers wide ranging opportunities for applying knowledge and creativity in making the world a better place to live. Students in civil engineering study the two-year common core curriculum in engineering, followed by core civil engineering courses in structural engineering, geotechnical engineering, transportation engineering and environmental engineering. These courses are supplemented by elective concentrations in any one of the sub-areas listed above, as well as in the area of construction engineering in cooperation with the School of Architecture.

## **Civil Engineering Program Educational Objectives**

- Contribute to the body of knowledge in Civil Engineering as professionals engaged in problem-solving, design, discovery, and responsible application of technology;
- Further develop leadership skills by accepting increasing levels of responsibility in engineering practice, communicating in professional and civic forums, and progressing toward professional licensure;
- Continue to develop both professionally and personally through graduate study, participation in professional societies, continuing education, and community service.

The Rensselaer bachelor's program in Civil Engineering builds upon a broad base of studies in mathematics, basic science, and fundamental engineering topics. Students then concentrate in geotechnical, structural, transportation, or environmental engineering with a culminating senior-design experience in the Civil Engineering Capstone Design course. A minimum of 128 credit hours is required for this curriculum.

Qualified students may pursue a professional program leading to the Master of Engineering (M. Eng.) degree as well as the B.S. degree. For this program, an additional 30 credit hours are required beyond the B.S. degree.

## **Environmental Engineering Program**

The Environmental Engineering program brings together dedicated people to study and work on the pressing environmental issues of our time. We prepare students for environmental careers in consulting engineering practice, private industry, national and international

research laboratories, government agencies and academia, as well as in many cross-disciplinary areas of engineering, science and public policy. The department maintains close ties with people and organizations in all these career venues through an active research agenda and a vibrant alumni community. Student needs and career objectives are met through a well-crafted, rigorous, and interdisciplinary curriculum that stresses hands-on learning, grounding in fundamentals, and practical experience.

Our long-standing tradition of education in environmental problem solving at Rensselaer spans from the pioneering work on water analysis by William Pitt Mason in the later 1800's to the visionary environmental engineering ideas of Edward J. Kilcawley who introduced environmental engineering as an option in the mid-1940's and as a degree program in the mid-1950's. In addition to the Department of Civil and Environmental Engineering, there are faculty members at Rensselaer with teaching and research interests in environmental problem solving in the Departments of Biology, Chemical Engineering, Chemistry, Earth and Environmental Sciences and Applied Math.

### **Environmental Engineering Program Educational Objectives**

While certain objectives of an undergraduate education in engineering are common to all programs, there are subtle but important differences depending upon the student's chosen field. In this regard, Environmental Engineering baccalaureate will:

- Contribute to the body of knowledge in Environmental Engineering as professionals engaged in problem-solving, design, discovery, and responsible application of technology;
- Further develop leadership skills by accepting increasing levels of responsibility in engineering practice, communicating in professional and civic forums, and progressing toward professional licensure;
- Continue to develop both professionally and personally through graduate study, participation in professional societies, continuing education, and community service

The Rensselaer bachelor's program in Environmental Engineering builds upon a broad base of studies in chemistry, life sciences, mathematics and engineering sciences, including such topics as elementary mechanics, computer aided design, fluid mechanics, applied statistics, probability, and professional development.

The Environmental Engineering course sequence addresses environmental issues associated with air, land, and water systems and associated environmental health impacts; integrated laboratory experiences prepare students to design experiments and critically analyze and interpret data. Engineering topics treated at an advanced level include water purification, chemical fate and transport, biological processes, air quality, hydrology and hydraulics. Design experiences are integrated throughout the curriculum, culminating in the capstone Environmental Process Design course. A minimum of 128 credit hours is required for this curriculum.

Qualified students may pursue a professional program leading to the Master of Engineering (M.Eng.) degree as well as the B.S. degree. An additional 30 credit hours are required beyond the B.S. degree.

## Contact Information

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## Faculty

There are 18 regular faculty in civil and environmental engineering, with doctorates from internationally recognized programs. Many of the faculty have extensive practical experience, and all are determined to prepare our students for the challenges of civil and environmental engineering careers.

## Graduate Programs

The Department offers graduate opportunities leading to Master of Engineering (ME), Master of Science (MS), and Doctor of Philosophy (PhD) degrees in civil engineering, environmental engineering and transportation engineering.

## Employment and Research Opportunities

There are numerous opportunities for employment in the summer, as well as co-op assignments during the regular academic year, in the design and construction industries and with government agencies. Many of our students take advantage of the opportunity to participate in on-campus undergraduate research projects with our faculty.

## Useful Links:

Advising and Learning Assistance Center: <http://alac.rpi.edu/setup.do>

Career Development Center: <http://www.rpi.edu/dept/cdc/>

Co-Op / Internships: <http://www.rpi.edu/dept/cdc/students/experience/coop/index.html>

Course Catalog: <http://www.rpi.edu/academics/catalog/>

International Programs: <http://undergrad.rpi.edu/update.do?catcenterkey=81>

Registrar Forms: <http://srfs.rpi.edu/update.do?catcenterkey=29>

Student Handbook: [http://www.rpi.edu/dept/doso/resources/judicial/docs/2012-2014RPIStudentHandbookofRightsandResponsibilitiesAUGUST2012\(rev\).pdf](http://www.rpi.edu/dept/doso/resources/judicial/docs/2012-2014RPIStudentHandbookofRightsandResponsibilitiesAUGUST2012(rev).pdf)

Student Information System: <http://sis.rpi.edu/>

Undergraduate Research Program: <http://undergrad.rpi.edu/update.do?catcenterkey=77>

# Faculty & Staff Directory

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## Civil Engineering Bachelor's Degree Requirements

The requirements of the BSCE program are outlined as follows:

- The BSCE degree requires a minimum of 128 credit hours.
- The minimum grade point average (GPA) is **2.0**.
- The course content in humanities and social sciences must total a minimum of **24 credit hours**, including at least **eight credit hours** in the humanities and **eight credit hours** in the social sciences. For engineering students, four of these credits are satisfied with Professional Development courses (PDI, II and III). For information on additional requirements see the School of Humanities, Arts, and Social Sciences section of the course catalog.
- Every Civil Engineering student is required to take at least **two** communication-intensive (CI) courses. One of these (CI) courses must be taught in the School of Humanities, Arts, and Social Sciences (HASS). A list of HASS (CI) courses is available on the Student Information System (SIS) homepage. The other CI course for Civil Engineering is CIVL 4920 CE Capstone Design.
- The student must be registered full-time for a minimum of four semesters. Two semesters of part-time study at Rensselaer will be considered equivalent to one semester of full-time study. In addition, the student must complete a minimum of **48 credit hours** at Rensselaer, all of which will be applied to the baccalaureate degree. If a transfer student elects to study abroad through the REACH Program, no more than 12 such credits may apply to the 48 needed for the bachelor's degree.

A degree candidate must earn the last 30 credits in courses completed on this campus or through a program formally recognized by the Institute. Transfer courses are limited to two courses or eight credits counting toward the student's last 30 credits and require approval of the director of the Advising and Learning Assistance Center.

### Dual Majors

Undergraduate students who fulfill all the degree requirements for two curricula and who have met the conditions below will have completed a dual major. They will receive one diploma noting both majors. (1) The student must designate a first-named and second-named major in writing at least one semester prior to graduation, and have the appropriate department(s) approve this designation prior to filing the dual major form with the registrar. (2) Each student will be assigned an adviser in each department who will monitor progress towards degrees in that specific department. (3) The degree clearance officer in each department will certify that the student has met the degree requirements in that department. (4) The 24-credit-hour mathematics/science requirement and the 24-credit-hour humanities and social sciences requirement will satisfy the Institute requirements for both majors.

### Double Degrees

A student may become a candidate for a second baccalaureate degree when he or she has completed: (1) the equivalent of at least two terms (30 credit hours) of additional work beyond the requirements of a single degree, and (2) the courses in the department in which the student is registered and such other courses as are required for the second degree. From the CEE department's perspective, students considering a Double Degree may want to instead consider a Co-terminal or regular Master's degree. The ability to obtain a graduate level degree by taking 30

credits beyond the Bachelor's degree should be seriously considered rather than taking 30 additional credits and end up with a second Bachelor's degree.

### **Minor in Civil Engineering**

Students pursuing this minor must satisfy the prerequisites and/or corequisites for these courses, which may involve other course work.

### **Program Requirements**

Students not majoring in civil engineering may receive a minor in this field by completing five courses selected from the following list (subject to consultation with a civil engineering department program adviser):

- CIVL 2030 - Introduction to Transportation Engineering Credit Hours: 4
- CIVL 2630 - Introduction to Geotechnical Engineering Credit Hours: 4
- CIVL 2670 - Introduction to Structural Engineering Credit Hours: 4
- CIVL 4010 - Foundation Engineering Credit Hours: 3
- CIVL 4070 - Steel Design Credit Hours: 3
- CIVL 4080 - Concrete Design Credit Hours: 3
- CIVL 4150 - Experimental Soil Mechanics Credit Hours: 3
- CIVL 4440 - Matrix Structural Analysis Credit Hours: 3
- CIVL 4660 - Traffic Engineering Credit Hours: 3
- CIVL 4670 - Highway Engineering Credit Hours: 3
- ENVE 2110 - Introduction to Environmental Engineering Credit Hours: 4

### **Recommended Courses for Students in Bachelor of Architecture Program**

Given the close link between architecture and civil engineering, the following set of courses are recommended for students in the Bachelor of Architecture program who are interested in completing a minor in civil engineering with an emphasis in structural engineering.

Take all of the following:

- CIVL 2670 - Introduction to Structural Engineering Credit Hours: 4
- CIVL 4070 - Steel Design Credit Hours: 3
- CIVL 4080 - Concrete Design Credit Hours: 3

Take two additional courses from the following:

- CIVL 2630 - Introduction to Geotechnical Engineering Credit Hours: 4
- CIVL 4010 - Foundation Engineering Credit Hours: 3
- CIVL 4150 - Experimental Soil Mechanics Credit Hours: 3
- CIVL 4270 - Construction Management Credit Hours: 3
- CIVL 4280 - Design for Constructability Credit Hours: 3
- CIVL 4440 - Matrix Structural Analysis Credit Hours: 3

Notes:

- 1) Completion of MATH 1010 is recommended prior to enrolling in Civil Engineering courses. However, MATH 1500 is an acceptable alternative to MATH 1010.
- 2) The core engineering courses ENGR 1100 and 2530 are prerequisites for many of the civil engineering courses. These core courses are waived for students who have completed ARCH 2330 with a grade of B or higher.
- 3) Subject to approval of the School of Architecture program adviser, ARCH 4330 will be waived for students who complete CIVL 2670, 4070, and 4080. Since ARCH 4330 is part of the Bachelor

of Architecture core program, students will be required to substitute a 4-credit elective in its place.

