RUTGERS
School of Engineering

NEW BRUNSWICK

CIVIL AND ENVIRONMENTAL ENGINEERING

UNDERGRADUATE STUDENT HANDBOOK

2024 – 2025

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INTRODUCTION

The Department of civil and environmental engineering offers a four-year undergraduate curriculum leading to the Bachelor of Science degree, a professional degree. A dual-degree program also is offered leading to a B.S. degree in civil engineering and a B.S. or B.A. degree in any liberal arts and science major. There are two joint BS/Master's programs available: a BS-MS five-year program and BS-MBA five year-program. Details for these two joint BS/Master's programs are available at https://soe.rutgers.edu/academics/undergraduate/combined-programs . Students can receive 3 credits for doing an internship with engineering firms or government agencies. These 3 credits can only be used for technical electives. See more information on pages 21 and 22.

This handbook is intended to inform and update the undergraduate civil and environmental engineering students regarding academic policies, procedures and requirements that are particular to civil and environmental engineering students. This handbook also is intended to provide faculty advisors with codified information necessary for student advising and counseling.

All faculty advisors and civil engineering students should carefully read this Student Handbook as well as the University Academic Policies and Procedures and Degree Requirements posted on this link https://soe.rutgers.edu/oas/academicpolicies and published in the current New Brunswick Undergraduate Catalog located on the web at http://catalogs.rutgers.edu/generated/nb-ug_current/. It is the responsibility of the student to be familiar and be cognizant of this student handbook and University Policies and Procedures.

PROGRAM EDUCATIONAL OBJECTIVES

Consistent with the stated mission of the University, the objectives of the civil engineering program are to provide students with a broad and thorough education in civil and environmental engineering fundamentals, applications, and design. The education will prepare graduates for the practice of civil and environmental engineering at the professional level with confidence and skills necessary to meet the technical and social challenges of the future and for continuing their studies at the graduate level. Recent graduates with a B.Sc. in civil engineering (within few years after graduation) will have:

1. Successful careers in the civil engineering profession that incorporate life-long learning leading to professional licensure and/or advanced degrees.
2. Effective oral, visual, and written communication and strong professional and ethical responsibility in the practice of civil engineering.
3. Demonstrated records of individual and team accomplishments in developing creative and sound engineering solutions to practical problems that meet professional, societal, sustainability, and global challenges.

PROGRAM STUDENT OUTCOMES

Attainment of student outcomes prepares graduates to enter the professional practice of civil engineering. Each student in the civil engineering program is expected to demonstrate the following outcomes by the time of graduation:

1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3) an ability to communicate effectively with a range of audiences.
4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5) an ability to function effectively on a team whose members together **provide leadership**, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

PROGRAMS OF STUDY

The objective of the undergraduate civil engineering program is to provide broad and thorough education to students in civil and environmental engineering fundamentals, applications, and design in order to prepare graduates for the practice of professional engineering. To enable the graduates to meet challenges posed by an ever-changing society and advancing technology, the program intends to provide a broad background in many of the different areas of civil and environmental engineering, and sound exposure to engineering sciences, humanities and social sciences. The civil engineering curriculum is ABET accredited.

Student may concentrate in one of the five areas of civil and environmental engineering. The first three years (6 semesters) are identical for all five areas. Changes take place in the senior year. A variety of departmental and technical electives and the “capstone” design courses, permit the student to concentrate in areas of personal interest. A total of 128 credits is required for the undergraduate degree in civil engineering. The curriculum for civil and environmental engineering is shown on page 12.

Students should make sure that they fulfill the following electives: one general elective, one science elective, two technical electives, one departmental elective, one civil design elective (capstone), and four humanities/social science (H/SS) electives. Students should always check Degree Navigator to see which courses are already fulfilled and which ones are still need to be fulfilled. Here is the link to Degree Navigator: https://cas.rutgers.edu/login?renew=true&service=https://dn.rutgers.edu/Default.aspx/

A. Electives for Civil and Environmental Engineers

1. **Departmental Electives** can be 300 or 400 level civil and environmental engineering courses (180: ___) courses listed on page 14.

2. **Civil Design Electives "capstone"** : Student must take in the spring semester of the senior year **at least one civil design elective "capstone" design** course from the ones listed below. The civil design electives or 'capstone" courses are:

   180:407 Construction Projects
   180:426 Structural Design
   180:431 Design of Environmental Facilities
   180:438 Transportation Engineering II
   180:474 Geotechnical Engineering

3. **Technical Electives** are those upper level technical courses appropriate for civil and environmental engineers. The CEE curriculum currently requires two (2) technical electives. The technical electives to be chosen from among those listed on pages 15-19 of this handbook. Any extra departmental elective course may be used as a technical elective. A student may take Special Problems in Civil and Environmental Engineering (180:491, 492, 493, 494), as technical electives or departmental electives with approval of a professor supervising the work, to a limit of 3 credits in the senior year. This course is generally limited to seniors with GPA of 2.7 or higher. The student needs to have an advisor and should email the Undergraduate Director or Administrator to request an SPN. Special Problems in Civil and Environmental Engineering (180:491, 492, 493, 494) can be accepted as a departmental elective with special approval from the undergraduate director.

4. **Humanities/Social Science (H/SS) Electives and Expository Writing 355:101** are intended to serve the objectives of a broad education, and to make engineers fully aware of their social responsibilities and better able to consider related factors in the decision-making process. The CEE curriculum requires 18 credits of Humanities/Social Science. Six (6) credits of the H/SS electives must be Expository Writing (355:101) and Science and Tech Writing (355:302). Of the remaining twelve (12) H/SS electives, at least 6 credits must be at an advanced level (200 level or higher). A list of acceptable Humanities/Social Science Electives courses is provided on the School of Engineering website at https://soe.rutgers.edu/oas/electives

5. **Science Elective**: Students in the CEE program must take one (1) science elective from those listed on page 21 of the Handbook.

6. **General Electives** may be almost any course taught for credit at Rutgers University qualifies as a general elective. There are, however, a few exceptions in certain subject areas . See the School of Engineering website for details: https://soe.rutgers.edu/oas/electives

List of the courses that are NOT acceptable AS General Electives:
Chemistry 01:160:110 Through 140
Computer Science 01:198:107, 110, 170
English 01:355:096 through 099, 01:355:155, 01:355:156
Exercise Science 01:377:171 through 180
Mathematics 01:640:011 through 01:640:115
Any University course with an "E" Credit Prefix

5. Graduate Courses may be taken as departmental electives by qualified undergraduate students. In order to qualify, the student be senior and have a cumulative Grade Point Average (GPA) of 3.0 and must obtain approval of the course instructor or Graduate Program Director.

B. Dual Degree, Double major, and Minor Programs:

Minors, majors, and dual degrees provide students with the opportunity to broaden skill sets outside of engineering. These programs are offered in conjunction with various other undergraduate schools at Rutgers University, including the School of Arts and Sciences and the School of Environmental and Biological Sciences. For more information about these programs, see http://soe.rutgers.edu/oas/minors-majors

C. BS/Master Degree Programs

There are two special joint programs offering the opportunity for engineering students to obtain a Master's degree within one calendar year of completing the baccalaureate degree requirements. Qualified School of Engineering students are eligible to apply for admission to these accelerated Master's Programs in their junior year.

BS/MS Program

The BS/MS program in civil and environmental engineering enables top Rutgers undergraduate engineering students to be accepted into our graduate program in an expedited way. In addition, it gives those students the possibility to receive an MS degree in a shortened time frame. It is strongly recommended students use the James J. Scholars program. This highly intensive academic program gives students more research experience and better prepares them for research and development careers or further graduate study. An application form is available on page 32 of this handbook. The form with the required information should be submitted to Gina in RWH-304 or by email at: gcullari@rutgers.edu

BS/MBA Program

The BS/MBA accelerated program requires student to apply to the Rutgers Business School (RBS) for admission in their junior year. Admission to the BS/MBA requires 3.3 GPA and top 75th percentile score on the GMAT or GRE exam plus one semester of calculus and statistics (with grades of 'B' or better). For more information, see http://www.business.rutgers.edu/academics. For more information, see http://soe.rutgers.edu/oas/BS-Masters.

D. Co-op Internship

The internship provides the student with the opportunity to practice and/or apply knowledge and skills in various civil and environmental engineering professional environments. This internship is intended to provide a capstone experience to the student's undergraduate experience by integrating prior course work into a working engineering environment. The experience also motivates the student for further learning. The credits earned are for the educational benefits of the experience. The co-op internship normally counts as a technical elective but may count as a departmental elective with the approval of a professor supervising the work and the undergraduate director. More details are given on pages 21 and 22.

