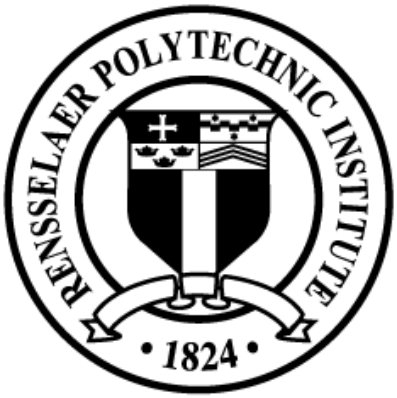


RENSSELAER POLYTECHNIC INSTITUTE

School of Engineering

CIVIL AND ENVIRONMENTAL ENGINEERING

HANDBOOK

Fall 2019

Contents

Department of Civil and Environmental Engineering

http://cee.rpi.edu

Welcome

This handbook is intended to provide a brief introduction to the role of Civil and Environmental Engineers in society and to assist students in navigating their degree program at Rensselaer.

Civil Engineering Program

Civil and Environmental Engineers provide our ***quality of life***. They plan, design, construct, operate and maintain the physical infrastructure that supports civilization, including: shelter; transportation/communication networks; water storage, supply and distribution; waste disposal and recycling; and energy infrastructure. Civil Engineers use computational tools, sensor networks, engineered and natural materials, and human creativity to design, construct and maintain the world's physical infrastructure. Environmental Engineers ensure the impact of such development on manmade and natural ecosystems is minimized.

For the individual who has a strong interest in innovative planning, design and construction, civil engineering offers far ranging opportunities for applying knowledge and creativity in making the world a better place to live. Students in civil engineering study core engineering principles for the first three semesters and then, after a semester of courses that introduce them to the four main sub-disciplines within the department (geotechnical, environmental, transportation and structural engineering), spend the remaining two years developing depth in the civil and environmental engineering specialty of choice. These courses are supplemented by elective concentrations in any one of the sub-disciplines listed above, as well as in the area of building engineering in cooperation with the School of Architecture.

Civil Engineering Program Educational Objectives

The Civil Engineering program is designed to prepare students for continuous learning and successful careers in industry, government, academia and consulting. Within a few years of graduation, graduates of the Bachelor of Science program in Civil Engineering are expected to:

- Contribute to the field of Civil Engineering as professionals engaged in problem-solving, design, and discovery through the responsible and ethical application and development 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

The Environmental Engineering program is designed to prepare students for continuous learning and successful careers in industry, government, academia and consulting. Within a few years of graduation, graduates of the Bachelor of Science program in Environmental Engineering are expected to:

- Contribute to the field of Environmental Engineering as professionals engaged in problem-solving, design, and discovery through the responsible and ethical application and development 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

Department Head:	Chris Letchford, DPhil, letchc@rpi.edu	JEC 4052
Associate Head for Academic Affairs:	Michael O'Rourke, Ph.D., orourm@rpi.edu	JEC 4046
Administrative Staff:	Debbie Roden, rodend3@rpi.edu	JEC 4049
Graduate Admissions	Kim Boyce, boycek@rpi.edu	JEC 4049

Faculty

There are 17 regular faculty members in the Department of 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 programs leading to Master of Engineering (M.E.), Master of Science (M.S.), 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://info.rpi.edu/advising-learning-assistance/

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

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

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

International Programs: http://info.rpi.edu/international-programs

Registrar: https://info.rpi.edu/registrar

Student Handbook: https://info.rpi.edu/dean-students/student-rights-responsibilities-and-_judicial-affairs

Student Information System: https://sis.rpi.edu/rss/twbkwbis.P_WWWLogin

Undergraduate Research Program: http://info.rpi.edu/undergraduate-research

Faculty & Staff Directory

Civil Engineering

Tarek Abdoun, Professor
Geotechnical Engineering
JEC 4002
518-276-6544
abdout@rpi.edu

Mohammed Alnaggar, Asst. Professor
Structural Engineering
JEC 4046
518-276-3956
alnagm@rpi.edu

Victoria Bennett, Assistant Professor
Geotechnical Engineering
JEC 4018
518-276-6365
bennev@rpi.edu

Ricardo Dobry, Professor
Geotechnical Engineering
JEC 4003
518-276-6934
dobryr@rpi.edu

Sean He, Assistant Professor
Transportation Engineering
JEC 4034
518-276-8043
hex6@rpi.edu

Jose Holguin-Veras, Professor
Transportation Engineering
JEC 4030
518-276-6331
jhv@rpi.edu

Chris Letchford, Professor
Structural Engineering
JEC 4049
518-276-6362
letchc@rpi.edu

Michael O'Rourke, Professor
Structural Engineering
JEC 4046
518-276-6933
orourm@rpi.edu

John (Jack) Reilly, Professor of Practice
Transportation Engineering
JEC 4024
518-276-6033
reillj2@rpi.edu

Michael Symans, Associate Professor
Structural Engineering
JEC 4044
518-276-6938
symans@rpi.edu

Shun Uchida, Assistant Professor
Geotechnical Engineering
JEC 4036
518-276-6944
uchids@rpi.edu

Xiaokun (Cara) Wang, Asst. Professor
Transportation Engineering
JEC 4032
518-276-2098
wanx18@rpi.edu

Mourad Zeghal, Professor
Geotechnical Engineering
JEC 4028
518-276-2836
zeghal@rpi.edu

Thomas Zimmie, Professor
Geotechnical Engineering
JEC 4038
518-276-6939
zimmit@rpi.edu

Environmental Engineering

James Kilduff, Associate Professor
Environmental Engineering
JEC 4022
518-276-2042
kilduff@rpi.edu

Marianne Nyman, Assoc. Professor
Environmental Engineering
JEC 4042
518-276-2268
nymanm@rpi.edu

Joint Appointments

Mark Shephard, Professor
Center Director, SCOREC
Mechanical Engineering
CII 7017
518-276-6795
shephard@scorec.rpi.edu

William A. Wallace, Professor
Industrial Systems Engineering
CII 5117
518-276-6854
wallaw@rpi.edu

Adjunct Appointments

Structural
James Dall
Mark Kanonik

Geotechnical
Dr. Carsten Floess

Environmental
Jason Dolmetsch

Transportation
Mike Lashmet
John Bassett

Lecturers

Mohammed Abdellatef
abdelm5@rpi.edu

Omar Osama El-Shafee
elshao2@rpi.edu

Daniel Lander
landed2@rpi.edu

Raphael Rodrigues
rodrir9@rpi.edu

Staff

Kimberly Boyce
Administrative Coordinator
JEC 4049
518-276-6941
boycek@rpi.edu

John LaPointe
Technician
JEC 1302
518-276-3046
lapoij@rpi.edu

Janet Pertierra
Business Manager
JEC 4050
518-276-6943
pertij@rpi.edu

Debbie Roden
Administrative Associate
JEC 4049
518-276-6679
rodend3@rpi.edu

The Arch

https://info.rpi.edu/the-arch

The Arch is a unique approach for student development and growth that prepares students to meet the multifaceted challenges of the 21st century. The Arch will augment academic and experiential programs, and provide a robust-and transformative-educational experience for undergraduate students.