4) Bachelor of Architecture students pursuing this minor should recognize that some of the civil engineering courses may rely on material from some of the core engineering courses (i.e., ENGR 1100, ENGR 2090, MATH 1010, MATH 1020, MATH 2400, and PHYS 1100). Thus, the student should anticipate the possible need for some self-study while taking the civil engineering courses.

## **Required Named Courses for B.S. in Civil Engineering**

### **FIRST YEAR FALL:**

#### **CHEM-1100 - Chemistry I**

Principles of chemistry, with particular focus on atomic and molecular structure and bonding, periodicity, basic thermodynamic principles, introduction to acid-base chemistry and elementary chemical equilibrium, and introduction to organic chemistry. Students cannot get credit for both this course and CHEM-1110. Fall term annually. **4 credit hours**

#### **ENGR-1100 - Introduction to Engineering Analysis**

An integrated development of linear algebra and statics emphasizing engineering applications and also incorporating computer exercises involving matrix techniques and calculations using available software packages. Fall, spring, and summer terms annually. **4 credit hours**

#### **CIVL-1200 - Engineering Graphics for Civil Engineers**

An introduction to the elements of computer aided design for Civil and Environmental Engineers using AutoCAD Civil 3D. Students will be introduced to basic AutoCAD drafting techniques as well as learn the key features of Civil 3D that aid site development design and analysis. Topics covered will include general AutoCAD techniques, existing conditions development and analysis using field collected survey data and GIS information, pipe network design, grading design, and roadway corridor layout.

Fall term annually. **3 contact hours, 1 credit hour**

**Note: CIVL 1200 may be replaced with ENGR 1200.**

#### **MATH 1010 - Calculus I**

Functions, limits, continuity, derivatives, implicit differentiation, related rates, maxima and minima, elementary transcendental functions, introduction to definite integral with applications to area and volumes of revolution. Fall and spring terms annually. **4 credit hours**

### **FIRST YEAR SPRING:**

#### **CIVL-1100 – Introduction to Civil and Environmental Engineering**

Deals with the practice of Civil and Environmental Engineering. Not a highly analytical course, as the course is primarily intended for first year students. Some topics: history of Civil Eng.; present practice; typical employers; typical projects; design philosophy; professional topics including organizations, registrations, ethics. Discuss case histories, bring in outside speakers. Students attend CE Capstone presentations. Spring term annually. **1 credit hour**

**Note: CIVL 1100 may be replaced with ENGR 1300.**

#### **MATH-1020 - Calculus II**

Techniques and applications of integration, polar coordinates, parametric equations, infinite sequences and series, vector functions and curves in space, functions of several variables, and partial derivatives. Prerequisite: MATH 1010. Fall and spring terms annually. **4 credit hours**

#### **PHYS-1100 - Physics I**

The first semester of a two-semester sequence of interactive courses. Topics include linear and angular kinematics and dynamics, work and energy, momentum and collisions, forces and fields, gravitation, oscillatory motion, waves, sound and interference. Corequisite: MATH 1010 or equivalent or permission of instructor. Credit cannot be obtained for both Physics 1050 and Physics 1100. Fall and spring terms annually. **4 credit hours**

## **SECOND YEAR FALL:**

### **ENGR-2050 - Introduction to Engineering Design**

A first course in engineering design, which emphasizes creativity, teamwork, communication, and work across engineering disciplines. Students are introduced to the design process through a semester-long project which provides a design-build-test experience. Oral and written communication are important elements of the course. The course meets with ENGR 1010.

Prerequisites: ENGR 1100 and ENGR 1200. Corequisite: PHYS 1200.

Fall, spring, and summer terms annually. **4 credit hours**

### **MATH-2400 - Introduction to Differential Equations**

First-order differential equations, second-order linear equations, eigenvalues and eigenvectors of matrices, systems of first-order equations, stability and qualitative properties of nonlinear autonomous systems in the plane, Fourier series, separation of variables for partial differential equations. Prerequisites: MATH 1020 and some knowledge of matrices. Fall and spring terms annually. **4 credit hours**

### **PHYS-1200 - Physics II**

The second semester of the two-semester sequence of interactive courses. Topics include electric and magnetic forces and fields, Gauss's Law, dc and ac circuits, Ampere's Law and Faraday's Law, electromagnetic radiation, physical optics, and quantum physics. Prerequisite: PHYS 1100 or equivalent or permission of instructor. Corequisite: MATH 1020. Fall and spring terms annually. **4 credit hours**

## **SECOND YEAR SPRING:**

### **CSCI-1190 - Beginning C Programming for Engineers**

This course teaches elementary programming concepts using the MATLAB environment for engineering students with little or no prior programming experience. Concepts include variables, looping, and function calls. Students cannot get credit for CSCI 1190 after earning credit for CSCI 1100 or any higher level CSCI course. Fall and spring terms annually. **1 credit hour**

**Note: CSCI 1190 may be replaced with CSCI 1100 Computer Science I or CSCI 1010 Introduction to Computer Programming.**

### **ENGR-2090 - Engineering Dynamics**

An integrated development of modeling- and problem-solving techniques for particles and rigid bodies emphasizing the use of free-body diagrams, vector algebra, and computer simulation. Topics covered include the kinematics and kinetics of translational, rotational, and general plane motion, energy and momentum methods. Prerequisites: ENGR 1100 and PHYS 1100.

Corequisite: MATH 2400. Fall and spring term annually. **4 credit hours**

### **ENGR-2250 - Thermal and Fluids Engineering I**

Application of control volume balances of mass, momentum, energy and entropy in systems of practical importance to all engineers. Identification of control volumes, properties of pure materials, mass and energy conservation for closed and open systems, second law of thermodynamics, Bernoulli equation, fluid statics, forces and heat transfer in external and internal flows, conduction and radiative heat transfer. Prerequisites: ENGR 1100 and PHYS 1100. Corequisite: MATH 2400. Fall, spring, and summer terms annually. **4 credit hours**

### **ENGR-2530 - Strength of Materials**

Concept of stress and strain, generalized Hooke's law, axial load, torsion, pure bending, transverse loading, transformation of stress and strain components in 2-D, design of beams and shafts for strength, deflection of beams, work and energy, columns. Prerequisite: ENGR 1100. Fall, spring and summer terms annually. **4 credit hours**

### **THIRD YEAR FALL:**

#### **CIVL-2030 - Introduction to Transportation Engineering**

Introduction to basic concepts in transportation engineering including planning, design, and operations. Introduces the challenges and issues in modeling transportation problems. Studies of various concepts related to the design of highway facilities, level of service, and demand for transportation services. Concepts related to signal optimization. Policy implications. Basics of transportation planning. Prerequisite: MATH 2400. Fall term annually. **4 credit hours**

#### **CIVL-2630 - Introduction to Geotechnical Engineering**

The application of the basic laws and phenomena of science to particulate matter, specifically soils. Basic physical and mechanical structural characteristics of soil. Equilibrium and movement of water. Flow through porous media. Effective stress. Stress-strain-time relations. Basic laboratory work as related to practice. Prerequisite: ENGR 2530. Fall term annually. **4 credit hours**

#### **CIVL-2670 - Introduction to Structural Engineering**

Introduction to the elastic behavior of structural components. Analysis of statically determinate systems. Deflection calculations by virtual work and elastic load methods. Analysis of simple statically indeterminate structures. Influence lines. Interaction of structural components. Typical structural engineering loads. Prerequisite: ENGR 2530 or equivalent. Fall term annually. **4 credit hours**

#### **ENVE-2110 - Introduction to Environmental Engineering**

The application of basic principles and equations dealing with water, air, and solid and hazardous wastes; material and energy balances; and chemical and biochemical cycles. Topics include water resources, water quality and pollution, air quality and pollution, solid and hazardous wastes, and environmental legislation. Prerequisite: CHEM 1100; Corequisite: MATH 2400, ENGR 2250. Fall term annually. **4 credit hours**

### **THIRD YEAR SPRING:**

#### **ENVE-4310 - Applied Hydrology and Hydraulics**

Physical processes governing occurrence and distribution of precipitation, infiltration, evaporation, and surface water runoff. Statistical hydrology, unit hydrograph theory, and watershed modeling. Floodplain hydrology and open channel hydraulics. Urban hydrology, hydraulics and design of storm sewers, and design of detention structures for flood control. Design project using the Army Corps of Engineers Hydraulic Engineering Center HEC-1 flood hydrograph package. Prerequisite: ENGR 2250 or CHME 4010. Spring term annually. **4 credit hours**

#### **ENGR-4760 - Engineering Economics**

The objective is to help engineering students recognize and understand the importance of cost factors that are inherent in all engineering decisions. Development of ability to handle engineering problems that involve economic factors. The course includes economic environment, selections in present economy, value analysis, critical path economy, interest and money-time relationships, depreciation and valuation, capital financing and budgeting, basic methods for undertaking economic studies, risk, uncertainty and sensitivity, selections between alternatives, fixed, increment, and sunk costs, the effects of income taxes in economic studies, replacement studies, minimum cost formulas, economic studies of public projects, economic studies in public utilities. Effects of inflation are considered at each step. Students cannot obtain credit for both this course and ENGR 4750. Spring term annually. **3 credit hours**

## **FOURTH YEAR FALL:**

### **ENGR-2600 - Modeling and Analysis of Uncertainty**

Appreciation and understanding of uncertainties and the conditions under which they occur, within the context of the engineering problem-solving pedagogy of measurements, models, validation, and analysis. Problems and concerns in obtaining measurements; tabular and graphical organization of data to minimize misinformation and maximize information; and development and evaluation of models. Concepts will be supported with computer demonstration. Applications to problems in engineering are emphasized. Prerequisite: MATH 1010. Fall and spring terms annually. **3 credit hours**

## **FOURTH YEAR SPRING:**

### **CIVL-4920 - Civil Engineering Capstone Design**

Open-ended design project in which students work in teams. Oral presentations and written reports cover alternates considered, design assumptions, cost, safety, and feasibility. This is a communication-intensive course. Prerequisites: senior status and CIVL 4070 and CIVL 4080, or CIVL 4010 and CIVL 4150, or CIVL 2030 and CIVL 4660 or CIVL 4640 or ENVE 2110 and either ENVE 4200, ENVE 4350, ENVE 4310 or ENVE 4340. Spring term annually. **3 credit hours**