GENERAL REGISTRATION RULES FOR ALL CLASSES

1. The average course load is about 15-18 credits per semester. Students should maintain a normal load of engineering-related courses as specified on their program sheet. The minimum load per semester is 12 credits and the maximum is 20 credits. Special permission from the Associate Dean of Academic Affairs is required for course loads outside these limits. Credit overload formhttps://rutgers.ca1.qualtrics.com/jfe/form/SV_ePyn8PkbcI4zDT0

2. Students are not allowed to register for any course without the proper prerequisites, unless approval is received from the instructor and their advisor. A chart of prerequisites for the CEE program can be found on page 13.

3. Students who fail any required course must repeat it. A letter grade of F is a failing grade. In some cases, students can apply to have the F removed from the GPA: http://soe.rutgers.edu/oas/pnc-repeat

4. All CEE courses, including all Department and Technical Electives, must be taken at Rutgers for the first time. Students who fail a CEE course may repeat it elsewhere. Permission to take the course outside Rutgers must be obtained from the faculty advisor and Associate Dean of Academic Affairs. Authorization forms are available in room EN B-100: https://soe.rutgers.edu/academic-advising-and-policies/academic-policies/summer-or-winter-courses

5. Students may register for at most one Pass/No Credit course per semester for a total of two during the entire time at RU-SOE. Obtain the Pass/No credit form from the School of Engineering website at https://soe.rutgers.edu/oas/pnc-repeat

6. *440:221"Statics", 180:243 "Mechanics of Solids", 440:222 "Dynamics", and 640:244 "Differential Equation" are prerequisite courses for many junior year courses. Make certain to complete these courses before the start of the fall semester of your junior year.*

Seniors must carefully review their progress towards the Civil and Environmental Engineering degree. It is important that the student review his/her academic record to ensure that they have completed the necessary classes required for graduation. The student is urged to obtain a complete transcript from the Registrar (free of charge - https://sis.rutgers.edu/tags/) and check the curriculum sheet against it to find out what courses remain to satisfy the degree requirements. Students should also check Degree Navigator: https://cas.rutgers.edu/login?renew=true&service=https://dn.rutgers.edu/Default.aspx/ . The Office of Academic Affairs, in B-100 of the Engineering Building is available for assistance with regard to degree audit.

REQUEST FOR SPECIAL PERMISSION NUMBER (SPN)

To better manage enrollment in CEE Undergraduate Courses for CEE undergraduates, SOE undergraduate students, and (SEBS) Bioenvironmental Engineering students, **Students will request to be added to a waiting list for the course.** A Special Permission Number (SPN) will be issued by the CE Undergraduate Program Administrator, Linda Szary, ljs@soe.rutgers.edu. Depending on enrollment demand, student seniority, CEE/SOE instructional resources, and SOE/Rutgers space availability**, students will be issued a SPN no later than 3 weeks prior to the beginning of a term.** The waiting list period should be shorter in most cases. The CEE Undergraduate Director will be managing enrollment in consultation with the CEE Faculty, Department Chair, Undergraduate Program Administrator, and B100 SOE Deans.

The procedure for obtaining a Special Permission Number (SPN) to enroll in a closed CEE Undergraduate Class is based on a waiting list enrollment demand system. The CE Undergraduate Program Administrator manages the course waiting list. The steps to obtain an SPN are given below.

Step 1. The student sends the following email message to the CEE i and cc'd individuals in the format shown below.

TO: CE Undergraduate Program Administrator (Linda Szary, ljs@soe.rutgers.edu)

CC: CEE Undergraduate Director (Prof. Najm, hnajm@soe.rutgers.edu)

CC: Student's CEE Class Advisor (see page 11 of this Handbook)

HEADER: Student Name, Student ID#, Course Name & ID#, SPN Request

BODY: I am requesting a SPN for Course Name & ID# for TERM (e.g. Fall 2019). [If you have special reason(s) you should be allowed to enroll please state.]

Step 2. Student will be placed on a waiting list for the course. The CEE Undergraduate Director will review the request and make a decision no later than 3 weeks prior to the session start date.

Step 3. Once approved, CE Undergraduate Program Administrator, Linda Szary, will issue the course Special Permission Number to the student via email.

REQUEST FOR PRE-REQUISITE OVERRIDE

General guidelines from the Office of Academic Affairs for pre-requisites and co-requisites for SOE Undergraduate Classes are found at http://soe.rutgers.edu/oas/prerequisite. Follow the steps below to obtain a Pre-Requisite Override Number for CEE Undergraduate Classes.

Step 1. Student meets with the course instructor requiring the pre-requisite(s) course to discuss the reason for the override and on what basis the student should be able to enroll in the course.

Step 2. If the CEE course instructor agrees to the student enrolling in the course without the pre-requisite course(s), then the **student sends the following email message to the course instructor and cc'd individuals in the format shown below**.

TO: CEE Course Instructor

CC: CEE Undergraduate Director (Prof. Najm, hnajm@soe.rutgers.edu)

CC: CE Undergraduate Program Administrator (Linda Szary, ljs@soe.rutgers.edu)

CC: Student's CEE Class Advisor (see page 11 of this Handbook)

HEADER: Student Name, Student ID#, Course Name & ID#, Pre-Requisite Override

BODY: I am requesting an Override for Course Name & ID# for TERM (e.g. Fall 2013). The reason(s) I should be allowed to enroll without the pre-requisite course(s) (NAME OF COURSES) is/are because (list your reasons).

Step 3. The CEE Undergraduate Director will review the request. Once approved, CE Undergraduate Program Administrator, Linda Szary, will issue an SPN to the student via email.

Step 4. The student should submit a 'special remigration form' using this link: https://rutgers.ca1.qualtrics.com/jfe/form/SV_0vK20fMyKiFjBOK

TAKING A COURSE AT ANOTHER SCHOOL

Students may take certain courses at another institution over the summer or winter sessions (not during the spring or fall terms) and transfer the credit (not the grade) to be applied towards your Engineering degree at Rutgers. A grade of C or better is required for the credits to be eligible for transfer (the grade does not transfer into the transcript/GPA). Courses eligible to be taken outside of RU during the summer/winter include first and second year courses of the engineering curriculum: math, physics, chemistry, humanities/social science electives, tech electives, sophomore level introductory major courses. Junior and Senior level major courses may NOT be taken outside of RU unless failed first at RU or unless there is some extenuating circumstances. Taking a junior/senior level major course outside of RU requires the approval of the civil engineering undergraduate director. For more details, see https://soe.rutgers.edu/academic-advising-and-policies/academic-policies/summer-or-winter-courses

TRANSFERRING INTO THE SCHOOL OF ENGINEERING

Advising of students transferring to Rutgers School of Engineering is directed by Assistant Dean Robert Ciervo, School of Engineering, Office of Academic Services, EN-B100. Email: Assistant Dean Robert Ciervo robert.ciervo@rutgers.edu. To be eligible to apply, ensure that you will have completed the appropriate courses by the time you intend to begin your studies at Rutgers. Generally we look for the equivalent of our first year courses: 2 semesters of calculus, 1 semester of calc based physics, Matlab computer programming, 2 semesters of chemistry. Some other relevant courses recommended to take are: engineering mechanics-statics, English Composition. For more details for transfer within Rutgers, see https://soe.rutgers.edu/oas/transfer_schooltoschool For more details for transfers from outside Rutgers, please see https://soe.rutgers.edu/oas/transfer_external

RUTGERS UNIVERSITY

SCHOOL OF ENGINEERING

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

UNDERGRADUATE FACULTY ADVISORS

Student advisees with last names beginning in the indicated alphabetical range are assigned to one designated CEE faculty member throughout the 8-semester undergraduate curriculum while at Rutgers.

Dr. Nenad Gucunski, Chair	gucunski@rutgers.edu	848-445-2232/2569	WH 304C
Dr. Husam Najm, UD	hnajm@rutgers.edu	848-445-7980	WH 428G

Dr. Najm's Advising Hours, M and F 12:00 – 2:00 PM

Advisors: Class of 2024

Dr. Hao Wang (A-F)	hw261@rutgers.edu	848-445-2874	WH 428E
Dr. Yook-Kong Yong (G-K)	yyong@rutgers.edu	848-445-3219	WH 322D
Dr. Jie Gong (L-R)	jg931@rutgers.edu	848-445-2881	WH 420D
Dr. Tyler Othes (S-Z)	to193@rutgers.edu	848-445-2881	WH 328G

Advisors: Class of 2025

Dr. Jing Jin (A-F)	peter.j.jin@rutgers.edu	848-445-8563	WH 420F
Dr. Husam Najm (G-K)	hnajm@rutgers.edu	848-445-7980	WH 428G
Dr. Xiang Liu (L-R)	xiang.liu@rutgers.edu	848-445-9339	WH 428D
Dr. Ethymios Nikolopoulos	efthymios.nikolopoulos@rutgers.edu	848-445-9338	WH-428F

Advisors: Class of 2026

Dr. Qizhong Guo (A-F)	qguo@rutgers.edu	848-445-2983	WH 328F
Dr. Meiyin Liu (G-K)	meiyin.liu@rutgers.edu	848-445-2880	WH 420E
Dr. Roger Wang (L-R)	rq.wang@rutgers.edu	848-445-2870	WH 328E
Dr. Vassiliki Demetracopoulou	vd381@rutgers.edu	848-445-2794	WH-428A

Advisors: Class of 2027

Dr. Hani Nassif (A-F)	nassif@rutgers.edu	848-445-4414	WH 322E
Dr. Nicole Fahrenfeld (G-K)	nfahrenf@rutgers.edu	848-445-8416	WH 328D
Dr. Monica Mazurek (L-R)	mmazurek@rutgers.edu	848-445-2871	WH 322F
Dr. Yalin Li (S-Z)	yalin.li@rutgers.edu	848-445-2870	WH-328A

Students are encouraged to see their advisors as often as necessary, but are required to see them at least once a year. The Chairman and the Undergraduate Director also are available for discussion of individual or departmental matters. ***GENERAL ADVISING AND SCHEDULING ARE CONDUCTED WITH THE CLASS ADVISORS ABOVE.*** Please send an email to your class faculty advisor to schedule an appointment.