Students in the Class of 2023 will be required to participate in the Arch program in summer 2021. There is an exception process for athletes, ROTC, and a few other select cases.

The Arch is a restructuring of the Rensselaer academic calendar. It creates additional opportunities for experiential learning that complement curricular and co-curricular offerings at Rensselaer.

Rising juniors will attend a full summer semester, The Arch, between their sophomore and junior years. Juniors then spend a semester away during the fall semester of their junior year. During this semester, students will take advantage of numerous experiential learning activities available off campus, including international travel, internships, co-ops, research opportunities, and community service projects.

Students following the curriculum templates below will graduate after completing 8 semesters.

YEAR	FALL	SPRING	SUMMER
Freshman	Required	Required	Optional
Sophomore	Required	Required	Required
Junior	Away	Required	Optional
Senior	Required	Required	Graduate

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 Registrar website. The other CI course for Civil Engineering is CIVL 4920 (Civil Engineering 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.
- 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 Degrees

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.

The CEE department discourages dual majors as the likelihood for a student to complete the degree in eight semesters is not very high. Students would be better served to enter the co-terminal program in their 3rd / 4th year and earn a Bachelor's degree in Civil Engineering and a Master's degree in Civil Engineering or another discipline.

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 should instead consider a earning a single baccalaureate degree and a Master's degree. The credit requirement is similar, and Master's degrees are highly regarded by graduate schools and by industry.

Minor in Civil Engineering

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). Note that, for the five courses that are selected, prerequisites and/or corequisites must be satisfied.

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: 4*
CIVL 4150 - Experimental Soil Mechanics	*Credit Hours: 4*
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 a Minor in Civil Engineering for Students in the 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: 4*

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: 4*
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***

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***

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.***

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***

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***

SECOND YEAR FALL:

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

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***

SECOND YEAR SPRING:

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. Spring 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. Spring 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. Spring 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. Spring term annually. ***4 credit hours***

The ARCH:

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. Summer and fall terms 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. Fall, spring, and summer terms annually. ***3 credit hours***

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***

THIRD YEAR SPRING:

CSCI-1190 - Beginning 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. Half-term courses offered 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***

STSS 4100 Professional Development II –Technical Issues and Solutions
This course focuses on increasing students' knowledge concerning the impact of non-technical issues on the viability of technical (engineering) designs and solutions. The non-technical issues we will consider include the cognitive and physical strengths and limitations of people in the chain spanning from product/equipment designers/manufacturers to end users, as well as economic, environmental, cultural, political, ethical, health and safety, and societal influences. During the course, we will read and discuss articles and case studies in which the technical solution pursued did not have the desired effect, or led to disaster. Possible explanations include a failure to take into account the environmental, economic, socio-cultural, and/or political issues associated with the technology's ultimate usage. Summer, Fall and spring terms annually. ***2 credit hours***
STSS 4100 may be replaced by an approved 4 credit course published at the beginning of each semester.

FOURTH YEAR FALL:

See the curriculum template below for a list of electives.

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 at least two civil engineering design electives in one concentration. Concentrations and associated design electives are: 1) Structural: CIVL 4070 and CIVL 4080; 2) Geotechnical: CIVL 4010 and either CIVL 4140 or CIVL 4150; 3) Transportation: two of the following courses: CIVL 4620, CIVL 4640, CIVL 4660, CIVL 4670; 4) Environmental: two of the following courses: ENVE 4200, ENVE 4330, ENVE 4340, ENVE 4350. 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 junior or senior year.

Additional Requirements

A minimum of 128 credit hours is required for this curriculum. Non-engineering courses graded 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 & Environmental Eng[3]	1
CIVL 1200	Eng. Graphics for Civil Eng [1]	1	ENGR 2600	Modeling &Analysis of Uncertainty	3
ENGR 1100	Intro. to Eng. Analysis	4	MATH 1020	Calculus II	4
MATH 1010	Calculus I	4	PHYS 1100	Physics I	4
IHSS ####	Hum., Arts or Soc. Sci Elective[2]	4		Hum., Arts or Soc. Sci Elective	4
FALL			**SECOND YEAR**	**SPRING**	
ENGR 2250	Thermal & Fluids Engineering I	4	CIVL 2030	Intro to Transportation Engineering	4
ENGR 2530	Strength of Materials	4	CIVL 2630	Intro to Geotechnical Engineering	4
MATH 2400	Intro. to Differential Eqns.	4	CIVL 2670	Intro to Structural Engineering	4
PHYS 1200	Physics II	4	ENVE 2110	Intro to Environmental Engineering	4
ARCH			**THIRD YEAR**	**SPRING**	
ENGR 2050	Intro to Engineering Design	4	CSCI 1190	Beginning C Programming for Eng. [4]	1
ENGR 4760	Engineering Economics	3	ENGR 2090	Engineering Dynamics	4
ENVE 4310	Applied Hydrology & Hydr.	4	STSS 4100	Professional Development II [5]	2
	Hum., Arts or Soc. Sci Elective	4		CE Design Elective [6]	3
				Free Elective	4
FALL			**FOURTH YEAR**	**SPRING**	
	CE Design Elective [6]	3	CIVL 4920	CE Capstone Design	3
	CE Technical Elective [6]	3	ENGR 4010	Professional Development III	1
	Math and Science Elective [7]	4		Basic Science Elective [8]	4
	Free Elective	4		Free Elective	4
	Hum., Arts or Soc. Sci Elective	4		Hum., Arts or Soc. Sci Elective	4

[1] CIVL 1200 may be replaced with ENGR 1200.

[2] The five HASS Electives may be taken in any semester; it is recommended to schedule one in each of the first two semesters and one in the Arch Summer. Students should take a HASS Inquiry course during their first year; for a listing of HASS Inquiry courses, go to https://info.rpi.edu/hass-inquiry. Students should take a HASS Communications Intensive course during their first three semesters; refer to the link "Communications Intensive (CI) Requirement" on the Registrar's "Academic Planning" web page.

[3] CIVL 1100 may be replaced with ENGR 1300.

[4] CSCI 1190 may be replaced with CSCI 1100.

[5] For a list of courses that satisfy the PD II requirement, refer to the link "Professional Development II Courses" on the Registrar's "Academic Planning" web page.