### **ENGR-4010 - Professional Development III**

Students will study issues associated with working in teams in a modern work environment. Various styles of leadership, the definitions of power and empowerment and their applications in industry and team settings will be studied. Additionally, other topics to be explored include vision, values and attitudes, and organizational culture. The course format will include small and large group discussions, case studies, experiential exercises, and regular participation from industry guests. Offered in conjunction with senior courses. **1 credit hour**

**Note: Can be taken either semester of the senior year.**

## **Additional Requirements**

A minimum of 128 credit hours is required for this curriculum. Non-engineering courses grades satisfactory/unsatisfactory cannot be applied toward this 128-credit hour requirement. **The Pass/No Credit option can be used only for humanities and social sciences electives subject to Institute-wide HASS core requirements and free electives having a department code other than CIVL or ENVE (per Institute policy, no more than 12 credits total can be taken Pass/No Credit). All other courses used to satisfy the degree requirements must be taken on a graded basis.**

# Civil Engineering Curriculum

FALL		FIRST	YEAR	SPRING	
CHEM 1100	Chemistry I	4	CIVL 1100	Intro to Civil & Env. Eng. <sup>3</sup>	1
MATH 1010	Calculus I	4	MATH 1020	Calculus II	4
ENGR 1100	Intro. to Eng. Analysis	4	PHYS 1100	Physics I	4
CIVL 1200	Eng. Graphics for Civil Eng <sup>1</sup>	1		Basic Science Elective <sup>2</sup>	4
	Hum., Arts or Soc. Sci. El.	4		Hum., Arts or Soc. Sci. El.	4
		SECOND	YEAR		
MATH 2400	Intro. to Differential Eqns.	4	ENGR 2090	Engineering Dynamics	4
PHYS 1200	Physics II	4	ENGR 2250	Thermal & Fluids Eng. I	4
ENGR 2050	Intro. to Eng. Design	4	ENGR 2530	Strength of Materials	4
	Hum., Arts or Soc. Sci. El.	4	CSCI 1190	Beginning C Prog. for Eng. <sup>4</sup>	1
				Hum., Arts or Soc. Sci. El.	4
		THIRD	YEAR		
CIVL 2030	Intro to Transp. Eng.	4		CE Design Elective <sup>5</sup>	3
CIVL 2630	Intro to Geotech. Eng.	4	ENVE 4310	Applied Hydrology & Hydr.	4
CIVL 2670	Intro to Structural Eng.	4	ENGR 4760	Eng. Economics	3
ENVE 2110	Intro to Env. Eng.	4		Professional Develop. II <sup>6</sup>	2
				Free Elective	4
		FOURTH	YEAR		
ENGR 2600	Model. & Analysis of Uncert	3	CIVL 4920	CE Capstone Design	3
	CE Design Elective <sup>5</sup>	3	ENGR 4010	Professional Devel. III <sup>8</sup>	1
	Free Elective	4		CE Tech. Elective <sup>5</sup>	3
	Math and Science Elective <sup>7</sup>	4		Free Elective	4
				Hum., Arts or Soc. Sci. El.	4

<sup>1</sup> CIVL 1200 may be replaced with ENGR 1200.

<sup>2</sup> Any 4-credit course in the School of Science with a prefix of ASTR, BIOL or EARTH.

<sup>3</sup> CIVL 1100 may be replaced with ENGR 1300.

<sup>4</sup> CSCI 1190 may be replaced with CSCI 1100.

<sup>5</sup> Text below lists the allowable courses.

<sup>6</sup> This course will be fulfilled from a list published at the start of each semester.

<sup>7</sup> Any 4-credit course in the School of Science with a prefix of ASTR, BCBP, BIOL, CHEM, EARTH, MATH or PHYS.

<sup>8</sup> Can be taken either semester of the senior year.

## 128 credits minimum

### CE DESIGN ELECTIVES AND CONCENTRATIONS

#### **Structural Engineering**

CIVL 4070 Steel Design (Fall)  
CIVL 4080 Concrete Design (Spring)

#### **Geotechnical Engineering**

CIVL 4010 Foundation Engineering (Fall)  
CIVL 4140 Geoenvironmental Eng. (Fall)  
CIVL 4150 Experimental Soil Mechanics (Spring)

#### **Environmental Engineering**

ENVE 4200 Solid and Hazardous Waste Eng. (Spring)  
ENVE 4330 Introduction to Air Quality (Fall)  
ENVE 4340 Physicochemical Processes in Env. Eng. (Spring)  
ENVE 4350 Biological Processes in Env. Eng. (Fall)

#### **Transportation Engineering**

CIVL 4620 Mass Transit Systems (Spring)  
CIVL 4640 Transp. Facility Design & Planning (Spring)  
CIVL 4660 Traffic Engineering (Fall)  
CIVL 4670 Highway Engineering (Spring)

### CE TECHNICAL ELECTIVES

CIVL 2040 Professional Practice  
CIVL 4240 Intro. to Finite Elements  
CIVL 4270 Construction Management  
CIVL 4440 Matrix Structural Analysis

**Additional Courses:** With adviser approval, courses from related disciplines can also be taken. These include architecture, environmental engineering, earth and environmental sciences, mechanical engineering, chemical engineering, industrial engineering, and operations research. A representative list of such courses is as follows:

ENVE 4110 - Aqueous Geochemistry	ENVE 4200 - Solid and Hazardous Waste Engineering
ENVE 4310 - Applied Hydrology and Hydraulics	ERTH 2120 - Structural Geology
ERTH 2330 - Earth Materials	ERTH 4710 - Groundwater Hydrology
MATH 4800 - Numerical Computing Credit Hours: 4	

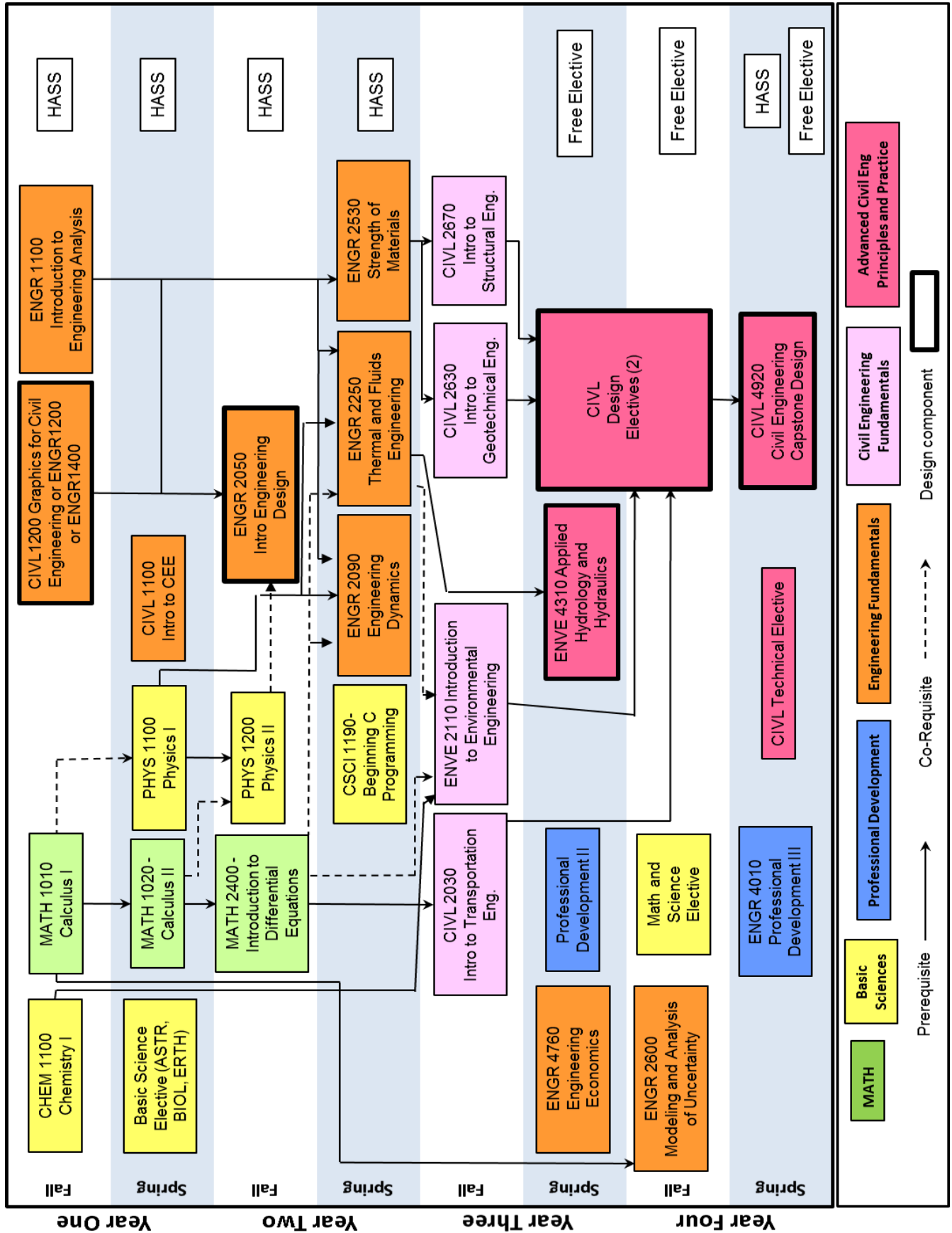


## Civil Engineering Curriculum Helpful Hints

Following the CE curriculum presented above will allow students to graduate with a BSCE Degree in 4 years. However, in the case of Co-op, Semester Abroad, Transfer, deviation from the template and graduating in four years is still possible. Listed below are helpful hints on which deviations from the standard template are possible and which should be avoided.

- 1) ENGR 2530 Strength of Materials is a prerequisite for both CIVL 2630, Intro. to Geotech and CIVL 2670, Intro. to Structures. Hence, ENGR 2530 should be taken no later than Spring/Sophomore year. If that is not possible, take ENGR 2530 in the summer before Fall/Junior year.
- 2) The four CEE Intro. courses – CIVL 2030, CIVL 2630, CIVL 2670 and ENVE 2110 – are only offered Fall semester. It is best to take these Fall semester of the Junior year. If taking all four Fall/Junior year is not possible, then take the Intro. courses in your specific area of interest and defer others (i.e., if you are interested in structural engineering, take CIVL 2670 Fall/Junior year and defer CIVL 2030 or ENVE 2110 to Fall/Senior year).
- 3) CIVL 4920, CE Capstone Design is only offered Spring semester. If you will be taking 4 1/2 years to complete your degree, arrange your courses so that the Capstone pre-requisite (two design course sequence) is completed prior to Spring/Senior year.
- 4) Except for ENGR 2530, Strength of Materials, students can take most required ENGR courses, specifically ENGR 2090, 2250, 2600, 4760 whenever the prerequisite/corequisite is completed.
- 5) If you are planning to be away from campus for either the Co-op or Study Abroad program, the best time to pursue these programs is the Spring semester, Junior year.