CIVIL AND ENVIRONMENTAL ENGINEERING CURRICULUM

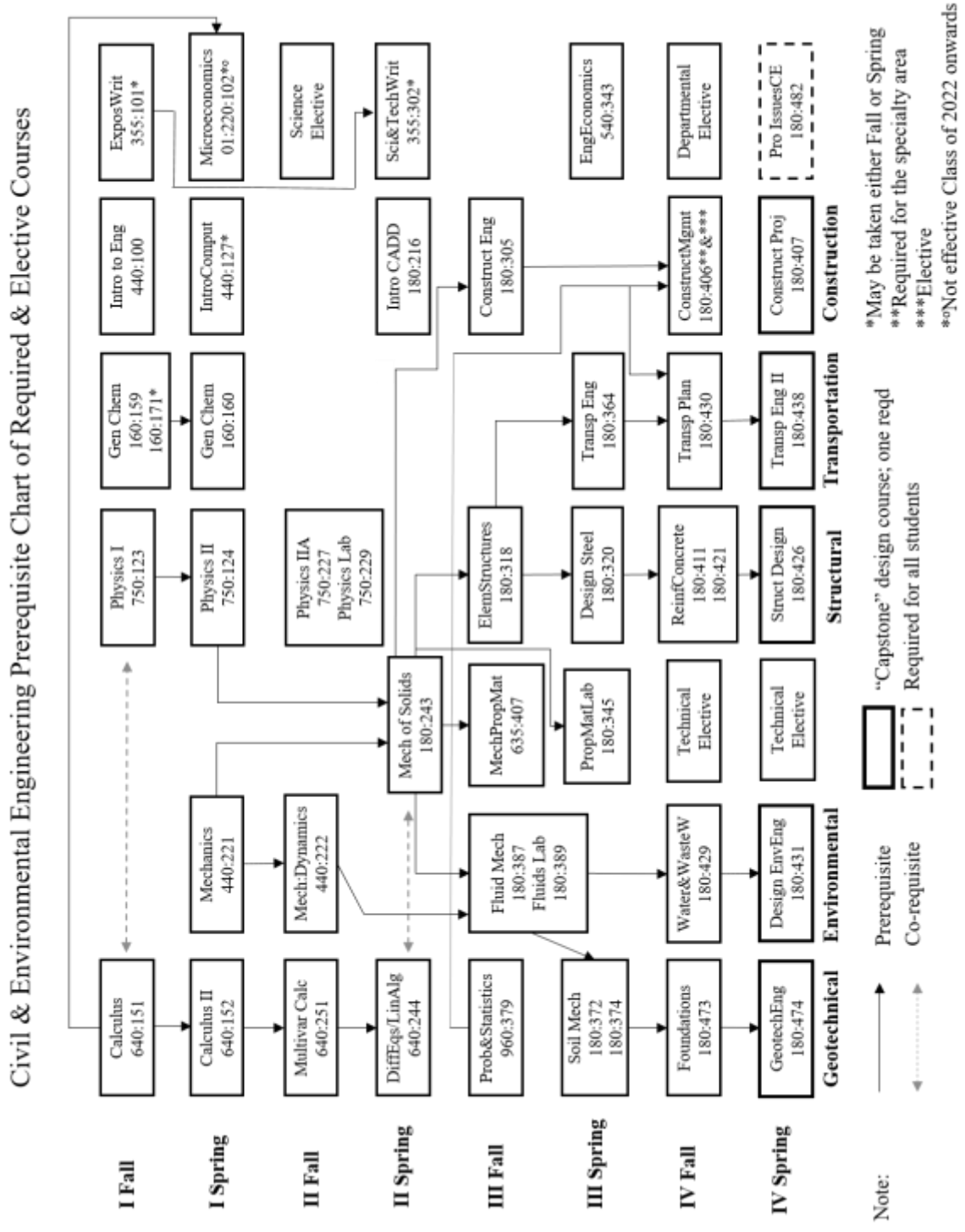
	Fall			**Spring**	
160:159	Gen Chem for Engrs	3	160:160	Gen Chem for Engrs	3
160:171	Intro to Experiment.	1	640:152	Calculus II: Math/Phys	4
355:101	Expository Writing I	3	750:124	Analytical Physics Ib	2
640:151	Calculus I: Math/Phys	4	440:127	Intro Comp for Engrs	3
750:123	Analytical Physics Ia	2	440:221	Eng'g Mech: Statics	3
440:100	Eng'g Orient Lecture	1	_____	Hum/Soc Elective	3
_____	Hum/Soc Elective	3		Total	18
	Total	17			
355:302	Scien. & Tech. Writing	3	640:244	Differential Equations	4
640:251	Multivariable Calculus	4	180:216	Intro CADD	3
750:227	Analytical Physics IIa	3	180:243	Mech of Solids	3
750:229	Analytical Phys IIa Lab	1	_____	Hum/Soc Elective (200+)	3
440:222	Eng'g Mech: Dynamics	3	_____	**Science Elective**	3
_____	Hum/Soc Elective (200+)	3		Total	16
	Total	17			
960:379***	Basic Prob & Statistics	3	180:320	Elem Structural Design	3
180:305	Construction Eng'g	3	180:345	Prop Materials Lab	1
180:318	Elem of Structures	3	180:364	Transportation Eng'g	3
180:387	Fluid Mechanics	3	180:372	Soil Mechanics	3
180:389	Fluid Mechanics Lab	1	180:374	Soil Mech Lab	1
635:407	Mech Prop Materials	3	540:343	Eng'g Economics	3
	Total	16		Total	14
180:411	Reinforced Concrete	3	180:482	Prof Issues in CE	1
180:421	Reinforced Concr't Lab	1	_____	**Civil Design Elective***	4
180:429	Water&Waste Wtr Eng	3	_____	**Tech or Dept Elective**	3
180:430	Transportation Plan'g	3	_____	**Tech Elective**	3
180:473	Foundation Eng'g	3	_____	**General Elective**	3
_____	**Tech or Dept Elective**	3		Total	14
	Total	16		**Total Credits: 128**	

*Civil Design Electives or "capstone" courses 180:407, 180:426, 180:431,180:438,and 180:474 are only offered in spring. Student should take at least one of these courses in order to graduate

** Tech or Departmental Electives can be taken either in Fall or Spring semester

*** 960:401 'Basic Statistics for Research' can be taken instead of 960:379

CIVIL AND ENVIRONMENTAL ENGINEERING PRE-REQUISITE CHART



School of Engineering

Department of Civil and Environmental Engineering

The School of Engineering policies state that each student must graduate with a minimum 2.0 grade point average in 'major' courses. Major courses for Civil Engineering are defined as: All 180:XXX courses; 960:379; 540:343; 635:407; technical electives, science elective.

For more details, see: https://soe.rutgers.edu/academic-advising-and-policies/academic-policies/calculating-gpa

All departmental and technical electives must conform to guidelines published in Departmental Advising Handbooks or be approved by the student's departmental academic advisor.

DEPARTMENTAL ELECTIVES

Subject	Course Number	Course Name
Civil Engineering	14:180:301	Civil Engineering Analysis
	14:180:331	Elements Env Engineering
	14:180:382	Hydraulic and Environmental Enginieering
	14:180:406	Construction Engineering Management
	14:180:413	Theory of Indeterminate Structures
	14:180:417	Masonry and Wood Design
	14:180:448	Elements of Hydrology
	14:180:491	Special Problems in Civil Engineering
	14:180:492	Special Problems in Civil Engineering
	14:180:493	Special Problems in Environmental Engineering
	14:180:494	Special Problems in Environmental Engineering

1) For course description of these course, see pages 27-30

School of Engineering
Department of Civil and Environmental Engineering

TECHNICAL ELECTIVES

Refer to Undergraduate Catalog for Course Descriptions

- Course must carry at least 3 credits
- Excluded are individual study, recitation special topic and seminar courses
- Any Civil and Environmental Engineering Elective Courses (14:180:___), including 491, 492, 493 and 494 are acceptable as technical electives.