[6] Allowable courses are listed under Design Electives and Technical Electives.

[7] Any 4-credit course in the School of Science with a prefix of ASTR, BCBP, BIOL, CHEM, ERTH, MATH or PHYS.

[8] Any 4-credit course in the School of Science with a prefix of ASTR, BIOL or ERTH.

128 credits minimum

CE DESIGN ELECTIVES Students must take at least two CE design electives in one area of concentration.

Structural Engineering
CIVL 4070 Steel Design
CIVL 4080 Concrete Design

Geotechnical Engineering
Students *must take:* CIVL 4010 Foundation Engineering
And must choose a second course from the following:
CIVL 4140 Geoenvironmental Eng.
CIVL 4150 Experimental Soil Mechanics

Environmental Engineering
Students *must choose two* of the following courses:
ENVE 4200 Solid and Hazardous Waste Eng.
ENVE 4330 Introduction to Air Quality
ENVE 4340 Physicochemical Processes in Env. Eng.
ENVE 4350 Biological Processes in Env. Eng.

Transportation Engineering
Students *must choose two* of the following courses:
CIVL 4620 Mass Transit Systems
CIVL 4640 Transp. System Planning
CIVL 4660 Traffic Engineering
CIVL 4670 Highway Engineering

CE TECHNICAL ELECTIVES
Any of the design electives listed above may be taken to satisfy the CE Technical Elective requirement, provided the necessary pre-requisites have been satisfied. The following courses may also be taken to satisfy the CE Technical Elective requirement:
CIVL 2040 Professional Practice
CIVL 4240 Intro. to Finite Elements
CIVL 4270 Construction Management
CIVL 4280 Design for Constructability
CIVL 4440 Matrix Structural Analysis
CIVL 4450 Conceptual Structural Systems
CIVL 4570 System Modeling for Civil and Env. Engineering

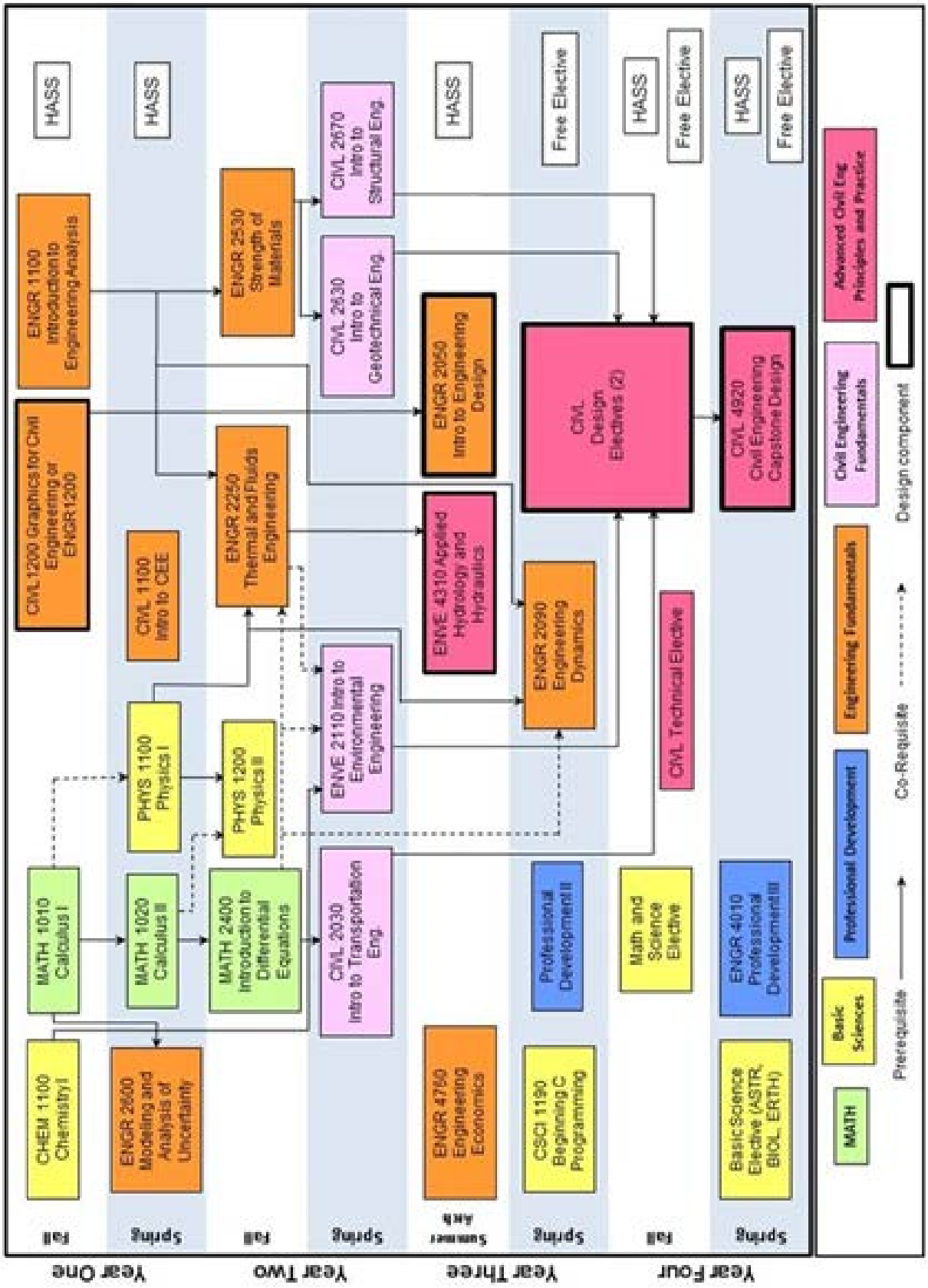
To satisfy the CE Technical Elective requirement, students may choose an additional CE Design Elective within any concentration or, with adviser approval, courses from related disciplines. These related disciplines include architecture, environmental engineering, earth and environmental sciences, mechanical engineering, chemical engineering, industrial engineering, and operations research. A representative list of such courses is as follows:
ENVE 4110 - Aqueous Geochemistry
ERTH 2120 - Structural Geology
ERTH 2330 - Earth Materials
ERTH 4710 - Groundwater Hydrology
MATH 4800 - Numerical Computing

Guidance for Efficient Completion of the Civil Engineering Curriculum

Students who follow the Civil Engineering curriculum template will graduate with a BSCE degree in 4 years. Transfer students and those electing Co-op or Semester Abroad experiences may need to deviate from the template; however, it is often still possible to graduate in 4 years. Guidance is provided below on which deviations from the standard template are possible and which should be avoided to ensure timely completion of the BSCE degree.