# Civil Engineering Required Courses Flowchart



## Environmental Engineering Bachelor's Degree Requirements

The requirements of the BSEE program are outlined as follows:

- The BSEE degree requires a minimum of 128 credit hours.
- The minimum grade point average (GPA) is **2.0**.
- The course content in humanities and social sciences must total a minimum of **24 credit hours**, including at least **eight credit hours** in the humanities and **eight credit hours** in the social sciences. For engineering students, four of these credits are satisfied with Professional Development courses (PD I, II and III). For more information on additional requirements see the School of Humanities, Arts, and Social Sciences section of the course catalog.
- Every Environmental Engineering student is required to take at least two communication-intensive courses. One of these courses must be communication intensive and taught in the School of Humanities, Arts, and Social Sciences (HASS). A list of HASS (CI) courses is available on the Student Information System (SIS) homepage. The other CI course for Environmental Engineering is ENVE 4180 Environmental Process Design.
- The student must be registered full-time for a minimum of four semesters. Two semesters of part-time study at Rensselaer will be considered equivalent to one semester of full-time study. In addition, the student must complete a minimum of **48 credit hours** at Rensselaer, all of which will be applied to the baccalaureate degree. If a transfer student elects to study abroad or enroll in the co-op program, no more than 12 such credits may apply to the 48 needed for the bachelor's degree.

A degree candidate must earn the last 30 credits in courses completed on this campus or through a program formally recognized by the Institute. Transfer courses are limited to two courses or eight credits counting toward the student's last 30 credits and require approval of the director of the Advising and Learning Assistance Center.

### Dual Majors

Undergraduate students who fulfill all the degree requirements for two curricula and who have met the conditions below will have completed a dual major. They will receive one diploma noting both majors. (1) The student must designate a first-named and second-named major in writing at least one semester prior to graduation, and have the appropriate department(s) approve this designation prior to filing the dual major form with the registrar. (2) Each student will be assigned an adviser in each department who will monitor progress towards degrees in that department. (3) The degree clearance officer in each department will certify that the student has met the degree requirements in that specific department. (4) The 24- credit-hour mathematics/science requirement and the 24-credit-hour humanities and social sciences requirement will satisfy the Institute requirements for both majors.

### Double Degrees

A student may become a candidate for a second baccalaureate degree when he or she has completed: (1) the equivalent of at least two terms (30 credit hours) of additional work beyond the requirements of a single degree, and (2) the courses in the department in which the student is registered and such other courses as are required for the second degree. From the CEE department's perspective, students considering a Double Degree may want to instead consider a

Co-terminal or regular Master's degree. The ability to obtain a graduate level degree by taking 30 credits beyond the Bachelor's degree should be seriously considered rather than taking 30 additional credits and end up with a second Bachelor's degree.

## **Minor in Environmental Engineering**

### **Program Requirements**

Students not majoring in environmental engineering may receive a minor in this discipline by completing 15-16 credit hours of study beyond the Introduction to Environmental Engineering course. Typically these courses are chosen in consultation with the environmental engineering program adviser but may include:

- ENVE 4260 - Biological Processes in Environmental Engineering
- ENVE 4310 - Applied Hydrology and Hydraulics *Credit Hours: 4*
- ENVE 4340 - Physicochemical Processes in Environmental Engineering *Credit Hours: 4*

And one or more of:

- ENVE 4200 - Solid and Hazardous Waste Engineering *Credit Hours: 3*
- ENVE 4320 - Environmental Chemodynamics *Credit Hours: 4*
- ENVE 4330 - Introduction to Air Quality *Credit Hours: 4*

## **Required Named Courses for B.S. in Environmental Engineering**

### **FIRST YEAR FALL:**

#### **CHEM-1100 - Chemistry I**

Principles of chemistry, with particular focus on atomic and molecular structure and bonding, periodicity, basic thermodynamic principles, introduction to acid-base chemistry and elementary chemical equilibrium, and introduction to organic chemistry. Students cannot get credit for both this course and CHEM-1110. Fall term annually. **4 credit hours**

#### **ENGR-1100 - Introduction to Engineering Analysis**

An integrated development of linear algebra and statics emphasizing engineering applications and also incorporating computer exercises involving matrix techniques and calculations using available software packages. Fall, spring, and summer terms annually. **4 credit hours**

#### **CIVL-1200 - Engineering Graphics for Civil Engineers**

An introduction to the elements of computer aided design for Civil and Environmental Engineers using AutoCAD Civil 3D. Students will be introduced to basic AutoCAD drafting techniques as well as learn the key features of Civil 3D that aid site development design and analysis. Topics covered will include general AutoCAD techniques, existing conditions development and analysis using field collected survey data and GIS information, pipe network design, grading design, and roadway corridor layout. Fall term annually. **1 credit hour**

**Note: CIVL 1200 may be replaced with ENGR 1200 Graphics and CAD, or ENGR 1400 Engineering Communications.**

#### **MATH 1010 - Calculus I**

Functions, limits, continuity, derivatives, implicit differentiation, related rates, maxima and minima, elementary transcendental functions, introduction to definite integral with applications to area and volumes of revolution. Fall and spring terms annually. **4 credit hours**

### **FIRST YEAR SPRING:**

#### **CIVL-1100 – Introduction to Civil and Environmental Engineering**

Deals with the practice of Civil and Environmental Engineering. Not a highly analytical course, as the course is primarily intended for first year students. Some topics: history of Civil Eng.; present practice; typical employers; typical projects; design philosophy; professional topics including organizations, registrations, ethics. Discuss case histories, bring in outside speakers. Students attend CE Capstone presentations. Spring term annually. **1 credit hour**

**Note: CIVL 1100 may be replaced with ENGR 1300.**

#### **MATH-1020 - Calculus II**

Techniques and applications of integration, polar coordinates, parametric equations, infinite sequences and series, vector functions and curves in space, functions of several variables, and partial derivatives. Prerequisite: MATH 1010. Fall and spring terms annually. **4 credit hours**

#### **PHYS-1100 - Physics I**

The first semester of a two-semester sequence of interactive courses. Topics include linear and angular kinematics and dynamics, work and energy, momentum and collisions, forces and fields, gravitation, oscillatory motion, waves, sound and interference. Corequisite: MATH 1010 or equivalent or permission of instructor. Credit cannot be obtained for both Physics 1050 and Physics 1100. Fall and spring terms annually. **4 credit hours**

## **SECOND YEAR FALL:**

### **ENGR-2250 - Thermal and Fluids Engineering I**

Application of control volume balances of mass, momentum, energy and entropy in systems of practical importance to all engineers. Identification of control volumes, properties of pure materials, mass and energy conservation for closed and open systems, second law of thermodynamics, Bernoulli equation, fluid statics, forces and heat transfer in external and internal flows, conduction and radiative heat transfer. Prerequisites: ENGR 1100 and PHYS 1100. Corequisite: MATH 2400. Fall, spring, and summer terms annually. **4 credit hours**

***Note: ENGR 2250 may be replaced by CHME 4010.***

### **ENVE-2110 - Introduction to Environmental Engineering**

The application of basic principles and equations dealing with water, air, and solid and hazardous wastes; material and energy balances; and chemical and biochemical cycles. Topics include water resources, water quality and pollution, air quality and pollution, solid and hazardous wastes, and environmental legislation. Prerequisite: CHEM 1100; Corequisites: MATH 2400, ENGR 2250. Fall term annually. **4 credit hours**

### **MATH-2400 - Introduction to Differential Equations**

First-order differential equations, second-order linear equations, eigenvalues and eigenvectors of matrices, systems of first-order equations, stability and qualitative properties of nonlinear autonomous systems in the plane, Fourier series, separation of variables for partial differential equations. Prerequisites: MATH 1020 and some knowledge of matrices. Fall and spring terms annually. **4 credit hours**

### **PHYS-1200 - Physics II**

The second semester of the two-semester sequence of interactive courses. Topics include electric and magnetic forces and fields, Gauss's Law, dc and ac circuits, Ampere's Law and Faraday's Law, electromagnetic radiation, physical optics, and quantum physics. Prerequisite: PHYS 1100 or equivalent or permission of instructor. Corequisite: MATH 1020. Fall and spring terms annually. **4 credit hours**

## **SECOND YEAR SPRING:**

### **CSCI-1190 - Beginning C Programming for Engineers**

This course teaches elementary programming concepts using the MATLAB environment for engineering students with little or no prior programming experience. Concepts include variables, looping, and function calls. Students cannot get credit for CSCI 1190 after earning credit for CSCI 1100 or any higher level CSCI course. Fall and spring terms annually. **1 credit hour**

***Note: CSCI 1190 may be replaced with CSCI 1100 Computer Science I or CSCI 1010 Introduction to Computer Programming.***

### **ENGR-2050 - Introduction to Engineering Design**

A first course in engineering design, which emphasizes creativity, teamwork, communication, and work across engineering disciplines. Students are introduced to the design process through a semester-long project, which provides a design-build-test experience. Oral and written communication are important elements of the course. The course meets with ENGR 1010. Prerequisites: ENGR 1100 and ENGR 1200. Corequisite: PHYS 1200. Fall, spring, and summer terms annually. **4 credit hours**

### **ENGR-2600 - Modeling and Analysis of Uncertainty**

Appreciation and understanding of uncertainties and the conditions under which they occur, within the context of the engineering problem-solving pedagogy of measurements, models, validation, and analysis. Problems and concerns in obtaining measurements; tabular and

graphical organization of data to minimize misinformation and maximize information; and development and evaluation of models. Concepts will be supported with computer demonstration. Applications to problems in engineering are emphasized. Prerequisite: MATH 1010. Fall and spring terms annually. **3 credit hours**

### **THIRD YEAR FALL:**

#### **CHEM-2250 - Organic Chemistry I**

Structure and chemical behavior of organic molecules with particular emphasis on reaction mechanisms as pathways for understanding their reactions. Stereochemistry, synthesis, and spectroscopic methods for the identification of organic functional groups are among the topics included. Prerequisite: CHEM 1100 or 1110 or equivalent. Fall term annually. **3 credit hours**