Subject	Course Number	Course Name
Biochemistry	11:115:301	Introductory Biochemistry
	11:115:321	Ethical Issues in Biochemical Research(NB)
	11:115:403	General Biochemistry
Bioenvironmental Engineering	11:117:413	Unit Processes in Bioenvironmental Engineering I (NB)
	11:117:414	Unit Processes in Bioenvironmental Engineering II (NB)
	11:117:462	Design of Solid Waste Treatment Systems (NB)
	11:117:474	Air Pollution Engineering (NB)
Biology	01:119:115	General Biology I
	01:119:116	General Biology II
Biomedical Engg	14:125:201	Introduction to Biomedical Engineering (NB)
	14:125:208	Introduction to Biomechanics (NB)
	14:125:255	Biomedical Engineering System Physiology (NB)
Chemical Engg	14:155:201	Chemical Engineering Material and Energy Balance (NB)
	14:155:208	Chemical Engineering Thermodynamics (NB)
Chemistry	01:160:209	Elementary Organic Chemistry
	01:160:307	Organic Chemistry I
	01:160:308	Organic Chemistry II

Subject	Course Number	Course Name
Civil Engineering	14:180:301	Civil Engineering Analysis (NB)
	14:180:331	Elements Env Engineering (NB)
	14:180:382	Hydraulic and Environmental Enginieering (NB)
	14:180:406	Construction Engineering Management
	14:180:413	Theory of Indeterminate Structures
	14:180:448	Elements of Hydrology
	14:180:491	Special Problems in Civil Engineering
	14:180:492	Special Problems in Civil Engineering
	14:180:493	Special Problems in Environmental Engineering
	14:180:494	Special Problems in Environmental Engineering
Computer Sci	01:198:112	Data Structures
	01:198:205	Introduction to Discrete Structures I
	01:198:206	Introduction to Discrete Structures II
	01:198:211	Computer Architecture (NB)
	01:198:323	Numerical Analysis and Computing (NB)
	01:198:336	Principles of Information and Data Management (NB)
ECE	14:332:231	Digital Logic Design
	14:332:252	Programming Methodology I
	14:332:373	Elements of Electrical Engineering
Environmental Resources	11:372:371	Air-Photo Interpretation
	11:372:442	Applied Principles of Hydrology
Environmental Science	11:375:302	Elements of Water and Wastewater Treatment
	11:375:307	Elements of Solid Waste Management and Treatment
	11:375:333	Environmental Law I
	11:375:334	Environmental Law II
	11:375:405	Fundamentals of Water and Wastewater Analysis
	11:375:409	Environmental Statement and Impact
	11:375:421	Air Pollution
	11:375:430	Hazardous Wastes
	11:375:444	Water Chemistry
General Engineering	14:440:301	Introduction to Packaging Engineering (NB)
	14:440:302	CAD For Packaging Engineering (NB)
	14:440:371	Packaging Evaluation Methods (NB)
	14:440:373	Packaging Manufacturing (NB)
	14:440:378	Sustainable Packaging (NB)
	14:440:392	Undergraduate Research in Engineering
	14:440:403	Safety Engineering in Packaging (NB)
	14:440:404	Innovation and Entrepeneurship (NB)
	14:440:406	Packaging Printing and Decoration (NB)
	14:440:468	Packaging Machinery (NB)
	14:440:471	Distribution Packaging (NB)

Geography	01:450:241	The City: Intor to Urban Geography
	01:450:250	Cities
	01:450:321	Geographic Information Systems
	01:450:322	Remote Sensing
	01:450:370	Climate Change and Society
	01:450:414	Geographical Hydrology
	01:450:417	Coastal Geomorphology
Geology	01:460:100	Planet Earth (NB)
	01:460:101	Intorductory Geology
	01:460:201	Earthquakes and Volcanoes (NB)
	01:460:202	Environmental Geology (NB)
	01:460:203	Building and Maintaining a Habitable Planet (NB)
	01:460:204	The Water Planet (NB)
	01:460:206	Dinosaurs (NB)
	01:460:207	Oil and Gold: The Good, The Bad, and The Ugly (NB)
	01:460:208	The Last 11,000 Years (NB)
	01:460:209	Exploration of the Oceans (NB)
	01:460:210	Rocks and Minerals (NB)
	01:460:211	Fundamentals of Sedimentary Geology (NB)
	01:460:101	Introductory Geology I: Physical
	01:460:301	Mineralogy
	01:460:302	Petrology
	01:460:303	Paleontology
	01:460:414	Hydrogeological Processes
	01:460:428	HydroGeology
ISE	14:540:201	Work Design and Ergonomics (NB)
	14:540:210	Engineering Probability (NB)
	14:540:311	Deterministic Models in Operations Research
	14:540:410	Linear Programming
	14:540:421	Industrial Organization and Management
	14:540:433	Quality Engineering and Statistics
	14:540:461	Engineering Law
Landscape Arch	11:573:232	Fundamentals of Environmental Geomatics (NB)
Marine and Coastal Sciences	11:628:401	Science in Shoreline Management (NB)
	11:628:451	Physical Oceanography (NB)
Material Science &	14:635:203	Introduction to Materials Science & Engineering (NB)
	14:635:204	Processing I (NB)
	14:635:205	Crystal Chemistry and Structure of Materials (NB)
	14:635:206	Thermodynamics (NB)
	14:635:303	Phase Diagrams (NB)
	14:635:304	Ceramic Compositions (NB)
	14:635:305	Processing II (NB)
	14:635:306	Processing III (NB)
	14:635:307	Kinetics of Materials Processes (NB)

Engineering	14:635:309	Characterization of Materials (NB)
	14:635:312	Glass Engineering (NB)
	14:635:314	Strength of Materials (NB)
	14:635:316	Electronic, Optical And Magnetic Properties Of Materials (NB)
	14:635:320	Introduction to Nanomaterials (NB)
	14:635:321	Structural, Mechand Chem Apps of Nanostruct and material (NB)
	14:635:322	Photonic, Elect and Magnet Apps of Nanostruct and mterial (NB)
	14:635:330	Introduction to Nanomaterials (NB)
	14:635:340	Electrochemical Materials And Devices (NB)
Math	01:640:250	Introductory Linear Algebra (NB)
	01:640:300	Introduction to Mathematical Reasoning (NB)
	01:640:311	Introduction to Real Analysis I (NB)
	01:640:312	Introduction to Real Analysis II (NB)
	01:640:321	Introduction to Applied Mathematics (NB)
	01:640:325	Differential Equations in Biology
	01:640:336	Differential Equations in Biology
	01:640:338	Discrete and Probabilistic Models in Biology
	01:640:339	Mathematical Models in the Social Sciences
	01:640:348	Cryptography
	01:640:350	Linear Algebra
	01:640:403	Introductory Theory of Functions of a Complex Variable
	01:640:411	Mathematical Analysis I
	01:640:412	Mathematical Analysis II
	01:640:421	Advanced Calculus for Engineering
	01:640:423	Elementary Partial Differential Equations
	01:640:424	Stochastic Models in Operations Research
	01:640:426	Topics in Applied Mathematics
	01:640:428	Graph Theory
	01:640:429	Industry-Oriented Mathematics: Case Studies
	01:640:432	Introduction to Differential Geometry
MAE	14:650:210	Introduction to Aerospace Engineering (NB)
	14:650:231	Mechanical Engineering Computational Analysis and Design (NB)
	14:650:342	Design of Mechanical Components (NB)
	14:650:350	Mechanical Engineering Measurements (NB)
	14:650:351	Thermodynamics
	14:650:361	Introduction to Mechatronics (NB)
	14:650:388	Computer-Aided Design in Mechanical Engineering (NB)
	14:650:449	Introduction to Mechanics of Composite Materials
	14:650:458	Aerospace Structures
	14:650:460	Aerodynamics
	14:650:462	Power Plants
	14:650:474	Solar Thermal Energy Collection and Storage
	14:650:477	Environmental Control of Buildings