1) Students that bring a number of transfer credits (including AP credits) to their academic careers are encouraged to contact the Office of Civil and Environmental Engineering (518-276-6360; JEC 4049) early in their academic career.
2) ENGR 2530 (Strength of Materials) is a prerequisite for both CIVL 2630 (Intro. to Geotechnical Engineering) and CIVL 2670 (Intro. to Structural Engineering). Hence, ENGR 2530 should be taken no later than Fall/Sophomore year. If that is not possible, please consult with your academic adviser.
3) The four CE Intro. courses – CIVL 2030, CIVL 2630, CIVL 2670 and ENVE 2110 – are only offered spring semester. It is best to take these spring semester of the Sophomore year. If taking all four during Spring/Sophomore year is not possible, then take the Intro. courses in your specific area of interest and defer others (e.g., if you are interested in structural engineering, take CIVL 2670, and maybe CIVL 2630, during Spring/Sophomore year and defer CIVL 2030 or ENVE 2110 to Spring/Junior year).
4) CIVL 4920 (CE Capstone Design) is only offered spring semester. If you will be taking 4 ½ years to complete your degree, arrange your courses so that the Capstone pre-requisites (two design course sequence) are completed prior to Spring/Senior year.
5) Except for ENGR 2530 (Strength of Materials), students can take most required ENGR courses, specifically ENGR 2090, 2250, 2600, and 4760, whenever the prerequisite/corequisite is completed.
6) If you are planning to be away from campus for either the Co-op or Study Abroad program, the best time to participate in these programs is the fall semester of Junior year.
7) Maximize job opportunities in civil engineering by taking CIVL courses to satisfy the free elective course requirements.

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 the required capstone 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 should instead consider earning a single baccalaureate degree and a Master's degree. The credit requirement is similar, and Master's degrees are highly regarded by graduate schools and by industry.

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 an environmental engineering program adviser but may include:

- ENVE 4350 - Biological Processes in Environmental Engineering *Credit Hours: 4*
- 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*

Note that, for all courses selected, prerequisites and/or corequisites must be satisfied.

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***

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***

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.

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:

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***

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.

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. Summer and fall terms annually.
3 credit hours

SECOND YEAR SPRING:

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. Spring term 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***

CSCI-1190 - Beginning 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. Half-term courses offered 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.

The ARCH:

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. Summer and fall terms annually. ***4 credit hours***

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-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 junior or senior year.***

THIRD YEAR SPRING:

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***

STSS 4100 Professional Development II –Technical Issues and Solutions
This course focuses on increasing students' knowledge concerning the impact of non-technical issues on the viability of technical (engineering) designs and solutions. The non-technical issues we will consider include the cognitive and physical strengths and limitations of people in the chain spanning from

product/equipment designers/manufacturers to end users, as well as economic, environmental, cultural, political, ethical, health and safety, and societal influences. During the course, we will read and discuss articles and case studies in which the technical solution pursued did not have the desired effect, or led to disaster. Possible explanations include a failure to take into account the environmental, economic, socio-cultural, and/or political issues associated with the technology's ultimate usage. Summer, Fall and spring terms annually. ***2 credit hours***

STSS 4100 may be replaced by an approved 4 credit course published at the beginning of each semester.

FOURTH YEAR FALL:

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***

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	
CHEM 1100	Chemistry I	4		CIVL 1100	Intro to Civil & Environmental Eng. [3]	1
CIVL 1200	Eng. Graphics for Civil Eng [1]	1		MATH 1020	Calculus II	4
ENGR 1100	Intro. to Engineering Analysis	4		PHYS 1100	Physics I	4
MATH 1010	Calculus I	4			Science Elective [2]	4
IHSS ####	Hum., Arts or Soc. Sci. Elective [2]	4			Hum., Arts or Soc. Sci. Elective	4
			SECOND YEAR			
ENGR 2250	Thermal and Fluids Eng.[5]	4		ENVE 2110	Intro to Environmental Engineering	4
MATH 2400	Intro. to Differential Equations	4		ENGR 2600	Modeling & Analysis of Uncert	3
PHYS 1200	Physics II	4		CSCI 1190	Beginning Prog. for Eng.[6]	1
CHEM 2250	Organic Chemistry I	3			Science Elective[4]	4
					Hum., Arts or Soc. Sci. Elective	4
Arch			THIRD YEAR	Spring		
ENGR 2050	Intro to Engineering Design	4		ENVE 4320	Environmental Chemodynamics	4
ENVE 4310	Applied Hydrology & Hydr.	4		ENVE 4340	Physiochemical Processes in ENVE	4
ENGR 4010	Professional Development III	1		STSS 4100	Professional Development II[7]	2
	Hum., Arts or Soc. Sci. Elective	4			Multidisciplinary Eng. Elective[8]	3
	Free Elective I	4			Technical Elective[9]	3
			FOURTH YEAR			
ENVE 4330	Intro to Air Quality	4		ENVE 4180	Environmental Process Design	3
ENVE 4350	Biological Processes in ENVE	4		ERTH ####	Earth Science Elective[10]	4
	Technical Elective[9]	3			Free Elective III	4
	Free Elective II	4			Hum., Arts or Soc. Sci. Elective	4

1. *CIVL 1200 may be replaced with ENGR 1200 or ENGR 1400.*
2. *The five HASS Electives may be taken in any semester. We recommend that students schedule one in each of the first two semesters and one in the Arch Summer. Students should take a HASS Inquiry course during their first year (IHSS XXXX); for a list of HASS Inquiry courses, go to https://info.rpi.edu/hass-inquiry. Students should take a HASS Communications Intensive course during their first three semesters; refer to the link "Communications Intensive (CI) Requirement" on the Registrar's "Academic Planning" web page.*
3. *CIVL 1100 may be replaced with ENGR 1300 ENGR 2250 may be replaced by CHME 4010.*
4. *Choose CHEM 1200 and either BIOL 1010 or another biology course chosen in consultation with adviser. Order does not matter.*
5. *ENGR 2250 may be replaced with CHME 4010.*
6. *CSCI 1190 may be replaced with CSCI 1100 or CSCI 1010.*
7. *STSS 4100 may be replaced by another course that satisfies the PD II requirement, refer to the link "Professional Development II Courses" on the Registrar's "Academic Planning" web page.*
8. *Multidisciplinary engineering elective: must be a 3 or 4 credit engineering course, chosen in consultation with the adviser (e.g., CIVL 2030, CIVL 2630, ENGR 1600, ENGR 2530, ENGR 4760, ISYE 4140).*
9. *Technical electives must be an engineering course 2000 level or above, selected in consultation with the program adviser (e.g., ENVE 4110, ENVE 4200, ENVE 4210, ENVE 4240). With adviser approval, courses from other disciplines may also be taken. These include Civil Engineering and Chemical Engineering (for example, CHME 4030, CIVL 2630, CIVL 4150, and others).*
10. *Earth Science Elective: must be an Earth Science course 2000-level or above. Choose from ERTH 2140, ERTH 2160, ERTH 2330, ERTH 4070, or ERTH 4500.*

EnvE Multidisciplinary Engineering Electives

Core Engineering
ENGR 1600 Materials Science
ENGR 2530 Strength of Materials
ENGR 4760 Engineering Economics

Transportation Engineering
CIVL 2030 Intro. to Transportation Engineering

Geotechnical Engineering
CIVL 2630 Intro. to Geotechnical Engineering

Industrial and Systems Engineering
ISYE 4140 - Statistical Analysis
ISYE 4240 - Engineering Project Management.

