

# JHU CIVIL ENGINEERING

## ADVISING MANUAL



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## Advising Manual Introduction

The scope of professional activities of the modern civil engineer is very broad. The design of structures, waterworks and other civil facilities remains the main thrust of civil engineering, but today the civil engineer must also address environmental issues and the economic analysis and management of the systems that he or she designs.

Our goal at Johns Hopkins is to provide a strong program in the major areas of civil engineering. We recognize the heavy demands on the civil engineer who must master the mathematical, physical and chemical principles that support the design of a wide variety of projects, while developing a sensitivity to the economic and societal effects of those projects. The massive scale of many civil engineering projects places a further demand on the engineer to acquire managerial skills and techniques. The undergraduate curriculum is, therefore, broad enough to include opportunities for elective courses both within and outside of the department. Courses offered by the Department of Geography and Environmental Engineering are particularly noteworthy; these include, in addition to programs in water supply and water quality, studies in economics and systems analysis.

The civil engineering program at Johns Hopkins educates intellectual leaders of the profession by instilling in them a fundamental understanding of the mathematical principles of physics and nature that underlie engineering science, a practical appreciation of the challenges of creative engineering design, and a sense of responsibility for professional service.

## Objectives and Outcomes of the Program

### **Mission Statement of the Undergraduate Civil Engineering Program:**

*The civil engineering program educates intellectual leaders of the profession by instilling in them a fundamental understanding of the mathematical principles of physics and nature that underlie engineering science, a practical appreciation of the challenges of creative engineering design, and a sense of responsibility for professional service.*

### **ABET Program Educational Objectives**

The program is designed so that the following broad objectives would be fulfilled:

- Graduates are prepared for advanced study in engineering or other fields.
- Graduates are prepared for successful engineering practice.

### **ABET Program Outcomes**

The specific outcomes of the civil engineering program are to produce graduates who:

- Understand the principles of physical science, mathematics and engineering science on which engineering research and practice are based;
- Have knowledge and skills to design, conduct, and evaluate experiments;
- Demonstrate critical thinking skills and an ability for independent study needed to engage in lifelong learning;
- Are prepared for career advancement through graduate study and/or professional practice;
- Possess knowledge and skills to identify, formulate, and execute solutions to engineering problems using modern engineering tools and synthesizing different fields of knowledge;
- Communicate effectively to function in multidisciplinary teams and to deal with other professions in public and private sectors;
- Are broadly educated to understand contemporary issues and the context in which civil engineering is practiced in modern society;
- Understand professional ethics and the value of service through participation in technical activities, and in community, state, and national organizations.

The undergraduate program has been designed to provide a firm foundation in a wide breadth of modern civil engineering. Some flexibility is built into the curriculum so that students may pursue particular interests such as structural or geotechnical analysis and design, coastal and ocean engineering, or economics and systems analysis. The program has been accredited by ABET, the Accreditation Board for Engineering and Technology, since 1936.

## Advising Procedures

### Procedures

The advisor is an important source of guidance in the student's selection of electives, a set of options that may materially shape the student's interests. The advisor also helps the student to interpret requirements in the face of the inevitable changes in course availability. Civil Engineering advising activities are managed by an Advising Coordinator who assigns students to advisors, responds to students' requests for changes in advisors, and may, when necessary, act on behalf of the advisor.

Prior to their arrival on campus, students will be assigned a freshman advisor by the Coordinator. Students will be assigned to their upper-class advisor, whom they normally retain for the remainder of their undergraduate period, in the Spring of their freshman year. Course registration forms and add/drop forms must always be signed by the student's advisor. Students must maintain their copy of the Advising Sign-off Form during their undergraduate program. Prior to graduation, this form is to be signed by the advisor and given to the Advising Coordinator as evidence that the curriculum has been satisfactorily completed.

### Ethics

Personal and professional ethics and integrity are important cornerstones of both your academic and professional life. As a student your role in ensuring academic integrity is important for your education and your fellow student's education, the university provides additional information on academic integrity at <http://www.jhu.edu/advising/ethics.html>. As a professional, ethics and integrity will rarely be a simple matter. As civil engineers you will often design for the betterment and safety of society, but the efforts may be led and funded by private development or government with more complicated motives. Considering ethics in civil engineering requires understanding the broader context of your efforts, and discussions are ongoing in all the professional societies (ASCE, SEA, etc.). For an example of a civil engineering code of ethics see <http://www.asce.org/inside/ethics.cfm>.