Physics	01:750:228	Analytical Physics IIB (NB)
	01:750:305	Modern Optics
	01:750:313	Modern Physics
	01:750:326	Computer-Based Experimentation and Physics Computing
	01:750:327	Modern Instrumentation
	01:750:341	Principles of Astrophysics I
	01:750:342	Principles of Astrophysics II
	01:750:351	Thermal Physics
	01:750:361	Quantum Mechanics and Atomic Physics
	01:750:381	Mechanics I
	01:750:382	Mechanics II
	01:750:385	Electromagnetism I
	01:750:386	Electromagnetism II
Planning and Public Policy	10:762:306	Principles of Urban Planning
	10:762:316	Physical Design and Site Planning
	10:762:413	Urban Revitalization
	10:762:420	GIS for Health and Planning
	10:762:440	Principles of Real Estate
	10:762:451	Environmental Policy and Regulation
	10:762:473	Transportation Policy
SCM & M Science	33:799:460	Introduction to Six Sigma and Lean Manufacturing (NB)
Statistics	01:960:382	Theory of Statistics
	01:960:384	Intermediate Stat Analysis
	01:960:401	Basic Statistics for Research (NB)
	01:960:463	Regression Methods
	01:960:467	Applied Multivariate Analysis
	01:960:476	Introduction to Sampling
	01:960:483	Statistical Quality Control
	01:960:484	Basic Applied Statistics
Urban Planning and Design	10:971:201	Intro Urban Planning and Design
	10:971:202	Designing Healthy Cities
	10:971:250	Introduction to GIS
	10:971:314	Graphic Communication for Planners
	10:971:315	Fundamentals of Urban Planning
	10:971:316	Introduction to Site Planning and Urban Design
	10:971:318	History and Theory of Urban Planning and Design
	10:971:403	Advanced Graphic Communication
	10:971:404	Planning and Design Studio I
	10:971:463	Environmental Law and Policy

School of Engineering
Department of Civil and Environmental Engineering

SCIENCE ELECTIVES

List of Acceptable Courses for the Required Science Elective

Subject	Course Number	Course Name
Biochemistry	11:115:301	Introductory Biochemistry
	11:115:403	General Biochemistry
Biology	01:119:115	General Biology I
	01:119:116	General Biology II
Ecology and Natural Resources	11:216:351	Principles of Ecology
Geography	01:450:212	Water Resources
	01:450:241	The City: Intor to Urban Geography
	01:450:250	Cities
	01:450:321	Geographic Information Systems
	01:450:322	Remote Sensing
	01:450:370	Climate Change and Society
	01:450:414	Geographical Hydrology
	01:450:417	Coastal Geomorphology
Geology	01:460:100	Planet Earth
	01:460:101	Introductory Geology I: Physical
	01:460:201	Earthquakes and Volcanos
	01:460:202	Environmental geology
	01:460:204	The Water Planet
	01:460:206	Dinosaurs
	01:460:212	Earth and Life
	01:460:224	Geol Moon and Planets
	01:460:301	Mineralogy
	01:460:302	Petrology
	01:460:303	Paleontology
	01:460:330	Sedimentary Geology
Marine and Coastal Sciences	11:628:401	Science in Shoreline Management
	11:628:451	Physical Oceanography

CO-OP INTERNSHIP INFORMATION

Course ID: 180: 496/497 **'**COOP CIV/ENV ENGG' (3 credits)

Catalog Description: The internship provides the student with the opportunity to practice and/or apply knowledge and skills in various civil and environmental engineering professional environments. This internship is intended to provide a capstone experience to the student's undergraduate studies by integrating prior course work into a working engineering environment. The experience also motivates the student for further learning. The credits earned are the educational benefits of the experience.

Eligibility: Open only to cee junior (Summer only) and senior (Summer, Fall, Spring)

Prerequisites: Students must satisfy the following criteria to be eligible to enter an internship:

(i) Completed a minimum of 90 credits with a cumulative grade point average of at least 2.5.
(ii) Completed a minimum of 18 credits in the major, with a major cumulative grade point average of at least 2.5.
(iii) The Internship can be taken at the summer going into the junior year or senior year. The workload should follow a standard credit definition, i.e., 4 hours of work per week per credit for 14 weeks or 56 total hours per credit. The student must spend a minimum of 12 to 15 hours per week to earn these 3 credits.
(iv) Students electing to participate in the Co-op Internship program for Pass/No credit cannot designate any additional Technical Electives as Pass/No Credit.

Registration for the co-op course is by special permission only. To receive special permission (SPN) to register, you need to email the following items to the Undergraduate Director.

1. An offer letter from the company/firm that is offering the internship that shows the type of work and the duration of the internship. The letter should be on the company letter head.
2. A completed copy of the COOP Form (form available next page)
3. A written proposal. The written proposal should include educational and professional benefits from the internship, anticipated engineering responsibilities at work, and expected project tasks if already known, how the internship can help in the future (about 150-250 words)

To receive a 'PA' grade and credits for the co-op, the student should submit a final report. The final report shall include project description, daily log and progress reports, any calculations, drawings, plots, photos, etc... that you worked on. Sample reports are available in the department office to help you with your final internship report. The final report should be submitted to the faculty advisor before the end of the semester in which the co-op is registered.

Rutgers University-School of Engineering
Department of Civil and Environmental Engineering

COOPERATIVE (CO-OP) INTERNSHIP FORM

Student:

Semester of Enrollment:

Length of Internship(s):

Employer(s):

Total Hours:

Academic Credits:

Faculty Advisor:

Plan for Evaluation:

A written summary of work experiences will be submitted by the student at either the end of the employment period or any time prior to the end of the semester for which the experience will be credited. The Faculty Advisor will meet with the student, evaluate the summary, and assign a grade.

The summary may include particular experiences of the student and general descriptions of the tasks achieved during the period of employment.

_____ Date:_____
Student

_____ Date:_____
Faculty Advisor

_____ Date:_____
Undergraduate Director - Civil/Env. Engg. Dept.

Rutgers, The State University of New Jersey
School of Engineering

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING FACULTY

Dr. Perumalsamy N. Balaguru received his PhD from the University of Illinois-Chicago. His areas of research include concrete structural systems; composite materials; construction management.

Dr. Balaguru's office is located in Weeks Hall on Busch Campus, Room RWH-322C. He can be reached by email at balaguru@soe.rutgers.edu or by phone at 848-445-2877.

Dr. Vassiliki Demetracopoulou received her PhD in civil engineering from the University of Texas at Austin. Her research interests include improving infrastructure quality in urban environments, optimizing infrastructure systems' delivery under the current climate's risks and complexities.

Dr. Demetracopoulou's office is located in Weeks Hall on Busch Campus, Room RWH 428A. She can be reached by email v.demetracopoulou@rutgers.edu or by phone at 848-445-2794.

Dr. Nicole Fahrenfeld received her PhD from Virginia Tech. Her areas of research lie at the interface of environmental chemistry and environmental microbiology to promote water quality and sustainability\with applications in natural and engineered systems.

Dr. Fahrenfeld's office is located in Weeks Hall on Busch Campus, Room RWH 328D. She can be reached by email nfahrenf@rutgers.edu or by phone at 848-445-8416.

Dr. Jie Gong received his PhD from the University of Texas at Austin. His areas of research include building information modeling, remote sensing for highway asset management, visual sensing and computing for construction process visualization and analysis.

Dr. Gong's office is located in Weeks Hall on Busch Campus, Room RWH 420D. He can be reached via email at jg931@soe.rutgers.edu or via telephone at 848-445-2881.

Dr. Nenad Gucunski received his PhD from the University of Michigan. His areas of research include soil-structure interaction; nondestructive testing; numerical methods; soil and structural dynamics; earthquake engineering. Dr. Gucunski's office is located in Weeks Hall on Busch Campus, Room RWH 420C. He can be reached by email at gucunski@soe.rutgers.edu or by the phone at 848-445-0261.

Dr. Qizhong (George) Guo received his PhD from the University of Minnesota. He also holds a Professional Engineer's license. His areas of research include hydraulics and hydrology, urban stormwater and flood management, inland and coastal water environment restoration, green and sustainable water infrastructure.

Dr. Guo's office is located in Weeks Hall on Busch Campus, Room RWH 328F. He can be reached by email at qguo@soe.rutgers.edu or phone at 848-445-2983.

Dr. Jing (Peter) Jin received his PhD from the University of Wisconsin Madison. His areas of research include Transportation Engineering, Intelligent Transportation Systems, Traffic Operations, Traffic Sensing, Traffic Flow theory and Network Modeling, Urban Data Analytics traffic operations and management

Dr. Jin's office is located in Weeks Hall on Busch Campus, Room RWH 420F. He can be reached by email at peter.j.jin@rutgers.edu or by phone at 848-445-8563.

Dr. Yalin Li received her PhD from the Colorado School of Mines. Her research focuses on advancing the sustainability of water and energy infrastructure through integrated experimentation and modeling, including experimental development of thermo-chemical and catalytic technologies and sustainable design and decision-making.

Dr. Li's office is located in Weeks Hall on Busch Campus, Room RWH 328A. She can be reached by email at yalin.li@rutgers.edu or by phone at 848-445-2870.

Dr. Meiyin Liu received her PhD from the University of Michigan-Ann Arbor. She also earned a master's degree in computer engineering from the University of Michigan. Her areas of research focus on computer vision-based human motion capture and automated on-site ergonomic risk assessment for construction workers.