EnvE Technical Electives

Environmental Engineering
ENVE 4110 Aqueous Geochemistry
ENVE 4200 Solid and Hazardous Waste Eng.
ENVE 4240 Bench Scale Design
ENVE 4360 Geomicrobiology
ENVE/ERTH 4560 Isotope Geochemistry
ENVE/ERTH 4710 Groundwater Hydrology

Civil Engineering
CIVL 2630 Intro. to Geotechnical Engineering
CIVL 4140 Geoenvironmental Engineering

Chemical Engineering
CHME 4030 Chemical Process Dynamics & Control
CHME 4400 Chromatographic Separation Processes

128 credits minimum

Guidance for Efficient Completion of the Environmental Engineering Curriculum

Students who follow the ENVE curriculum template will graduate with a B.S. ENVE degree in 4 years. Transfer students and those electing Co-op or Semester Abroad experiences may need to deviate from the template; however, it is often still possible to graduate in 4 years. Guidance is provided below on which deviations from the standard template are possible and which should be avoided to ensure timely completion of the B.S. ENVE degree.

1) Students that bring a number of transfer credits (including AP credits) to their academic careers are encouraged to contact the Office of Civil and Environmental Engineering (518-276-6360; JEC 4049) early in their academic career.

2) ENGR 2250 Thermal and Fluids Engineering I is a prerequisite for 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.

3) 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 selected.

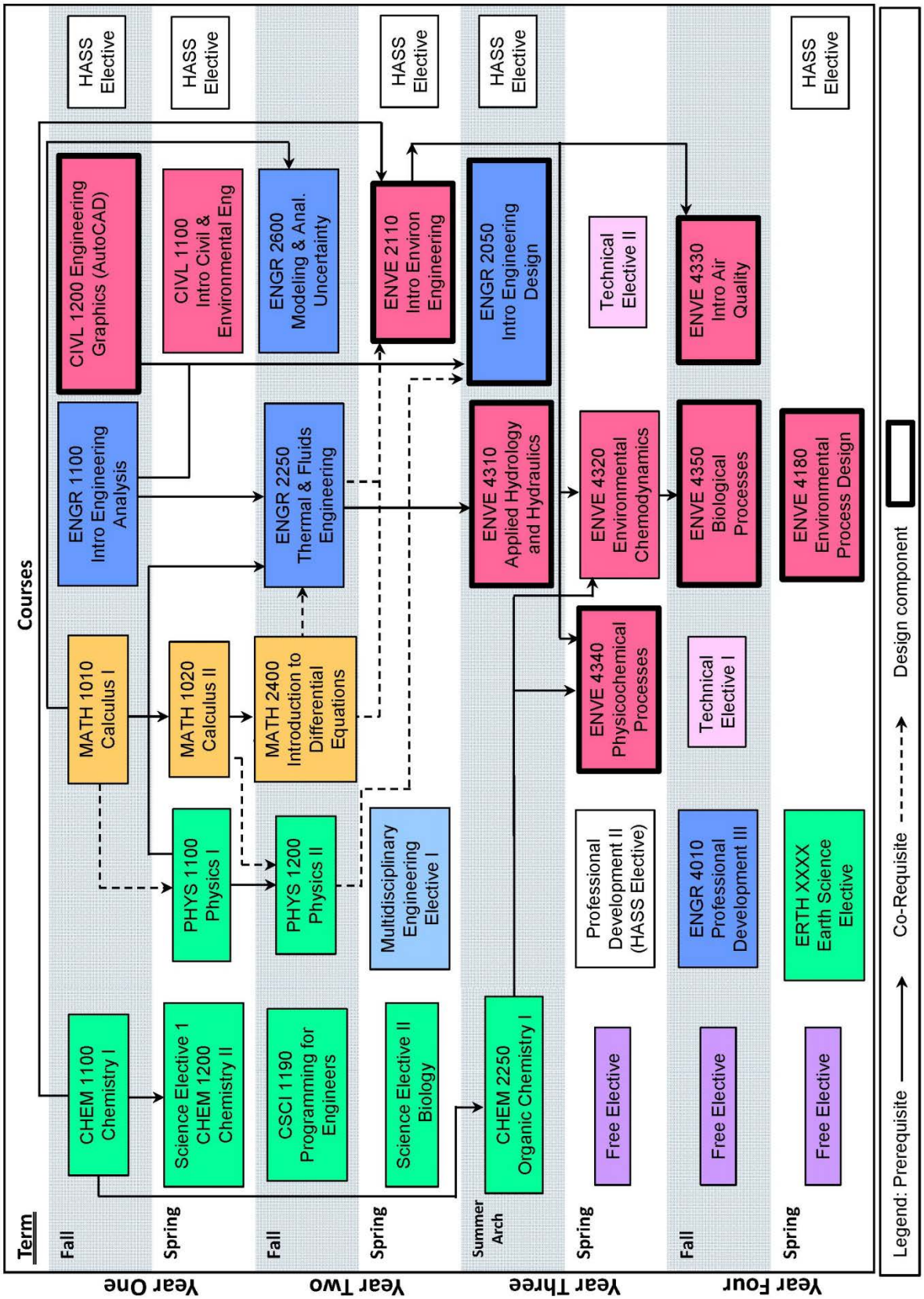
4) Students interested in environmental issues related to soils (landfill design, soil remediation) are encouraged to take CIVL 2630 Intro. to Geotechnical Engineering. Note that it is only be offered in the spring semester. Note that ENGR 2530 Strength of Materials is a prerequisite. ENGR 2530 will fulfill the Multidisciplinary Engineering elective requirement.

5) 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 4200 Solid and Hazardous Waste, ENVE 4330 Introduction to Air Quality, ENVE 4310 Applied Hydrology and Hydraulics, ENVE 4340 Physicochemical Processes, and ENVE 4350 Biological Processes.