## Curriculum Introduction

The faculty of the Department of Civil Engineering has developed the curriculum described in the above links. This curriculum has been designed to provide a firm foundation in the full breadth of modern civil engineering, with enough humanities and social sciences courses to provide a liberal education. Some flexibility is built into the curriculum allowing students to pursue, through technical electives, special interests within civil engineering such as structural analysis and design, geotechnical engineering, environmental and water resource engineering, or economics and systems analysis. The ordering of the courses is only a suggested one, but students are cautioned to check prerequisites and schedule conflicts if changes are made. **No courses shall be used as substitutes for required civil engineering courses.**

**For students entering JHU in Fall 2006 or later**, the minimum distribution requirements are:

Type of Elective	Minimum number of credits	Links
Technical (T)	16	<a href="#">Technical Electives</a> , <a href="#">Technical Course List</a> , and <a href="#">Computer Electives</a>
Humanities (H)	9	<a href="#">Non-Technical</a>
Social and Behavioral Sciences (S)	9	<a href="#">Non-Technical</a>
Additional (H) or (S)	6	<a href="#">Non-Technical</a>
Unspecified	7	any of the above

**For students enrolled prior to Fall 2006**, the minimum distribution requirements are:

Type of Elective	Minimum number of credits	Links
Technical (T)	20	<a href="#">Technical Electives</a> , <a href="#">Technical Course List</a> , and <a href="#">Computer Electives</a>
Humanities (H)	9	<a href="#">Non-Technical</a>
Social and Behavioral Sciences (S)	9	<a href="#">Non-Technical</a>
Additional (H) or (S)	6	<a href="#">Non-Technical</a>
Unspecified	6	any of the above

## Typical Schedule of Courses

Below is a typical schedule of courses with options available to students with advanced placement credits. **This is an example - the student's actual schedule should be worked out with the student's advisor.**

**Courses in red are required civil engineering courses.**

Elective credits are approximate only.

**For students entering JHU in Fall 2006 or later:**

### FRESHMAN YEAR

Fall Semester		Credits
<u>110.108</u>	Calculus I OR	4
<u>110.109</u>	Calculus II OR	
<u>110.202</u>	Calculus III	
<u>171.101</u>	General Physics I OR	4
	Humanities/Social Science Elective	3
<u>173.111</u>	General Physics Laboratory	1
		3
<u>030.101</u>	Introductory Chemistry	3
<u>030.105</u>	Introductory Chemistry Laboratory I	1
	Humanities/Social Science Elective	<u>3</u>
	TOTAL	<u>16-17</u>
Spring Semester		Credits
<u>110.109</u>	Calculus II OR	4
<u>110.202</u>	Calculus III OR	
<u>110.xxx</u>	other mathematics	
<u>171.101</u>	General Physics I OR	4
<u>171.102</u>	General Physics II	
<u>173.111</u>	General Physics Laboratory I OR	1
<u>173.112</u>	General Physics Laboratory II	
<u>270.120</u>	The Dynamic Earth: An Introduction to Geology OR	<u>3</u>
<u>030.104</u>	Introductory Organic Chemistry OR	4
	another natural science course	3

<a href="#">560.141</a>	Perspectives on the Evolution of Structures	3
	TOTAL	15-16

## SOPHOMORE YEAR

Fall Semester		Credits
<a href="#">110.202</a> <a href="#">110.xxx</a>	Calculus III OR other mathematics	4
<a href="#">560.201</a>	<b>Statics and Mechanics of Materials</b>	4
<a href="#">510.301</a>	Introduction to Engineering Materials	3
	Computing Course	3
	H/S Elective	3
	TOTAL	<u>17</u>
Spring Semester		Credits
<a href="#">550.291</a>	Linear Algebra and Differential Equations	4
<a href="#">560.202</a>	<b>Dynamics</b>	4
<a href="#">560.206</a>	<b>Solid Mechanics and Theory of Structures</b>	4
	H/S Elective	3
	TOTAL	<u>15</u>

## JUNIOR YEAR

Fall Semester		Credits
<a href="#">560.435</a>	<b>Probability and Statistics in Civil Engineering</b>	3
<a href="#">560.305</a>	<b>Soil Mechanics</b>	4
<a href="#">570.301</a>	Environmental Engineering I: Fundamentals	3
<a href="#">560.351</a>	<b>Introduction to Fluid Mechanics</b>	3
<a href="#">560.491</a>	<b>Civil Engineering Seminar</b>	<u>0.5</u>

	H/S Elective	3
	TOTAL	<u>16.5</u>
Spring Semester		Credits
<u>560.320</u>	Steel Structures	3
<u>570.302</u>	Environmental Engineering II: Water and Wastewater Treatment	3
<u>560.492</u>	Civil Engineering Seminar	<u>0.5</u>
<u>560.330</u>	Foundation Design	3
	H/S Elective	3
<u>560.380</u>	Intro to Ocean and Wind Engineering	3
	TOTAL	<u>15.5</u>

## SENIOR YEAR

Fall Semester		Credits
<u>560.349</u>	Design and Synthesis I	2
	Technical Elective	3
	Technical Elective	3
	Technical Elective	3
	H/S Elective	3
	H/S Elective	3
	TOTAL	<u>17</u>
Spring Semester		Credits
<u>560.350</u>	Design and Synthesis II	3
	Technical Elective	3
	H/S Elective	3



	Elective	4
	Elective	3
	TOTAL	<u>16</u>

See additional notes below.