Dr. Liu's office is located in Weeks Hall on Busch Campus, Room RWH 420E. She can be reached by email at meiyin.liu@rutgers.edu or by phone at 848-445-2880.

Dr. Xiang Liu received his PhD from the University of Illinois at Urbana-Champaign. His areas of research include railway engineering, freight transportation, infrastructure asset management, and transportation big data.

Dr. Liu's office is located in Weeks Hall on Busch Campus, Room RWH 428D. He can be reached by email at xiang.liu@rutgers.edu or by phone at 848-445-2868.

Dr. Ali Maher received his PhD from the University of Michigan. He is an ASCE Fellow and his areas of research include soil/site improvement; soil composite materials; geo-synthetics, environmental geo-technology and soil dynamics.

Dr. Maher's office is located in the CAIT Building on Busch Campus, Room 211E. He can be reached by email at mmaher@soe.rutgers.edu or by phone at 848-445-2951.

Dr. Monica Mazurek received her PhD from the University of California-Los Angeles. Her areas of research include air quality engineering; organic geochemistry; analytical chemistry for environmental systems; sustainability systems engineering.

Dr. Mazurek's office is located in Weeks Hall on Busch Campus, Room RWH 322F. She can be reached by email at mmazurek@soe.rutgers.edu or by phone at 848 445-2871.

Dr. Husam Najm received his PhD from the University of Michigan. Dr. Najm holds both a Professional Engineer's and Structural Engineer's license. His areas of research include structural system design; bridge design; concrete materials.

Dr. Najm's office is located in Weeks Hall on Busch Campus, Room RWH 428G. He can be reached via email at hnajm@soe.rutgers.edu or phone at 848-445-7980.

Dr. Hani Nassif received his PhD from the University of Michigan. He also holds a Professional Engineer's license. His areas of research include reliability analysis; design, analysis, and field testing of bridges; advanced high-performance materials; structural modeling and analysis

Dr. Nassif office is located in Weeks Hall on Busch Campus, Room RWH 322E. He can be reached by email at nassif@soe.rutgers.edu or by phone at 848-445-4414

Dr. Efthymios (Thymios) Nikolopoulos received his PhD degree from the University of Connecticut. His area of research includes monitoring and modeling of hydrologic hazards and assessment of climate change impacts on the natural and the built environment.
His office is located in Weeks Hall on Busch Campus, Room 328A. He can be reached via email at efthymios.nikolopoulos@rutgers.edu or via telephone at 848-445-9338

Dr. Tyler Oathes received his PhD from the University of California, Davis. His research focuses on investigating the interplay between fundamental soil behavior and the dynamic and static response of geotechnical infrastructure systems.

Dr. Oathes's office is located in Weeks Hall on Busch Campus, Room RWH 328G. He can be reached by email at tyler.oathes@rutgers.edu or by phone at 858-445-9339

Dr. Hao Wang received his PhD from the University of Illinois at Urbana- Champaign. His areas of research include innovative and sustainable infrastructure material, computational modeling and mechanics of structure material; pavement design, maintenance, and management.

Dr. Wang's office is located in Weeks Hall on Busch Campus, Room RWH 428E. He can be reached by email at hwang.cee@rutgers.edu or by phone at 848-445-2874.

Dr. Ruo-Qian (Roger) Wang received his PhD from Massachusetts Institute of Technology. His research focuses on developing numerical models to connect big data and decision-making in coastal engineering, natural hazards, water resources and renewable energy systems.
Dr. Wang's office is located in Weeks Hall on Busch Campus, Room RWH 328E. He can be reached by email at rq.wang@rutgers.edu or by phone at 848-445-4288.

Dr. Yook-Kong Yong received his PhD from Princeton University. He holds a Professional Engineer's license from New Jersey. His areas of research include structural behavior and mechanics; structural dynamics; computational mechanics; frequency control devices; piezoelectric devices, magnetostrictive devices.

Dr. Yong's office is located in Weeks Hall on Busch Campus, Room RWH 322D. He can be reached by email at yyong@soe.rutgers.edu or by phone at 848-445-3219.

NTT Faculty

Dr. Robert Miskewitz (Environmental Engineering and Environmental Science)
Dr. Miskewitz's office is located in Weeks Hall on Busch Campus, Room RWH 328I.
He can be reached email at robert-miskewitz@rutgers.edu

Adjunct Faculty

Howard Kliger received his PhD from the University of Delaware. His area of research includes mechanical engineering and engineering mechanics.

Mohammad Arafa received his PhD from Rutgers University and currently works at an engineering firm, Severud Associates in New York City. His area of expertise is structural engineering.

Joseph Lifrieri received his PhD from NJIT and his area of research includes geoenvironmental and geotechnical engineering.

Alfred Brenner is a Vice President at Johnson, Mirmiran & Thompson Inc. His expertise include land surveying, land development, and construction management,

Joseph Palka, Jr., PE, P.P., Executive VP , Toll Brothers. Head of land development department. His expertise includes land development , planning, and project management.

Chris Christoforou, PE, LEED AP BD+C is a Principal at Thornton Tomasetti in NYC and NJ. His expertise is in high rise building design and construction services. His email CChristoforou@ThorntonTomasetti.com

Professor Emeritus

Dr. Trefor P. Williams received his PhD from The Georgia Institute of Technology. He also holds a Professional Engineer's license. His areas of research include construction management; traffic engineering; decision support systems; neural networks; computer aided analysis; expert systems. William can be reached by email at tpw@soe.rutgers.edu

COURSE DESCRIPTION (REQUIRED COURSES)

14:180:216 Introductory Computer-Aided Design and Drafting (3 cr)
Principles of computer-aided design and drafting (CADD): graphic entities, hatch patterns, layering, part file creation, and information extraction. Two-dimensional drafting and pictorial drawings using a CADD system. Introduction to three-dimensional modeling and surface revolution. Descriptive geometry. CADD applications in civil engineering. Lec. 1 hr, lab. 3 hrs, rec. 1 hr.

14:180:243 Mechanics of Solids (3 cr)
Axial force, shear, moment, and torque in structural members; stress, strain, and stress-strain relations; principal stresses and strains; torsion of circular shafts; bending of singly symmetric beams; compound loading; buckling of columns; statically indeterminate systems. Prerequisites: (14:440:221 or 14:440:291) and (01:640:152 or 01:640:192 or 21:640:235 or 50:640:221). Corequisite: 01:640:244.

14:180:305 Construction Engineering (3 cr)
An introduction to construction and the construction industry. Topics include construction contracts, scheduling, estimating, and cost control. Prerequisite: 14:180:243.

14:180:318 Elements of Structures (3 cr)
Structural analysis of statically determinate trusses, frames, cables, and arches. Computation of deflections in trusses and plane frames. Influence lines for beams and trusses. Introduction to indeterminate structures. Prerequisites: 14:180:243, 14:440:222.

14:180:320 Design of Steel Structures (3 cr)
Design of bolted and welded connections; design of components of structural systems in tension, compression, bending, and combined axial and bending loads. Use of computers for design and detailing. Lec. 2 hrs., rec. 1 hr. Prerequisites: 14:180:243, 318; 14:440:222.

14:180:345 Properties of Materials Laboratory (1 cr)
Mechanical properties and behavior of structural elements under a variety of load conditions. Prerequisite: 14:180:243.

14:180:364 Transportation Engineering I (3 cr)
Principles of transportation engineering with application to various modes; planning, selection, formulation, and administration of transportation systems. Economic, environmental, and political constraints; land-use studies; applications. Prerequisite: 14:180:243.

14:180:372 Soil Mechanics (3 cr)
Elements of engineering geology; mechanical and hydraulic properties of soils; soil-water systems and fluid flow; stresses in soils; compressibility, consolidation, and settlement; shearing resistance; lateral earth-pressures; slope stability; bearing capacity; numerical methods and computer applications. Prerequisites: 14:180:243, 387.

14:180:374 Soil Mechanics Laboratory (1 cr)
Engineering classification of soils and rocks. Laboratory studies of physical properties and shear strength of soils such as Atterberg limits, compaction, permeability, unconfined compression, and direct shear tests. Lab. 3 hrs. Corequisite: 14:180:372.

14:180:387 Fluid Mechanics (3 cr)
Fluid properties, statics and kinematics; concepts of system and control volume; mass, momentum, and energy conservation principles; laminar and turbulent flows in conduits and channels; boundary layer theory; drag and lift; ideal fluid flow. Prerequisites: 14:440:222, 01:640:244.

14:180:389 Fluid Mechanics Laboratory (1 cr)
Experimental applications and demonstrations; measurement of fluid properties; applications of mass, energy, and momentum principles; energy losses; forces on immersed bodies; flow measurement devices. Corequisite: 14:180:387.

14:180:411 Reinforced Concrete (3 cr)
Strength theories for the analysis and design of beams, slabs, columns, and floor systems in flexure, diagonal tension, torsion, serviceability, and load factors, including computer applications. Prerequisites: 14:180:318, 320.