6) If you are planning to be away from campus for either the Co-op or Study Abroad program, the preferred semester for ENVE students is fall semester of 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 the Registrar website. If you wish to take a 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.

7) Maximize job opportunities in Environmental Engineering by filling free elective course requirements with ENVE courses or courses related to ENVE.

Environmental Engineering Required Courses Flowchart



HASS and PD II – Policies for Engineering Students

As part of their B.S. degree program, all Rensselaer undergraduates take a selection of HASS courses referred to as the HASS Core.

The HASS Core consists of:

- 24 credits distributed to afford students a breadth of perspective across the various disciplines (See footnotes 1 below).
    - A maximum of 12 credits at the 1000-level can be counted toward the HASS core.
    - A maximum of 8 AP or transfer credits can be counted toward the HASS core. (See footnotes 3 and 5 below)
    - A maximum of 8 credits can be designated as P/NC.
- An approved 12-credit area of focus known as an Integrative Pathway, which is designed to add depth and coherence to the HASS Core, enhance students' majors, and optimize students' degree curriculum. Students can choose from a list of either disciplinary or interdisciplinary Pathways.
    - Courses counting toward the Pathway may not be designated as P/NC.
- One four-credit 4000-level course (See footnote 4 below)
- One HASS Communication Intensive course
    - Students should take their HASS Communication Intensive course during their first three semesters.
    - P/NC designation may not be used to satisfy this requirement.
- One HASS Inquiry course
    - Students should take an Inquiry course during their first year. These courses cultivate a deep appreciation of the ethical and moral imperatives that are the foundation of integrative knowledge that spans the humanities, arts, and social sciences. Students learn the habits of mind that illuminate contemporary global issues from a diversity of perspectives using an interdisciplinary, integrative, and collaborative approach. For a listing of HASS Inquiry courses go to: *https://info.rpi.edu/hass-inquiry*
- Breadth
    - Students should take at least one course from the humanities and one course from the social sciences.
    - Completion of a HASS Inquiry course (typically an IHSS course), in addition to the previously stated HASS Core requirements, satisfies the requirement.

Footnotes:

1. *Engineering majors must complete 20 credits of HASS courses in addition to the credits earned associated with the three-course sequence of professional development (PD) courses entitled PD1 (either ENGR 1010 or as part of ENGR 2050), PD2, and PD3 (ENGR 4010).*
2. *Transfer credit limit may be waived for transfer students if courses were taken at the previous institution, however, the limit for AP credits still applies.*
3. *Students who transfer into Rensselaer can satisfy this through a three- or four-credit course at their prior institution or a four-credit course at Rensselaer.*
4. *Students enrolled at Rensselaer who wish to take a HASS course for credit at another accredited institution must obtain prior approval for the course from the HASS Associate Dean for Academic Affairs. Applicants must furnish a catalog description of the proposed course and syllabus, and a completed copy of Rensselaer's Transfer Credit Approval Form to the HASS Student Services Hub on the 4th floor of the Sage building.*

Humanities	Code	Social Sciences	Code
Arts	ARTS	Cognitive Science	COGS
Communication	COMM	Economics	ECON

Games and Simulation Arts & Sciences	GSAS	Games and Simulation Arts & Sciences	GSAS
Human-Centered Design	HCDE	Human-Centered Design	HCDE
Interdisciplinary Studies	IHSS	Interdisciplinary Studies	IHSS
Languages	LANG	Psychology	PSYC
Literature	LITR	Science and Technology Studies, Social Science	STSS
Philosophy	PHIL		
Science and Technology Studies, Humanities	STSH		
Writing	WRIT		

THE 2-CREDITS OF PD II SHALL BE SATISFIED AS FOLLOWS:
STSS -4100 PD2 Tech Issues and Solutions, will satisfy the PD II requirement.

A 4-credit PD II alternate course at any level (2000-4000) can be substituted for the 2-credit STSS -4100 PD2 Tech Issues and Solutions course. A list of these PD II alternate courses is available on the Registrar's website.

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 HASS. These credits:
- cannot count toward the 4000 requirement,
- cannot count toward the depth requirement,

However,
- they can count toward the overall 20 credits of HASS,
- they can count toward the H and SS credit minimums,
- they can count toward the HASS "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 of STSS -4100 PD2 Tech Issues and Solutions, they may furnish a syllabus 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) Associate Dean of Academic Affairs is: **Brett Fajen** (fajenb@rpi.edu, Sage 4302)
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 HASS?
A: Use a 4-credit PD II alternate, with 2 credits to PD II, 1-2 credits to HASS 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. Use a 3- or 4- credit CIVL or ENVE course (beyond those required for your major)

Q: Am I really free to choose my free electives?
A: There are two restrictions for "free" electives:

- One credit courses that are graded Satisfactory / Unsatisfactory (S/U) and offered outside 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.
- ROTC courses (USAF, USAR, USNA) must not total more than six credits

One credit Engineering courses that are graded Satisfactory / Unsatisfactory (S/U), and one credit courses that are letter-graded (even if taken on a Pass/No Credit basis) fulfill Free Elective requirements.

Options for 1 credit free electives:

- independent study (1 credit ≈ 3 hours/week ⇒ ≈ 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-1200 Engineering Graphics for Civil Engineers
  - ENGR-1300 Engineering Processes (if not required for your major)
  - ENGR-1700 Intro to Better World Engineering
  - ISYE-1100 Introduction to Industrial and Systems Engineering
  - MANE-1100 Introduction to Nuclear Engineering
  - MANE-1090 Introduction to Mechanics 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-2360 Roots of Africa Music Ensemble
- ROTC courses (USAF, USAR, USNA, up to six credits maximum)
- most one-credit topics courses (see http://srfs.rpi.edu/update.do?artcenterkey=305)

HASS Checklist for Engineers

What departments are in the School of Humanities, Arts, and Social Sciences (HASS)?

ARTS: Arts and Music	LITR: Literature
COGS: Cognitive Science	PHIL: Philosophy
COMM: Communication & Media	PSYC: Psychology
ECON: Economics	STSH: Science, Technology, and Society – Social Science - Humanities
GSAS: Gaming and Simulation Arts and Sciences	STSS: Science, Technology, and Society – Social Science
IHSS: Interdisciplinary HASS	WRIT: Writing
LANG: Language	

What are my requirements?