#### **ENVE-4330 - Introduction to Air Quality**

Quantitative introduction to the engineering methods for the study of air quality. Topics include but are not limited to: estimation procedures for air pollution emissions; indoor air quality problems, impacts and control strategies; sources, impacts and control strategies for greenhouse gases; dispersion modeling for point sources; pollutant acidification of lakes; chemistry of stoichiometric and non-stoichiometric combustion; assessment methods for human exposure to air pollutants. Includes experimental analysis of air quality and air quality control processes, emphasizing experimental design, data evaluation, and report writing. Prerequisite: ENVE 2110. Fall term annually. **4 credit hours**

### **THIRD YEAR SPRING:**

#### **ENVE-4310 - Applied Hydrology and Hydraulics**

Physical processes governing occurrence and distribution of precipitation, infiltration, evaporation, and surface water runoff. Statistical hydrology, unit hydrograph theory, and watershed modeling. Floodplain hydrology and open channel hydraulics. Urban hydrology, hydraulics and design of storm sewers, and design of detention structures for flood control. Design project using the Army Corps of Engineers Hydraulic Engineering Center HEC-1 flood hydrograph package. Prerequisite: ENGR 2250 or CHME 4010. Spring term annually. **4 credit hours**

#### **ENVE-4320 - Environmental Chemodynamics**

The movement of chemicals in air, water, and soil is presented to demonstrate the relation of physiochemical principles in the behavior of chemicals in the environment. Topics include chemical and thermal equilibrium at environmental interfaces, transport fundamentals, and the fate and transport of chemicals in various environmental compartments. Includes experimental analysis of natural and engineered chemical and thermodynamic processes, emphasizing experimental design, data evaluation, and report writing. Prerequisites: ENVE 2110, CHEM 2250. Spring term annually. **4 credit hours**

#### **ENVE-4340 - Physicochemical Processes in Environmental Engineering**

Physical and chemical processes governing water quality in natural and engineered systems with applications to potable water treatment. Topics include reactor dynamics, coagulation and flocculation, sedimentation, filtration, gas transfer, adsorption and ion exchange, and membrane processes. A design project for which students develop a computer model of an environmental process is required. Includes laboratory experiments to measure physicochemical process parameters, emphasizing experimental design, data evaluation, and report writing. Corequisite: ENVE 4320. Spring term annually. **4 credit hours**

#### **FOURTH YEAR FALL:**

##### **ENGR-4010 - Professional Development III**

Students will study issues associated with working in teams in a modern work environment. Various styles of leadership, the definitions of power and empowerment and their applications in industry and team settings will be studied. Additionally, other topics to be explored include vision, values and attitudes, and organizational culture. The course format will include small and large group discussions, case studies, experiential exercises, and regular participation from industry guests. Offered in conjunction with senior courses. **1 credit hour**

***Note: Can be taken either semester of the senior year.***

##### **ENVE-4350 - Biological Processes in Environmental Engineering**

The study of biochemical and biological processes common to environmental engineering. Introductory physiology, biochemistry and ecology of bacteria, yeasts, fungi. Laboratory work in microbial techniques. Development of reaction rate and mass balances on biological processes for pollution control. Includes experimental analysis of natural and engineered biological processes, emphasizing experimental design, data evaluation, and report writing. Prerequisite: ENVE 4320. Fall term annually. **4 credit hours**

#### **FOURTH YEAR SPRING:**

##### **ENVE-4180 - Environmental Process Design**

The design of equipment, processes, and systems of interest in environmental engineering through application of scientific, technological and economic principles. Emphasis is placed on problem formulation and conceptual, analytical and decision aspects of open-ended design situations. Students will integrate knowledge and skills gained in previous and concurrent courses, and learn research techniques to find and use resources from the technical literature. Health and safety issues are presented. Professional development topics are presented including professional ethics and registration. Students will develop communication skills through proposal preparation, report writing, oral presentation. This is a communication-intensive course. Prerequisite: Senior status and ENVE 2110. Spring term annually. **3 credit hours**

#### **Additional Requirements**

A minimum of 128 credit hours is required for this curriculum. Non-engineering courses grades satisfactory/unsatisfactory cannot be applied toward this 128-credit hour requirement. **The Pass/No Credit option can be used only for humanities and social sciences electives (subject to Institute-wide HASS core requirements) and free electives having a department code other than CIVL or ENVE (per Institute policy, no more than 12 credits total can be taken Pass/No Credit). All other courses used to satisfy the degree requirements must be taken on a graded basis.**



# Environmental Engineering Curriculum

FALL	FIRST	YEAR	SPRING
	Hum., Arts or Soc. Sci. El. 4		Hum., Arts or Soc. Sci. El. 4
CHEM 1100	Chemistry I 4		CIVL 1100 Intro to Civil & Env. Eng. <sup>3</sup> 1
MATH 1010	Calculus I 4		MATH 1020 Calculus II 4
ENGR 1100	Intro. to Eng. Analysis 4		PHYS 1100 Physics I 4
CIVL 1200	Eng. Graphics for Civil Eng <sup>1</sup> 1		Science Elective <sup>2</sup> 4
SECOND		YEAR	
MATH 2400	Intro. to Differential Eqns. 4		ENGR 2050 Intro to Eng. Design 4
PHYS 1200	Physics II 4		ENGR 2600 Modeling & Anal. of Uncert. 3
ENGR 2250	Thermal and Fluids Eng <sup>4</sup> 4		CSCI 1190 Beginning C Prog. for Eng. <sup>5</sup> 1
ENVE 2110	Intro to Env. Eng. 4		Science Elective <sup>2</sup> 4
			Hum., Arts or Soc. Sci El 4
THIRD		YEAR	
	Free Elective I 4		Free Elective II 4
	Hum., Arts or Soc. Sci. El. 4		ENVE 4310 Applied Hydrology & Hydr. 4
	Professional Development <sup>6</sup> 2		ENVE 4320 Env. Chemodynamics 4
CHEM 2250	Organic Chemistry I 3		ENVE 4340 Physio. Processes in ENVE 4
ENVE 4330	Intro to Air Quality 4		
FOURTH		YEAR	
	Multidisc. Eng. Elective <sup>7</sup> 3		Technical Elective II <sup>8</sup> 3
	Technical Elective <sup>8</sup> 3		Free Elective III 4
	Hum., Arts or Soc. Sci. El. 4		ENVE 4180 Env. Process Design 3
ENGR 4010	Prof. Development III 1		ERTH ##### Earth Science Elective <sup>9</sup> 4
ENVE 4350	Biol. Processes in ENVE 4		

<sup>1</sup> CIVL 1200 may be replaced with ENGR 1200 or ENGR 1400.

<sup>2</sup> Choose CHEM 1200 and either BIOL 1010 or another biology course chosen in consultation with adviser. Order does not matter.

<sup>3</sup> CIVL 1100 may be replaced with ENGR 1300.

<sup>4</sup> ENGR 2250 may be replaced by CHME 4010.

<sup>5</sup> CSCI 1190 may be replaced with CSCI 1100 or CSCI 1010.

<sup>6</sup> This course will be fulfilled from a list published at the start of each semester.

<sup>7</sup> Multidisciplinary engineering elective: must be an engineering course, chosen in consultation with the adviser (see examples below).

<sup>8</sup> Technical electives must be selected in consultation with the program adviser (e.g., ENVE 4110, ENVE 4200, ENVE 4240, and ENVE 496X). With adviser approval, courses from other disciplines may also be taken. These include Civil Engineering, Chemical Engineering, and Earth and Environmental Sciences (see examples below).

<sup>9</sup> Earth Science Elective: must be an Earth Science course 2000 level or above. Choose from EARTH 2140, EARTH 2330, EARTH 4070, or EARTH 4500.

## 128 credits minimum

### EnvE MULTIDISCIPLINARY ENGINEERING ELECTIVES

#### Core Engineering

ENGR 1600 Materials Science for Engineers (Spring & Fall)

ENGR 4760 Engineering Economics (Spring)

ENGR 2530 Strength of Materials (Spring & Fall)

#### Transportation Engineering

CIVL 2030 Intro. to Transportation Engineering (Fall)

#### Geotechnical Engineering

CIVL 2630 Intro. to Geotechnical Engineering (Fall)

#### Industrial and Systems Engineering

ISYE 4260 Human Performance Modeling and Support (Fall)

#### Mechanical, Aerospace and Nuclear Engineering

MANE 4010 Thermal and Fluids Engineering II (Spring and Fall)

### EnvE TECHNICAL ELECTIVES

#### Environmental Engineering

ENVE 4200 Solid and Hazardous Waste Eng. (Spring)

ENVE 4240 Bench Scale Design (Fall)

ENVE 4110 Aqueous Geochemistry (Fall)

ENVE 496X Special Topics announced each semester

#### Civil Engineering

CIVL 2630 Intro. to Geotechnical Engineering (Fall)

CIVL 4150 Exp. Soil Mechanics (Spring)

CIVL 4140 Geoenvironmental Eng. (Fall)

#### Chemical Engineering

CHME 4030 Chemical Process Dynamics & Control (Fall)

CHME 4400 Chromatographic Separation Processes (Spring)

#### Earth and Environmental Sciences

ERTH 4540 Organic Geochemistry (Spring even-numbered years)

ERTH 4190 Env. Measurements (Fall odd-numbered years)