14:180:421 Reinforced Concrete Laboratory (1 cr)
Experimental stress analysis of concrete structures, including test to failure of beams, plates, and prestressed elements; control testing and design of concrete mixtures. Lab. 3 hrs. Corequisite: 14:180:411.

14:180:429 Water & Wastewater Engineering (3 cr)
Design principles for water and wastewater engineering systems, water supply and distribution, wastewater collection and disposal, water treatment, and wastewater treatment. Prerequisites: 14:180:387, 389.

14:180:430 Introduction to Transportation Planning (3 cr)
Discusses the various aspects of transportation demand forecasting problems. Introduces the classic four-step modeling process and the new activity-based modeling approach. Students will have the chance to use some of the state-of-the-art transportation planning software packages, such as Cube, VISUM, and TRANSCAD to conduct case studies of transportation planning problems during labs. Prerequisites: 14:180:364, 01:960:379.

14:180:473 Foundation Engineering (3 cr)
Subsurface exploration; bearing capacity, settlement, and design of shallow foundations; design of rigid and flexible retaining structures; bearing capacity, settlement, and design of deep foundations. Lec. 2 hrs., rec. 1 hr. Prerequisites: 14:180:372, 374.

COURSE DESCRIPTION (DEPARTMENTAL ELECTIVES)

14:180:301 Civil and Environmental Data Analysis (3 cr)
Civil and environmental data tools in analyzing problems and creating solutions and designs. Tools include, as examples, data streaming and cleaning, programming languages and software for graphics, statistical analysis and modeling. Tools vary with current engineering practices. Prerequisite: 440:127, 640:251

14:180:331 Elements of Environmental Engineering (3 cr)
Engineering management of the environment with particular emphasis on chemical contaminants in water, wastewater, and air. Effects of energy-related pollutants and industrial emissions on environmental systems. Federal regulation and management of chemical contaminants.

14:180:382 Hydraulic and Environmental Engineering (3 cr)
Basic concepts of viscous flows; conservation laws (mass, momentum, and energy); pipe flows and open-channel flows; water distribution systems; hydraulic modeling (stream and marine pollution); air, stream, and marine pollution problems. Computer applications.
Prerequisite: 14:180:387.

14:180:406 Construction Engineering Management (3 cr)
Construction planning, scheduling, and control. Use of computer-based information systems for project management. Value engineering. Critical path method and PERT scheduling techniques. Computer-drawn scheduling networks. Schedule compression. Resource allocation leveling and optimization. Project organization and financial control. Decision-making.Prerequisites:14:180:305, 01:960:379.

14:180:407 Construction Projects (4 cr)
Application of skills and theories of construction engineering management to actual projects. Students are assigned to a project and work with managers to budget, schedule, and control operations. Topics include utilization of heavy construction equipment, computer simulation of construction, and information technology in construction. Prerequisites: 14:180:305, 406.

14:180:413 Theory of Indeterminate Structures (3 cr)
Force method for solving simple indeterminate structures. Classical methods of slope-deflection and moment distribution. Formulation and algorithms for matrix method. Application of computers for analyzing indeterminate trusses and frames. Prerequisite: 14:180:318.

14:180:417 Masonry & Wood Design (3 cr)
Introduction to masonry and wood terminology and materials as well as ASTM-related specifications. ASD and LRFD design of structural elements such as masonry and wood beams, lintels, and columns. Reinforced and unreinforced masonry design. Masonry and wood shear wall design. Introduction to prestressed masonry. Connection design. Sustainability and energy efficiency, fire rating, and cost analysis. Prerequisite: Open to senior civil engineering majors only.

14:180:426 Structural Design (4 cr)
Design of steel or concrete structures; prestressed concrete design of beams and slabs. Design project with working drawings for a bridge or high-rise building. Economic and ethical considerations. Comprehensive report. Lec. 3 hrs., lab. 3 hrs. Prerequisites: 14:180:318, 320, 411.

14:180:431 Water Resources and Environmental Engineering Design (4 cr)
Analysis and design considerations for water resources and environmental engineering facilities, such as stormwater green infrastructure, water supply and wastewater treatment plants; physical engineering management of solid and hazardous wastes; resource recovery; economic and ethical considerations. Comprehensive report. Prerequisites: 14:180:387, 389, 429.

14:180:434 Land Development- Elements of Urban Infrastructure (3 cr)
Introduction to urban infrastructure; introduction to civil design plans then a review of the function, alternatives, design and construction of civil infrastructure elements such as grading, hydrology, storm-water management, grading and earthwork, erosion and sediment control, storm and sanitary sewer systems, dry utilities, curb and flexible pavements, improvements to existing infrastructure.

14:180:438 Transportation Engineering II (4 cr)
Training in state-of-the-art transportation planning and operations software such as HCS, Synchro, VISSIM, and CUBE. Students will work in teams to conduct traffic studies at given sites/corridors. Traffic improvement alternatives will be used to address the identified transportation problems. Such alternatives to study may include redesigning geometric layout, signal optimization, adding traffic signs and control, and ITS (intelligent transportation) equipment and systems. Lec. 3 hrs., lab. 3 hrs. Prerequisite: 14:180:364.

14:180:443 Advanced Hydraulics (3 cr)
Hydraulic engineering fundamentals: boundary layer, surface roughness, resistance in viscous flows; design of erodible and nonerodible canals; gradually varied flow, backwater analysis in rivers; computational methods; hydraulic jump; hydraulic applications in channel transitions and controls; flow over spillways; pollution problems in rivers and streams. Prerequisite: 14:180:387.

14:180:448 Elements of Hydrology (3 cr)
Hydrologic cycle; weather and hydrology; precipitation; evaporation and transpiration; stream flow and subsurface hydrology; stream flow hydrographs; unit hydrograph theory; stream flow routing; computer simulation of hydrologic processes; probability concepts in hydrology; models for frequency distribution of floods; time series analysis. Prerequisite: 14:180:387.

14:180:471 Elements of Environmental Geotechnology (3cr)
Geotechnical aspects of analysis design and construction of waste containment systems. Prerequisite: 14:180:372.

CEE FIVE (5) YEAR BS/MS PROGRAM

A. Program

The goal of the CEE BS/MS is to allow academically qualified students to receive the BS and MS degrees in a shortened time frame (5 year or 5 years and summer). This highly intensive academic program gives students more research experience and better prepares them for research and development careers or further graduate study. Completing the BS/MS is possible if you take graduate-level courses in the senior year **in addition to** completing all of the undergraduate degree requirements. (Courses cannot double-count for both undergraduate requirements and graduate credit).

B. Eligibility

In order to be admitted to the BS/MS, students must:

1) Have a 3.2 cumulative GPA or higher.
2) Have completed their junior year
3) Have completed all of the requirements for general, humanities and social science
4) Apply during their sixth semester but no later than September 15th of the senior year.
5) Submit two (2) letters of recommendation. At least one of your letters must be from a faculty member or research advisor.
6) Submit a personal statement
7) Submit unofficial copy of transcripts

C. Application

1. The GRE requirement is waived off. It is still recommends that you take the GRE exam especially if you are applying for graduate fellowships or graduate programs at other universities.
2. Students do **not** need to submit a formal application to the Rutgers Office of Graduate and Professional Admissions. The application will be processed internally in the department of civil and environmental engineering. **The application can be obtained from the CEE department graduate administrator. It is also available on page 33.**
3. Once students are admitted to the BS/MS program, they will receive official notice from the CEE graduate program that they have been admitted. After that, they will receive an official letter from the Office of Graduate and Professional Admissions

D. Curriculum

Our MS program currently offers two plans: (A) 24 credits of coursework, 6 credits of research, and a comprehensive oral examination that includes the defense of a written thesis; or (B) 27 credits of coursework and 3 credits special project. The BS/MS program also offers the same plans and provides students with the opportunity to earn a master's degree within an expedited time frame. The BS/MS program requires the student to take at least six (6) graduate credits in their senior year. These credits can be course credits or can be research credits or a combination of both. The BS/MS program requires the student to take 30 graduate course

credits in addition to the 128 undergraduate course credits in to graduate. BS/MS students can take up to six (6) credits of 400 level courses. The JJ Slade program research credits (180:491 and 180:492) will count as graduate credits towards your MS degree

Timeline for BS/MS Program

Spring of Junior year If a student wants to participate in the James J. Slade Scholars Program, the student should identify an advisor for their James J. Slade Scholars research and apply for the James J. Slade Scholars Program. The James J. Slade research may become the thesis topic for the M.S. degree. The JJ Slade research credits (180:491 and 180:492) will count as graduate credits towards your MS degree

September 15th: Deadline to apply to the CEE BS/MS program.

Summer following Junior Year (optional) If already applied and selected for the James J. Slade Scholars Program, the student may begin research and/or Slade Project in the summer.