Check off each completed requirement. If all boxes are checked and you haven't violated the restrictions below, you are done!	
	HASS Inquiry Course: Have you taken a course with an IHSS prefix? *Must be taken in your first academic year.*
	Communication Intensive Course: Have you taken a course with the "communication intensive" designation (found in SIS class search on the right side of the screen)? Note: This course can be one you took for your integrative pathway or your inquiry course. *Should be taken within your first 3 semesters, no P/NC allowed.*
	Integrative Pathway: Pick one pathway from this link (https://info.rpi.edu/hass-pathways/pathways-topics/#Choosefromover40topics) and write it here: Keep track of your pathway courses in the boxes below, check each off as it's completed. This requirement is done when you finish all three courses. *No P/NC allowed at any point in your integrative pathway.* ☐ ☐ ☐
	4000-Level Requirement: Have you taken a course at the 4000 level? Note: This course can be one you took for your integrative pathway.
	Credit Requirement: Have you taken 20 total HASS credits?

What are the restrictions?

1) No more than 3 classes can be taken at the 1000 level.
2) No more than 8 credits can be transferred into the HASS core.
3) No more than 2 courses can be designated as P/NC.

Registration

When: Registration for the Spring semester generally occurs in early November. Registration for the Summer semester generally occurs in mid March. 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

Degree Works

Your Degree Works worksheet 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 Degree Works 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 course is a core/required course, every effort will be made to accommodate the request. If it 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 courses after the published deadline, you may do so using a Late Add/Drop Form. Please note that after the instructor's signature is obtained (if required), the form must 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 Degree Works worksheet.
- 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 during 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

http://eng.rpi.edu/students/hub

The School of Engineering Advising Hub is the primary source of academic advising for all engineering students during their first two semesters at RPI. Beginning with the third semester. a faculty advisor will be assigned to each engineering student. The Hub is located in the Ansell lounge on the third floor of the Jonsson Engineering Center (JEC) and is staffed by experienced advisors who will offer academic assistance for all engineering majors. Hub advisors assist students in establishing a foundation for academic success through student responsibility and planning. The Hub is a resource for all advising purposes including:

- Semester course planning
- Clear Student Advising Meeting (SAM) holds
- Major/minor declaration or changes
- Form approvals
- Registrar Protocol
- The Arch planning
- HASS and other course requirements

The Advising Hub will offer academic support to students through the end of the spring semester of their freshmen year. At that time, students will transition to a faculty advisor specific to the student's major. The faculty advisor will then contribute to the student's academic success by offering valuable perspective on internships, research and job prospects in addition to graduation requirements.

The Advising Hub hours are Monday, Tuesday, Thursday, and Friday, 9am-4pm by appointment.
Walk-in Wednesdays offer 20 minute meetings with no appointment necessary.

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. The student chapter of Chi Epsilon at RPI engages in various activities including holding initiation ceremonies (students are invited to join based on GPA and the aforementioned qualities), organizing exam review sessions for the Fundamentals of Engineering exam, the first step toward earning a professional engineering license, and assisting the Department of Civil and Environmental Engineering with open house/recruitment events.

Order of the Engineer
Hosted by Chi Epsilon, JEC 4049

The Order of the Engineer was initiated in the United States to foster a spirit of pride and responsibility in the engineering profession, to bridge the gap between training and experience, and to present to the public a visible symbol identifying the engineer. The Rensselaer Link holds their initiation ceremony in the spring, all senior engineering students are invited to accept the Obligation of the Engineer and a stainless steel ring. The Obligation is the pledge to uphold the standards and dignity of the engineering profession and to serve humanity by making the best use of Earth's precious wealth. The ring is to be worn on the fifth finger of your working hand and is an outward symbol of your dedication to the profession which can be recognized by all other engineers. More information can be found at http://www.order-of-the-engineer.org .

Undergraduate Research Program (URP)

Departmental faculty are involved in four areas of research - Environmental, Geotechnical, Structural and Transportation Engineering. 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 a 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 in consultation with the participating faculty member.

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 require eight to twelve hours of work per week.

The URP application should be submitted to the Department Coordinator, Debbie Roden, 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 & Biroremediation	Microscopic Activity of Microorganisms	Water Resources
Tarek Abdoun	X		X		X					
Mohammed Alnaggar		X			X					
Victoria Bennett			X							
Ricardo Dobry	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					
Xiaokun (Cara) Wang				X						
Mourad Zeghal	X		X		X					
Thomas Zimmie	X		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.

For more information on study abroad programs, go to the Office of International Programs, located in Academy Hall, Suite 4226, or see the Office of Undergraduate Education website at http://info.rpi.edu/international-programs, 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 enhance 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 above for guidance on completing curriculum requirements).

For more information on Co-op programs, please go to the following website:
https://info.rpi.edu/career-development/students

Co-Terminal Degree (B.S./M.S. or B.S./M.E.) Program

1. General Information, Application and Admission

The *co-terminal* B.S./M.S. or B.S./M.E. 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 (BUT NOT FEDERAL FINANCIAL AID) will continue for the co-terminal students through their fifth year of study (detailed information may be obtained by contacting the Office of Financial Aid). Students contemplating the co-terminal degree are encouraged to talk to their academic advisor early (first semester) in their academic career. The M.S. and M.E. degrees are graduate degrees supervised by the Office of Graduate Education and thus the application for admission to the co-terminal program is handled by the Graduate Admissions Office. The general requirements for the Master's degree earned through the co-terminal program are the same as those for the regular Master's 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. Under special circumstances, students with a cumulative GPA between 3.0 and 3.2 may be admitted into the program.

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 program is available online from the registrar office: 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 Degree Works worksheet, (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 Bachelor's degree and at least 30 to the Master's degree.

2. Credit Requirements

M.S. Degree (Co-Terminal degree with Thesis): An M.S. degree requires: (1) 30 credits beyond the bachelor's degree (consisting of course work and master's 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 master's 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).

M.E. Degree (Co-Terminal degree without Thesis): An M.E. 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 M.E. 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* M.S./M.E. 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.

M.E. students will be assigned an advisor by the department. Before the start of the fall semester of their co-terminal (5th) year, M.S. students are required to identify an advisor who is committed to supervising their research. Upon admission to the program, M.S. students should contact prospective advisors to identify an area of research and reach a mutual agreement on a research project for their M.S. thesis. The M.S. advisor plays the role of both academic and research advisors. The M.S. student and graduate advisor will work closely to ensure successful completion of a research project. In addition, 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 M.S. and M.E. degrees require that 30 credits be completed beyond the B.S. However, as explained above, the M.S. degree requires 24 credits of courses while the M.E. degree requires 30 credits of courses. Credits applied toward satisfying the bachelor's degree requirements cannot be used to satisfy the Master's 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 established by and managed by the Office of Graduate Education. These include the following rules which apply to all courses that are counted toward the Master's 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 Master's 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 program must include a Plan of Study. This plan outlines the student's academic program and must comprise 30 credits of coursework for M.E. students and 30 credits of research and coursework for the M.S. 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 credits 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 M.S. students

In addition to the credit requirements (Section 2), the M.S. degree requires:

- Identification of a research advisor (as described above),
- Establishment of an M.S. research committee (in collaboration with the advisor),
- Registration in CIVL 6900 (spring term only),
- Writing an M.S. thesis, and
- Public defense of the M.S. research (Oral Thesis Examination).