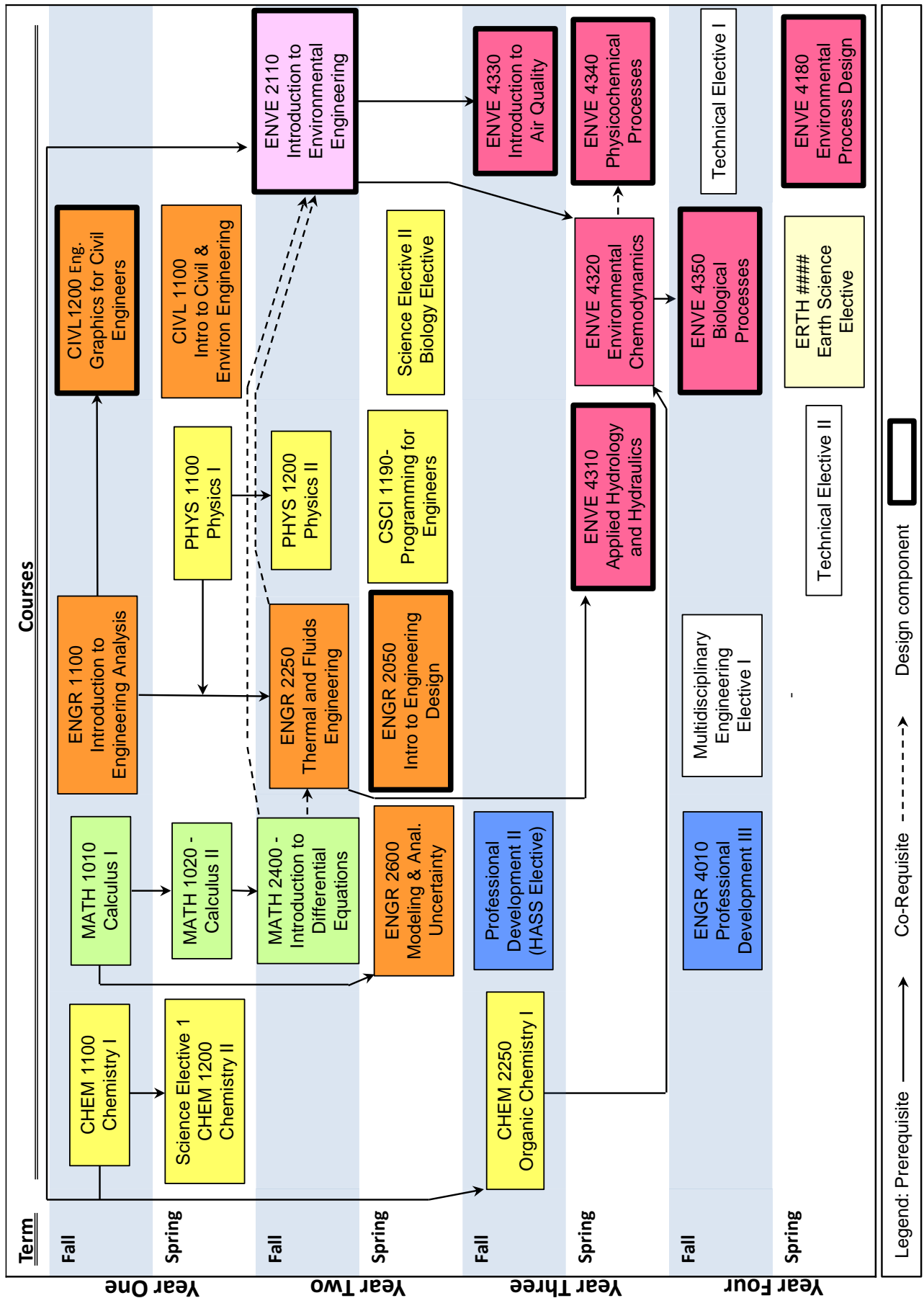
ERTH 4710 Groundwater Hydrology (Fall)

## Environmental Engineering Curriculum Helpful Hints

Following the ENVE curriculum template will allow students to graduate with a BS ENVE degree in 4 years. However, in the case of Co-op, Semester Abroad, and Transfer, deviation from the template and graduating in four years is still possible. Listed below are helpful hints for such cases.

- 1) ENGR 2250 Thermal and Fluids Engineering I is a prerequisite for several courses in the Junior year. It is also a corequisite for Intro to Environmental Engineering. Therefore, it should be taken in the Fall of Sophomore year.
- 2) There are two science electives in the Environmental Engineering curriculum. Students must choose Chemistry II (CHEM 1200) and a biology course; order does not matter. Courses that fulfill the biology requirement include BIOL 1010 - Introduction to Biology and BIOL 2120 - Introduction to Cell and Molecular Biology. Neither course has a prerequisite. With permission of the instructor, [BIOL 4310 - Microbiology](#) may also be elected.
- 3) Students interested in environmental issues related to soils (landfill design, soil remediation) are encouraged to take CIVL 2630 Intro. to Geotechnical Engineering. It is only offered in the Fall semester. Note that ENGR 2530 Strength of Materials is a prerequisite for CIVL 2630.
- 4) ENVE 4180, Environmental Process Design, is a capstone design course offered only in the Spring semester. You should arrange your courses to complete ENVE design courses prior to taking ENVE 4180. These include ENVE 4330 Introduction to Air Quality, ENVE 4310 Applied Hydrology and Hydraulics, ENVE 4340 Physicochemical Processes, and ENVE 4350 Biological Processes.
- 5) If you are planning to be away from campus for either the Co-op or Study Abroad program, preferred semester for ENVE students is Fall- Junior year. CHEM 2250 Organic Chemistry I should be taken in your sophomore year or in the summer between the Sophomore and Junior year. The RPI equivalents of various courses offered by our overseas partners are listed on SIS. If you wish to take the course for which an equivalency has not been established, use the Transfer Credit form and supply the syllabus to the Department on campus that teaches the Rensselaer version.

# Environmental Engineering Required Courses Flowchart



## H&SS and PD II – Policies for Engineering Students

Engineering students at Rensselaer are required to successfully complete

- 20 credits of H&SS (Humanities and Social Sciences)
- 2 credits of PD II (Professional Development II)

as well as

- 1 credit of PD I (typically as part of ENGR-2050 Introduction to Engineering Design, or alternatively as ENGR-1010 Professional Development I if ENGR-2050 transferred in as less than a 4 credit course)
- 1 credit of ENGR-4010 PD III

for a total of 24 credits to fulfill the H&SS Core requirement.

### ENGINEERING STUDENTS SHALL DISTRIBUTE THE 20 CREDITS OF H&SS AS FOLLOWS.

- ≥ 8 credits of H (ARTS, COMM, IHSS, LANG, LITR, PHIL, STSH, WRIT)
- ≥ 8 credits of SS (COGS, ECON, IHSS, PSYC, STSS)
- ≥ 4 credits at the 4000+ level
  
- ≤ 3 courses at the 1000 level (but note depth sequence restriction, below)
- ≤ 4 credits from 1-credit courses (e.g., music ensembles)
- ≤ 6 credits as pass/no-credit (but note depth sequence and CI restrictions, below)
- ≤ 2 courses (8 credits maximum) as transfer courses (including AP courses)

a depth sequence of two courses, each of ≥ 4 credits, from the same area code (ARTS, COMM, etc., but not including IHSS) where a minimum of one course (≥ 4 credits) is at an advanced level (2000+), and no courses are taken on a Pass/No Credit basis. STSS and STSH count as the same area code.

In addition, students are required to take at least one HASS course that is “CI” (Communications Intensive – a list of these courses is available from a link on the SIS home page, and here: [http://srfs.rpi.edu/update.do?artcenterkey=208&setappvar=page\(1\)](http://srfs.rpi.edu/update.do?artcenterkey=208&setappvar=page(1))). This course may not be taken on a Pass/No Credit basis. This CI course is not required to be part of the 24 credits of H&SS Core; that is, it may instead be an HASS CI course taken as a free elective

Enrolled Rensselaer students wishing to take an H&SS course for credit at another accredited institution must obtain prior approval for the course from the HASS Manager of Student Services. Applicants must furnish a catalog description of the proposed course and a completed copy of Rensselaer’s Transfer Credit Approval form to the HASS Manager of Student Services to apply for approval.

Cross-listed STSS/STSH courses can be switched (between H and SS) after the course is taken by making a request to the Assistant Registrar.

**THE 2-CREDITS OF PD II SHALL BE SATISFIED AS FOLLOWS.**

Either of the 2-credit courses, PSYC-4170 or STSS-4840, will satisfy the PD II requirement. **At some future time these will transition to a single 2-credit IHSS-4xxx course that will satisfy the PD II requirement.** Only **one** of these 2-credit PD II courses can be taken for credit.

A 4-credit PD II alternate course at any level (1000-4000) can be substituted for the 2-credit course. A list of these PD II alternate courses is available from a link on the SIS home page, and here: <http://registrar.rpi.edu/update.do?artcenterkey=325>.

A course used to satisfy the PD II requirement may **not** be taken on a Pass/No Credit basis.

In general, the PD II alternate course will be split as follows:

- two credits allocated to satisfy PD II
- the remaining credits allocated to free elective (or “Not Applied” to the degree if free elective credits have been completed)

With restrictions, the credits of a PD II alternate that are not allocated to PD II may be used to fulfill the 20-credits of H&SS. These credits:

- can **not** count toward the 4000 requirement,
- can **not** count toward the depth requirement,
- can **not** increase the number of 1000 level credits past 12.

However,

- they can count toward the overall 20 credits of H&SS,
- they can count toward the H and SS 8-credit minimums,
- they can count toward the H&SS “CI” requirement.

If a student transfers in a course that is in name and course number equivalent to a PD II alternate it counts as that named HASS course, but it does **not** transfer in its status as a PD II alternate. The student would still be responsible for taking PD II or a PD II alternate at Rensselaer.

In the rare case that a student transfers in a course with Professional Development II content nearly identical to that in either PSYC-4170 or STSS-4840 (the 2-credit PD II courses), they may furnish a catalog description of the transfer course and a completed copy of Rensselaer’s Transfer Credit Approval form to the Associate Dean of Engineering to apply for approval. Note that some courses in the Study Abroad program automatically satisfy the PD II requirement, as indicated in the transfer equivalency guide.

The School of Humanities, Arts, and Social Sciences (HASS) Manager of Student Services is:  
Jennifer Mumby (mumbyj@rpi.edu, Sage 4305)

The Assistant Registrar is:  
Kim Herkert (herkek@rpi.edu, Academy Hall 2713)

The Associate Dean of Engineering is:  
Kurt Anderson (anderk5@rpi.edu, JEC 3018)

## Need an Extra Credit?

**Q:** What if I'm short 1-2 credits in H&SS?

**A:** Use a 4-credit PD II alternate, with 2 credits to PD II, 1-2 credits to H&SS as needed, and any remaining credits to free elective (or "Not Applied" if you have filled all of your free elective credits)

**Q:** What if I'm short 1-2 credits in Free Electives?

**A:** Use a 4-credit PD II alternate, with 2 credits to PD II and 2 credits to free elective

**Q:** Am I really free to choose my free electives?

**A:** Almost, but not quite – there are restrictions for "free" electives. To count as a free elective, one credit classes must be either

- from the School of Engineering, or
- graded classes (though you can take these on a Pass/No Credit basis),

and

- ROTC courses (USAF, USAR, USNA) must not total more than six credits

One credit classes that are graded Satisfactory / Unsatisfactory (S/U) that are not in the School of Engineering may **not** be used as free electives. For example, PHYS-1010 A Passion for Physics is a 1-credit S/U course that will not count as a free elective.