Senior year Take graduate courses or take research courses if participating in the James J. Slade Scholars Program and doing research. Advanced Topics courses (180:180:601 and 180:602) will count as graduate courses towards the MS degree. These courses require the student to have an advisor. Graduate courses or research courses taken in the senior year can only count towards the MS degree- they can't count towards the B.Sc. degree. The student should take minimum 6 graduate credits in the senior year (these credits can be graduate courses or research courses).

Fifth year Take remainder of MS courses (Research/Electives/Core Graduate Courses). Students can take fewer courses, but this would lengthen the duration of the MS degree. Students should look at the Graduate Program Manual and be familiar with the MS degree requirements. https://cee.rutgers.edu/sites/default/files/uploads/Graduate%20Program%20Manual%202022-2023.pdf

Summer and Fall following fifth year: If necessary, students will write the MS thesis (Option A) and defend it or present a Special Project (Option B).

Please Note:

1) Students need to graduate with a B.Sc. at the end of the spring semester of their senior year.
2) Continuation in the BS/MS program is contingent on receiving **no more than one C grade** in the graduate courses in the senior year.

Rutgers, The State University of New Jersey
Department of Civil and Environmental Engineering

Application for Combined Bachelor of Science/Master of Science Degree Program

Civil and Environmental Engineering

Application Package should include:

•Completed Application •Personal Statement •Two letters of recommendation
•Transcript (it can be downloaded from the RU transcripts website)

Please submit your application to the CEE Graduate Program Office in Weeks Hall, RWH-304D Weeks Hall 500 Bartholomew Road, Piscataway, NJ 0885 or email Gina at: gcuallri@rutgers.edu

Please print clearly

NAME:_____ RUID:_____

HOME MAILING ADDRESS: _____

_____

CAMPUS MAILING ADDRESS: _____

EMAIL: _____ PHONE #:_____

OVERALL GPA: _____ MAJOR GPA: _____

EXPECTED GRADUATION DATE: _____ 1ST TERM AT RU: _____

CEE COMPLETED CREDITS: _____ AREA OF INTEREST: _____

NAMES OF RECOMMENDERS: _____ &_____

Are you applying for the J.J. Slade Scholars Program? YES NO
If yes, who is the faculty adviser and title of project: _____

_____

[ ] Part Time [ ] Full Time [ ] US [ ] Permanent Resident [ ] Foreign

APPLICANT SIGNATURE: _____ *DATE:*_____

FOR OFFICE USE ONLY: ADMITTED REJECTED

COMMENTS: _____

_____

GRADUATE PROGRAM DIRECTOR: _____ DATE: _____

FE/EIT EXAM INFORMATION

It is highly recommended to take the FE exam in the spring semester of the senior year

- The Fundamentals of Engineering (FE) exam is generally your first step in the process to becoming a professional licensed engineer (P.E.). It is designed for recent graduates and students who are close to finishing an undergraduate engineering degree from an EAC/ABET-accredited program. The FE exam is a computer-based exam administered year-round at NCEES-approved Pearson VUE test centers.
- The FE exam includes 110-questions. The exam appointment time is 6 hours long and includes
  - Nondisclosure agreement (2 minutes)
  - Tutorial (8 minutes)
  - Exam (5 hours and 20 minutes)
  - Scheduled break (25 minutes)
- To take the exam, you need to register with NCEES
- Go to https://account.ncees.org/login to create MyNCEES account
- Examinees will be provided one attempt per testing window and no more than three attempts in a 12-month period.
- The FE Examination is $175 payable at the time of the online registration
- Passing this exam does not ensure that the student will be certified as an Engineer Intern (E.I.T). To obtain certification, the student must file an application with an engineering licensing board and meet that board's requirements for certification.
- The New Jersey board does not require examinees to submit an application or an additional fee prior to registering with NCEES and scheduling an FE exam. After passing the FE exam, the NJ Licensing Board requires to file a separate application to become certified Engineer-In-Training (EIT). Link to download the NJ Board EIT instructions and application: http://www.njconsumeraffairs.gov/pels/Applications/Professional-Engineer-in-Training-Application.pdf

Test Center Locations and Dates

- Choosing the exam location and date is typically the last step of the exam registration process

How to prepare for the FE exam

- Reviewing the FE exam specifications, fees, and requirements
- Reading the reference materials
- Understanding scoring and reporting
- Viewing the most up-to-date FE exam pass rates
- Special accommodations are available for examinees who meet certain eligibility criteria and sufficiently document their request.

Reference Materials and Exam Preparation

- The NCEES *FE Reference Handbook* is the only reference material that can be used during the exam.
    - You will be provided with an electronic reference handbook during the exam.
    - For access prior to your exam, you may either purchase a hard copy or download a free electronic copy.
    - Register or log in to MyNCEES to download your free copy of the *FE Reference Handbook*.
- NCEES offers practice exams. These practice exams contain questions that have been used on past exams and questions written just for study materials to give you extra practice.
- The NCEES practice exams now come in paperback print copies. Online practice exams are no longer available. If you have already purchased an online practice exam, you will have access to the exam until the exam is completed or until your purchased time expires.
- FE exam results are typically available 7–10 days after you take the exam. You will receive an email notification from NCEES with instructions to view your results in your MyNCEES account. Results include information specific to your licensing board regarding how you should proceed based on your performance.

Calculator Policy

- The only calculator models allowed in the 2018 exams are:
    - Casio: All fx-115 and fx-991 models
    - HP: All HP-33 and HP-35 models
    - TI: All TI-30X and TI-36X

STUDENT ORGANIZATIONS

ASCE (American Society of Civil Engineers) Student Chapter

The Rutgers ASCE Student Chapter represents The American Society of Civil Engineers (ASCE) on campus. Here at Rutgers, we provide students with a Civil & Environmental Engineering career fair day, professional engineers from industry that come in and review student resumes, as well as shadow days at top engineering firms. In addition to this, we have two teams, a concrete canoe team and a steel bridge team where students themselves design and then compete with other universities in the northeast area every year. For more information, visit our homepage http://asce.rutgers.edu/

American Water Works Association (AWWA) Student Chapter

The Rutgers AWWA Student Chapter represents The American Water Works Association (AWWA) on campus. Here at Rutgers, we provide students with numerous networking opportunities on campus with environmental engineers from various local engineering firms, such as Hatch Mott MacDonald and CDM Smith. There is also an opportunity every year to compete in a water filter design competition with other engineering students. For more information, visit our Facebook page at https://www.facebook.com/RutgersUniversityAWWA/

Engineers In Action Student Chapter

The Bridges to Prosperity University Chapter stems from a non-profit organization called Bridges to Prosperity (B2P). B2P is an international non-profit organization that works alongside community members, industry partners, and university students to build footbridges in isolated communities in the developing world. B2P provides isolated communities with access to essential health care, education and economic opportunities by building footbridges over impassable rivers. Since its foundation in 2001, B2P has supported or constructed over 200 footbridges in 20 countries, serving nearly one million people. Our chapter consists of students who, with the help of Bridge Corp members, design these footbridges and then travel to the developing country to build them with the local community. For more information, visit our homepage on Facebook, https://www.facebook.com/pg/b2p.rutgers/photos/?ref=page_internal

Engineers Without Borders-USA (EWB-USA)

EWB-USA is a non-profit humanitarian organization established to partner with developing communities worldwide in order to improve their quality of life. EWB-USA supports community-driven development programs worldwide by collaborating with local partners to design and implement sustainable engineering projects, while creating transformative experiences and responsible leaders. To ensure sustainability of its projects, communication with communities is maintained for no less than five years.

The Rutgers Chapter is involved in several projects. Three of the four projects are international projects in Guatemala, Kenya, and Tanzania. The last project is local in our own Camden, NJ. Visit our official website for more information: https://ewb-rutgers.com/

Chi Epsilon – Civil & Environmental Engineering Honors Society

Chi Epsilon is the national honor society for Civil & Environmental Engineering students. This society recognizes the top third of the junior or senior class who display the qualities embodied by their four pillars: Scholarship, character, practicality, and sociability.
Scholarship: recognize excellence and achievement in academic and professional endeavors
Character: uphold the integrity and responsibility of the civil engineering profession through our service
Practicality: advance the civil engineering profession through innovative and impactful solutions
Sociability: connect our members while engaging the broader community

NASTT – North American Society of Trenchless Technologies

The North American Society of Trenchless Technology (NASTT) is an engineering society of individuals, public organizations and private companies with strong beliefs in the practical, social and environmental benefits of trenchless technology. Founded in 1990, NASTT represents more than 1,600 members throughout the U.S.A and Canada who all promote better and more responsible ways to manage our underground infrastructure. Trenchless technology is a progressive civil engineering process for the installation, replacement or renewal of underground utilities with no or minimal excavation and surface disruption. Learn more information about our organization at https://www.nastt.org/ and http://nodigshow.com/