M.S. Committee

The purpose of the M.S. committee is to assess the quality 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 M.S. committee. This committee should consist of three full-time, tenure track faculty members from the *Department of Civil and Environmental Engineering*. The committee Chair must be the research advisor.

Thesis Examination

M.S. students are required to successfully pass an oral examination of their Master's 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 oral 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 conference 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 research funding agencies.

7. Satisfactory Progress

It is imperative that students make continual and satisfactory progress toward earning their co-terminal master's degree. 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

Areas of Study/Degrees

Civil Engineering, M.S., M.Eng, PhD
Environmental Engineering, M.S., M.Eng, PhD
Transportation Engineering, M.S., M.Eng, PhD

Typical Degree Requirements
M.S. 30 credits (24-27 coursework, 3-6 thesis)
M.Eng. 30 credits coursework
PhD 42 credits beyond B.S. plus doctoral thesis

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

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

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; *a separate application form is not 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 2019-2020 academic year is $54,000; fees and insurance are $2,694; Estimated Living expenses are $14,662 and Estimated Books and Supplies are $2,950. Total Estimated Cost of Attendance: $74,306

Contact Us

Kimberly Boyce, Department Admissions Coordinator, Department of Civil and Environmental Engineering
Phone: 518-276-6941
Email: boycek@rpi.edu
http://www.cee.rpi.edu

Frequently Asked Questions

Accelerating Courses

1. If I have advanced placement credit, what course should I take in place of the listed course? For many topics, courses are taught in the first few years as sequences of 2 or 3 courses that are taken in order. Advanced placement credit will be posted by the Rensselaer course name so the action by you might be to take the next topic course in the sequence. The Mathematics sequence is a prime example of this. A second option is to delay taking the next course in the sequence and to substitute in its place another future semester course provided all the prerequisites for the course are met.

2. Can I take senior level courses as a sophomore when I meet the course prerequisites? The general guidance provided in course level numbering is that 1000 level courses are freshman level, 2000 are sophomore, and 4000 are junior – senior level. The recommendation is to respect this guidance especially when looking at 4000 level courses.

Pass/No Credit Usage

1. Can pass/no credit be used for courses selected from a list? No, courses that are listed by name as degree requirements (including those that are selected from a list of restricted electives) cannot be applied to the named degree requirement if taken pass/no credit.

2. Who signs the pass/no credit election form? Your advisor must sign the form. The purpose of this signature is to force a meeting between you and your advisor so that the consequences of your election are fully understood. No signature is required to remove the designation.

3. Can pass/no credit be used for HASS courses? Pass/no credit can be used for HASS courses but with restrictions. The catalog lists the current restrictions so refer to the latest issue of the catalog to get the current policy. No course used for the depth sequence in a topic can be taken pass/no credit.

Registration

1. What do I do if a class I want to register for is full? For many courses, the class size listed on SIS is the room size so no additional students can be added to the room. For CIVL/ENVE courses, meet with the instructor of the course and request to be admitted to the course. If there is physical space to accommodate you, your request will often be approved. If an elective course is full, you may be asked to take the course in a subsequent semester. Note that for Core Engineering courses (ENGR prefix) there will be an electronic waitlist available at the time of registration.

2: How do I add/drop a course? You may use the Student Information System (SIS) to add or drop courses. Generally speaking, during the fall and spring 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. Students are encouraged to discuss courses changes with their advisor.

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 getting the instructors signature (if required), the form must also be approved by the Advising and Learning Assistance Center.

Co-Terminal Program FAQ's

1. **When do I apply?**

Co-terminal applications must be submitted before the end of the first semester of the applicants' senior year. Each department has their own application deadline separate from the Office of Graduate Education's deadlines of November 15th for spring admission and May 1st for fall admission into the Co-Terminal Program. Applicants must have 90 credits of coursework in progress or earned towards their undergraduate degree.
https://info.rpi.edu/co-terminal

2. **Where do I find a Plan of Study?**

The Plan of Study is available on-line at the Office of Graduate Education website.

3. **What if the courses I list on the Plan of Study change?**

If the courses listed change, an updated plan must be filed with your Department, the Office of Graduate Education, and the Office of the Registrar.

4. **Do I have to file a FAFSA for my 5th year to get aid?**

Yes - you must file a FAFSA, if you receive need based aid or choose to apply for a graduate level Federal Direct Aid loan. (Please contact the Office of Financial Aid for application deadlines).

5. **When/how does a student get assigned a graduate advisor?**

Co-terminal students will continue to work with their undergraduate adviser until completion of the 8th semester and will have a graduate advisor assigned in the 8th semester.

6. **How many credits will I be eligible to register for?**

During graduate study, students are limited to a total of 15 credits each semester.

7. **Can I become a part-time student in the Co-Terminal Program?**

Co-terminal students must remain as full time students and cannot shift to part-time status.

8. **When do I receive my B.S. degree? I was supposed to graduate in May 2019 but I will be completing two more semesters to receive my Master's degree under the co-terminal program?**

You should file a degree application with the Office of the Registrar for your B.S. degree at the beginning of the semester in which you will have met the degree requirements for the degree. See the academic calendar for deadline information. Upon graduating with your B.S. degree, your primary status/classification will change to graduate.

9. **Can I use a course for both my undergraduate and graduate degree?**

No - credits applied toward satisfying requirements of the undergraduate degree cannot be used to satisfy the requirements for the Master's degree and vice versa.

10. **I finished my 9th semester but decided not to continue in the Master's program. How do I receive my B.S. degree?**

You must formally withdraw from the co-terminal program. This is done using the Graduate Student Request for Change of Status form. The Change of Status form is required at any point that you decide to leave the program. This includes if you decide to leave the program upon completion of your B.S. degree.

11. Can I still designate courses as Pass/No Credit?

Co-terminal students are subject to graduate degree program guidelines. Any courses being applied to a graduate degree cannot be taken as Pass/No Credit. Students must earn a grade of C- or better in courses used towards a graduate degree and graduate with a GPA of 3.0 or higher.

12. How does the degree application process work for Co-Terminal Students?

Students may participate in commencement when they complete their B.S. degree requirements, and again upon completion of their M.S. degree. To apply for graduation, students must fill out a degree application on the Student Information System (SIS) the semester they intend to graduate. Although Rensselaer students can officially graduate in August, December, or more commonly, May, Rensselaer's commencement ceremony is only held once a year in May. Check the academic calendar for application deadlines.