Options for 1 credit free electives

- independent study (1 credit  $\approx$  3 hours/week  $\Rightarrow$   $\sim$  45 hours of work)
- undergraduate research project (when taken for credit)
- School of Engineering courses, such as
  - CHME-1010 Introduction to Chemical Engineering
  - CIVL-1100 Introduction to Civil and Environmental Engineering
  - CIVL-1960 / ENVE-1960 AutoCAD CIVL 3D
  - ENGR-1300 Engineering Processes (if not required for your major)
  - ENGR-4962 Fortran Programming
  - ISYE-1100 Introduction to Industrial and Systems Engineering
  - MANE-1100 Introduction to Nuclear Engineering
  - MANE-2961 Mechatronics Hardware and Software
  - MTLE-1200 Introduction to Materials Engineering
- School of Science courses
  - ISCI-4510 Origins of Life Seminar (requires Junior standing or higher)
- HASS courses
  - ARTS-2300 Rensselaer Orchestra
  - ARTS-2310 Rensselaer Concert Choir
  - ARTS-2320 Percussion Ensemble
  - ARTS-2330 Jazz Ensemble
  - ARTS-2960 Ensemble Congeros
- ROTC courses (USAF, USAR, USNA, up to six credits maximum)
- most one-credit topics courses (see <http://srfs.rpi.edu/update.do?artcenterkey=305>)

## Registration

**When:** Registration for the Spring semester generally occurs in early November. Registration for the Fall semester occurs the preceding Spring, usually in early April. Exact dates are included in the [Academic Calendar](#).

**How:** Use the [Student Information System \(SIS\)](#) to register for your courses.

**Where:** You can register for your classes using any computer with Internet access.

### Time tickets:

As a student at Rensselaer, you are issued a "time ticket," which assigns you a specific window of time during which you may register for the next semester. Your time ticket will be sent to your RPI email address, 2 - 3 weeks before registration.

Your registration time is assigned based on the number of credit hours you have **earned** as a student. The table below shows the range of earned credit hours associated with each class. Please note that classes which are still in progress or courses which have been graded as "incomplete" do *not* count towards earned credits, nor do transferred courses and Advanced Placement (AP) credit.

Year	Credits
Freshman	0-30
Sophomore	31-60
Junior	61-95
Senior	96-128

### CAPP reports:

Your Curriculum Advising and Program Planning (CAPP) report is a planning and advising tool -- available only to undergraduate students -- that allows you to track the progress you're making toward your Bachelor's Degree. You can access your CAPP report via the main menu of the [Student Information System \(SIS\)](#)

### What do I do if a class I want to register for is full?

Meet with the instructor of the course and request to be admitted to the course. If the class is a core/required course every effort will be made to accommodate the request. If this is an elective course you may be asked to take it in a subsequent semester. Note that for Core Engineering courses (ENGR prefix) there will be an electronic waitlist available at the time of registration, which is capped at ten students per section.

### How do I add/drop a course?

You may use the [Student Information System \(SIS\)](#) to add or drop courses. Generally speaking, from the beginning of the semester, you will have **two weeks to add** courses and **eight weeks to drop** them. Please refer to the Academic Calendar for specific add and drop deadline dates. If you wish to petition to add or drop classes after the published deadline, you may do so using a [Late Add/Drop Form](#). Please note that after the instructor's signature (if required), the form must also be approved by the Advising and Learning Assistance Center.

## **Student/Advisor Responsibilities**

### **Student's responsibilities:**

- To know their advisor's office hours and advising schedule.
- To make an appointment and prepare for registration advising by reviewing the Catalog, Class-Hour Schedule, and the students Curriculum Advising & Program Planning (CAPP) report.
- To formulate questions regarding curriculum, course selections, career options, etc.
- To be aware of their academic and personal needs and to seek assistance when needed.
- To understand that the role of their advisor is to advise, not to make decisions. Each student needs to realize that it's his or her education at stake, and that, with advisement; *they* are ultimately responsible for making any final decisions.

### **Advisor's responsibilities:**

- To be accessible to students throughout the year at posted office hours. If an advisor will be away from campus for an extended period of time, he or she should post outside their offices the names and office locations of alternate advisors, so that students will have other advising resources.
- To set aside designated times for registration advising and individual discussions.
- To be knowledgeable about current curriculum requirements, academic policies and procedures, referrals and resources on campus, and career opportunities in the major field.
- To guide students through academic programs that will complement their personal, educational, and professional interests.

## **The HUB**

The HUB is the School of Engineering advising center and is located in the Ansell Lounge in the Jonsson Engineering Center (JEC), 3rd floor. The main purpose of the HUB is to complement the job of the freshmen and sophomore academic advisors. The HUB is staffed with a faculty/staff member and is open weekdays during the following hours:

Monday-Thursday 10:00-4:00, Friday 10:00-1:00

HUB personnel will help answer academic as well as career questions, authorize forms, handle wait lists for ENGR courses, rapid prototyping work orders, etc. HUB personnel have been trained to answer questions regarding all engineering majors, including required courses, prerequisites, different concentrations, optimal time for co-ops and internships, traveling abroad, etc. Each personnel member will have access to every student's CAPP reports and transcripts to be able to supply the student with the best advice. HUB personnel will not be able to sign Student-Advisor Meeting (Sam) requirements for students. Their job is to supplement, not replace, the student's appointed academic advisor.



## Student Professional Societies

### ***ASCE (American Society of Civil Engineers) –***

Faculty Advisor: Prof. Jack Reilly, JEC 4024

With 160,000 members nationwide, the American Society of Civil Engineers is the predominate organization of Civil Engineers in the U.S. The Rensselaer student chapter organizes events and lectures by practicing Civil Engineers, as well as the annual Steel Bridge and Concrete Canoe competition. Attendance at student chapter meetings is a great way to determine if Civil Engineering is for you.

RPI's ASCE chapter holds a meeting usually **every other Wednesday in CII 4050**. The meetings are open to anyone interested in civil engineering and are designed to be a relaxed place for students to learn some practical knowledge about what is going on in the Civil Engineering world. (Free pizza and drinks are served). For those who like what they see, becoming a member of ASCE means having access to the many social, community service and networking opportunities that are offered throughout the year.

### ***SEP (Society of Environmental Professionals) –***

Faculty Advisor: Prof. Kilduff, JEC 4022

The purposes of the Chapter are:

- To promote student interest in the environment
- To provide an avenue for the exchange of information and ideas between students and members of professional associations
- To provide a common ground where students from various disciplines related to air, waste, and water environment management can advance their understanding of environmental management through an organized exchange of knowledge
- To promote a better understanding of the scope and opportunities in air, waste, and water environment management
- To present educational programs of general interest topics in the science of air, waste, and water environment management, as well as other related technological fields
- To encourage its members to participate in the Associations' conferences, meetings, and social events

### ***Chi-Epsilon National Civil Engineering Honor Society***

Faculty Advisor: Prof. Xiaokun (Cara) Wang, JEC 4032

Founded in the Spring of 1922 at the University of Illinois, Rensselaer Polytechnic Institute Chapter was established in 1940. Chi Epsilon is dedicated to the maintenance and promotion of civil engineering as an ideal profession. To this end, initiation into Chi Epsilon distinguishes a person as being exemplary of the qualities of scholarship, character, practicality, and sociability. At the same time, Chi Epsilon members have a responsibility to offer extraordinary service in the advancement of their profession. Chi Epsilon fosters the development and exercise of sound traits of character and ability among civil engineers, always seeking higher standards of professional service. As of January 1, 2014, there are 137

chapters of Chi Epsilon that have initiated over 116,900 members including the late Ralph Peck who was elevated to become a National Member of the Chi Epsilon Honor Society.

## **Undergraduate Research Program (URP)**

Departmental faculty are involved in four areas of research - Environmental, Geotechnical, Structures and Transportation. URP opportunities exist in each. They allow students to interact with faculty on their research, apply knowledge learned in the classroom setting, publish conference and journal articles alongside faculty and receive course credit or supplemental income.

### **Finding a Project**

Most students will solicit URP projects by contacting departmental professors – those they have had in class and others. The key is to determine a project that will interest you as well as finding a faculty member that may want to work with you on a project.

### **Credit or Funding**

You can either earn credit hours (between one and four) for participating in an URP project or you can be paid for the project. If you choose credit, the decision on the number of credit hours is usually decided by the student and the participating faculty member in consultation.

Being paid to participate in a URP project can help a student offset some of the costs of college, such as books, lab fees, activities or incidentals that may come up. In the past, students who have participated in the URP for pay have earned up to \$2,000 per semester. The majority of participants earn \$500 per semester. URP funding comes from two sources:

- Your sponsoring faculty member or department
- The Office of Undergraduate Education

The faculty sponsor or department is responsible for the financial support of your research. In addition, the Office of Undergraduate Education pays URP participants a maximum of \$400 per semester in the form of matching funds. Most projects expect eight to twelve hours of work per week.

The URP application should be submitted to the Department Coordinator, Deb Roden, [rodend3@rpi.edu](mailto:rodend3@rpi.edu)

## CEE Faculty Research Interests

Department of Civil and Environmental Engineering Research Areas and Related Faculty										
	Earthquake Engineering	Structural Engineering	Geotechnical Engineering	Transportation Engineering	Computational Mechanics	Pollutant Fate and Transport	Water Treatment	Site Remediation & Bioremediation	Microscopic Activity of Microorganisms	Water Resources
Tarek Abdoun	X		X		X					
Mohammed Alnaggar		X			X					
Xuegang (Jeff) Ban				X						
Philippe Baveye									X	X
Victoria Bennett			X							
Ricardo Dobry	X		X							
Yuri Gorby						X		X	X	
Jose Holguin-Veras				X						
James (Chip) Kilduff						X	X	X		X
Chris Letchford		X								
Marianne Nyman						X	X	X		X
Michael O'Rourke	X	X								
John (Jack) Reilly				X						
Michael Symans	X	X								
Shun Uchida			X		X					
Mourad Zeghal	X		X		X					
Thomas Zimmie	X		X							
Xiaokun (Cara) Wang				X						

## International Programs

Many students at Rensselaer study abroad, usually during their junior or senior years. It is important to plan ahead if you wish to study abroad so that you can still take all the courses required to graduate. A list of study abroad options can be found at:

<http://undergrad.rpi.edu/update.do?catcenterkey=81>

For more information on study abroad programs, go to the Office of International Programs, located in Walker 4010, or see the Office of Undergraduate Education website at <http://undergrad.rpi.edu>, Office of International Programs.

## Cooperative Education

Rensselaer's Co-op program offers a way to apply classroom experience in a business setting. This is important for two reasons:

- As you apply newly-learned technical skills, you will gain an understanding of office dynamics that can only be learned through experience.
- Just as important, you will gain experience that will look good on your resume.

Two things you should consider when planning your co-op assignment are the type of co-op that best suits your needs, and where the co-op assignment fits in your academic plan (please see Helpful Hints above).

For more information on Co-op programs, please go to the following website:

<http://eng.rpi.edu/soe/index.php/unique-programs/co-op-education>

## **Co-Terminal Degree (BS/MS or BS/ME) Program**

### **1. General Information, Application and Admission**

The *co-terminal* MS/ME program is intended for undergraduate students who wish to continue their education at Rensselaer and obtain a Master's degree. Co-terminal degree students receive both their Bachelors and Masters upon completion of all requirements for these two degrees. Some portion of the undergraduate financial aid will be continued for the co-terminal students through their fifth year of study (detailed information may be obtained by contacting the Office of Financial Aid). The co-terminal MS and ME degrees are graduate degrees supervised by the Office of Graduate Education, and the application for admission to the program is handled by the Graduate Admissions Office. The general requirements for the co-terminal Master's degree are the same as those for the regular Masters degree. However, co-terminal students are not eligible to serve as a graduate Teaching Assistant (TA) nor as a Research Assistant (RA).

### **Criteria for Admission**

A student must have completed 90 credits of coursework (including AP credits, transfer credits and courses in progress) in order to be eligible to apply. The applicant must also have a cumulative GPA of 3.2 or higher. Students with a cumulative GPA between 3.0 and 3.2 may be admitted into the program in special circumstances after review of their application.

### **Application Process**

Students are encouraged to apply by the end of their junior year. Applicants with less than 90 credits of completed course work will be evaluated after the 90-credit requirement is reached. The deadline for the application is the last Friday in September during the student's senior year. The application form for the co-terminal degree is available online from the registrar office: [admissions.rpi.edu/graduate/Co-TerminalBS-MS\\_Application\\_and\\_Procedures.pdf](http://admissions.rpi.edu/graduate/Co-TerminalBS-MS_Application_and_Procedures.pdf). The completed application must be submitted to the CEE department office along with: (1) a copy of the student's CAPP report, (2) Graduate Plan of Study, and (3) Program Planner (4th and 5th year planner). The application must be signed by the Graduate Program Director, Undergraduate Advisor and Graduate Advisor. Note that the undergraduate and graduate advisors may be the same person (see section 3). The completed 4th and 5th year planner (last page of the application form) must have at least 128 credits applied to the BS and at least 30 to the MS.

### **2. Credit Requirements**

**MS Degree (Co-Terminal degree with Thesis):** An MS degree requires: (1) 30 credits beyond the bachelor's degree (consisting of course work and master thesis credits), (2) a formal master's thesis approved by a thesis committee and submitted to the Graduate School, and (3) a public oral presentation of the thesis to the committee. The degree is awarded after successfully satisfying all degree requirements (see Sections 3 to 6). A typical student takes 24 credits of coursework and 6 masters thesis credits. The student is required to register for CIVL or ENVE 6990 (Master's Thesis) for 1 or 2 semesters. The student must also form a thesis committee that consists of the research advisor and two additional committee members (see Section 6).

**ME Degree (Co-Terminal degree without Thesis):** An ME degree is a degree that comprises 30 credits of coursework. A student may also take up to six credits as Readings in Civil Engineering (CIVL 6940) or Professional Project (CIVL 6970) under the supervision of

a faculty adviser. The Professional Project is evaluated solely by the faculty advisor (since there is no committee for the ME degree). The degree is awarded after successfully satisfying all degree requirements (see Sections 3 to 5).

### **3. Identification of an Advisor**

Identification of a suitable advisor is an important aspect of the *co-terminal* MS/ME program. Upon admission to the program, co-terminal students continue to work with their undergraduate advisor until they are assigned a graduate advisor. The admitted student and graduate advisor will work together to ensure that the student is following a proper Plan of Study (approved by the office of Graduate Education) and fulfilling all degree requirements.

ME students will be assigned an advisor by the department. Before the start of the fall semester of their co-terminal (5th) year, MS students are required to identify an advisor who is committed to supervising their research. Upon admission to the program, MS students should contact prospective advisors to identify an area of research and reach a mutual agreement on a research project for their MS thesis. The MS advisor plays the role of both academic and research advisors. The MS student and graduate advisor will have a close relationship and interaction that involves research apprenticeship. The student and advisor will work together to ensure that the student is following a proper Plan of Study and fulfilling all degree requirements.

### **4. Course Requirements**

Both the MS and ME degrees require that 30 credits be completed beyond the BS. However, as explained above, the MS degree requires 24 credits of courses while the ME degree requires 30 credits of courses. Credits applied toward satisfying the bachelor's degree requirements cannot be used to satisfy the Masters degree requirements. Furthermore, for courses that are offered at both the undergraduate and graduate level, a student is not permitted to take the course at the undergraduate level and then repeat the course at the graduate level. The graduate program requirements are set and managed by the Office of Graduate Education. These include the following rules which apply to all courses that are counted toward the Masters degree:

- No course may be taken as "Pass/No Credit."
- No more than 15 credits may be from 4000 level courses.
- Students must take a minimum of 12 credits per semester.
- Courses below 4000 level are not allowed.

Given that graduate courses can be significantly more challenging than undergraduate courses, students should consult with their advisors when selecting courses and maintain an average course load of about 15 credits per semester.

### **Core Curriculum and other requirements**

Co-terminal Master's degree students must complete at least four courses from the published list of core courses outlined for each of the four graduate program areas. Students must also complete any course needed to meet the prerequisite requirements of the selected core courses. Students must maintain an overall average of B (3.0) or higher for their Masters courses. Furthermore, while maintaining this average, they are required to earn a C- or higher in any individual course.

### **5. Plan of Study**

As mentioned above, an application for the co-terminal Master's degree must include a Plan of Study. This plan outlines the student academic program and must comprise 30 credits of coursework for ME students and 30 credits of research and coursework for the MS degree (all credits beyond the bachelor's degree). At least 15 credits are required to be taken at the 6000 level (i.e., graduate courses). Only the credits required to earn the degree should be shown on the Plan of Study (i.e., exactly 30 should be listed on the Plan of Study, even if a student will actually take more than 30 credits). The Plan of Study must be approved by the Graduate Advisor and Graduate Program Director. The Plan of Study may be revised at any time during the student's tenure at Rensselaer.

## **6. Additional Requirements for Co-terminal MS students**

*In addition to the credit requirements (Section 2), the MS degree requires:*

- *Identification of a research advisor (as described above),*
- *Establishment of an MS research committee (in collaboration with the advisor),*
- *Writing an MS thesis, and*
- *Public defense of the MS research (Oral Thesis Examination).*

### **MS Committee**

The purpose of the MS committee is to assess the worthiness of the student's research and to evaluate the master's thesis. With the assistance of the research advisor, each student must form a master's committee. This should be done no later than the first semester of the co-terminal (typically 5th) year. The Dean of the Graduate School, on recommendation of the Department Head (who is advised by the Graduate Committee), formally appoints the MS committee. This committee should consist of three full-time, tenure track faculty members from the *Civil and Environmental Engineering department*. The committee Chair must be the research advisor.

### **Thesis Examination**

MS students are required to successfully pass an oral examination of their Masters thesis. The oral examination is administered by the student's master's committee. The thesis must be submitted to the committee at least two weeks prior to the examination. The master's exam is designed to evaluate the ability of the student to: (1) identify a research problem; (2) demonstrate knowledge of the pertinent principles and literature; (4) design experiments, conduct simulations or perform analyses; and (5) draw appropriate conclusions.

### **Dissemination of Research**

Dissemination of each student's research in the form of presentations at professional meetings and publication in peer-reviewed journals and proceedings is expected. Dissemination of research is important for the student's career and for Rensselaer, and is often the ultimate academic product required by many funding agencies.

## **7. Satisfactory Progress**

It is imperative that students make satisfactory progress toward the co-terminal degree on a continuous basis. This requires a high level of dedication, commitment, effort and focus. Significant outside obligations, including part-time employment, are likely to prevent satisfactory progress, and are strongly discouraged. Student progress will be evaluated each semester by the student's advisor and reviewed by the department head.



# Graduate Programs

## *Department of Civil & Environmental Engineering*

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### **Areas of Study/Degrees**

Civil Engineering, MS, MEng, PhD  
Environmental Engineering, MS, MEng, PhD  
Transportation Engineering, MS, MEng, PhD

Typical Degree Requirements  
MS 30 credits (24-27 coursework, 3-6 thesis)  
MEng 30 credits coursework  
PhD 42 credits beyond BS plus doctoral thesis

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### **Research Areas**

We offer a wide range of disciplines that are sufficiently flexible to accommodate individual interests, but the main research areas of interest are separated into several broad categories:

Earthquake Engineering (Civil)	Water Treatment (Environmental)
Structural Engineering (Civil)	Waste Treatment (Environmental)
Geotechnical Engineering (Civil)	Site Remediation and Bioremediation (Environmental)
Transportation Engineering (Civil)	Environmental Systems (Environmental)
Computational Mechanics (Civil)	Environmental Biotechnology (Environmental)
Pollutant Fate and Transport (Environmental)	Indoor Air Quality and Water Quality (Environmental)

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### **Admission**

Submit on-line at: <http://gradadmissions.rpi.edu/>

Deadlines are January 1 for Summer and Fall admission and August 15 for Spring admission

**You will need:** a well-written Statement of Background & Goals; official transcripts from all colleges attended; at least 2 letters of recommendation (preferably from faculty); official GRE scores (general test only, minimum 550 Verbal/550 Quantitative/4.0 Analytical) or ETS scores (Minimum 156 Verbal/146 Quantitative/4.0 Analytical) and official TOEFL or IELTS scores (required for all international applicants, minimum CBT/IBT/PBT of 230/89/570 TOEFL or IELTS minimum 6.5); Bachelor's GPA 3.0 or higher; non-refundable application fee.

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### **Financial Aid/Tuition**

Awards are made based on merit, not on need, and priority is given to doctoral candidates.

Apply for financial aid through the admission application, *no separate form is required*.

Financial aid is available in the form of Fellowships, Teaching Assistantships and Research Assistantships.

International students are eligible for all forms of aid except some fellowships that require US citizenship.

Tuition for the 2015-2016 academic year is \$48,100; Other expenses can vary widely, but we estimate them to be: fees and insurance are approximately \$2,339; Living expenses (\$13,320), books and supplies (\$2,841).

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### **Contact Us**

Kimberly Boyce, Department Admissions Coordinator, Department of Civil and Environmental Engineering

Phone: 518-276-6941

Email: [boycek@rpi.edu](mailto:boycek@rpi.edu)

<http://www.cee.rpi.edu>