For students enrolled prior to Fall 2006:

### FRESHMAN YEAR

Fall Semester		Credits
<u>110.108</u>	Calculus I OR	4
<u>110.109</u>	Calculus II OR	
<u>110.202</u>	Calculus III	
<u>171.101</u>	General Physics I OR	4
	Humanities/Social Science Elective	3
<u>173.111</u>	General Physics Laboratory	1
		3
<u>030.101</u>	Introductory Chemistry	3
<u>030.105</u>	Introductory Chemistry Laboratory I	1
	Humanities/Social Science Elective	<u>3</u>
	TOTAL	<u>16-17</u>
Spring Semester		Credits
<u>110.109</u>	Calculus II OR	4
<u>110.202</u>	Calculus III OR	
<u>110.xxx</u>	other mathematics	
<u>171.101</u>	General Physics I OR	4
<u>171.102</u>	General Physics II	
<u>173.111</u>	General Physics Laboratory I OR	1
<u>173.112</u>	General Physics Laboratory II	
<u>270.120</u>	The Dynamic Earth: An Introduction to Geology OR	<u>3</u>
<u>030.104</u>	Introductory Organic Chemistry OR	4
	another natural science course	3

<a href="#">560.141</a>	Perspectives on the Evolution of Structures	3
	TOTAL	15-16

## SOPHOMORE YEAR

Fall Semester		Credits
<a href="#">110.202</a> <a href="#">110.xxx</a>	Calculus III OR other mathematics	4
<a href="#">560.201</a>	<b>Statics and Mechanics of Materials</b>	4
<a href="#">510.301</a>	Introduction to Engineering Materials	3
<a href="#">520.213</a>	Circuits, OR	4
<a href="#">540.203</a>	Engineering Thermodynamics, OR	3
<a href="#">530.231</a>	Mechanical Engineering Thermodynamics	4
	Elective	3
	TOTAL	<b><u>16 or 17</u></b>
Spring Semester		Credits
<a href="#">550.291</a>	Linear Algebra and Differential Equations	4
<a href="#">560.202</a>	<b>Dynamics</b>	4
<a href="#">560.206</a>	<b>Solid Mechanics and Theory of Structures</b>	4
	Elective	3
	TOTAL	<b><u>15</u></b>

## JUNIOR YEAR

Fall Semester		Credits
<a href="#">560.435</a>	<b>Probability and Statistics in Civil Engineering</b>	3
<a href="#">560.305</a>	<b>Soil Mechanics</b>	4
<a href="#">570.301</a>	Environmental Engineering I: Fundamentals	3
<a href="#">570.351</a>	Introduction to Fluid Mechanics	3

<u>560.491</u>	Civil Engineering Seminar	<u>0.5</u>
	Elective	3
	TOTAL	<u>16.5</u>
Spring Semester		Credits
<u>560.320</u>	<b>Steel Structures</b>	3
<u>570.302</u>	Environmental Engineering II: Water and Wastewater Treatment	3
<u>560.492</u>	Civil Engineering Seminar	<u>0.5</u>
	Technical Elective	3
	Nontechnical Elective	3
	Elective	3
	TOTAL	<u>15.5</u>

## SENIOR YEAR

Fall Semester		Credits
<u>560.349</u>	<b>Design and Synthesis I</b>	2
	Technical Elective	3
	Technical Elective	4
	Technical Elective	3
	Nontechnical Elective	3
	Elective	3
	TOTAL	<u>18.5</u>
Spring Semester		Credits
<u>560.350</u>	<b>Design and Synthesis II</b>	3
<u>560.494</u>	Civil Engineering Seminar	<u>0.5</u>
	Technical Elective	3

	Nontechnical Elective	3
	Elective	3
	Elective	3
	TOTAL	<u>15.5</u>

## NOTES

The maximum number of credits per semester students can register for is 19 (18 for Freshmen). Exceptions to this rule may be made for students with an outstanding GPA (above 3.5), and in cases where overload is a result of independent study or research. Further information can be found in the [JHU Catalog](#).

The [Dynamic Earth Laboratory \(270.121\)](#) can be considered by students opting for [270.120 The Dynamic Earth: An Introduction to Geology](#). The [Introductory Chemistry Laboratory II \(030.106\)](#) should be given consideration by students opting for [030.104 \(Introductory Organic Chemistry\)](#), but it is not required. It would count as a technical elective. Courses 270.120 or 030.104 are not required, and they may be replaced by another natural science course (notice that the first Chemistry course, [030.101](#), is required).

Students may choose to fulfill the computer programming requirement in their freshman year (see Section 3.3). Two writing-intensive courses (at least 6 credits) are required, one of which must be [060.113 \(Practical Composition I\)](#) or [220.105/106 \(Introduction to Fiction and Poetry Writing I and II\)](#). These should be taken early in the student's program (they must be taken for a letter grade and passed with a grade of C or better).

**Students entering JHU during Fall 2006 and beyond:** the second writing course of at least 3 credits must be taken from the Krieger School of Arts and Sciences.

**Students enrolled prior to Fall 2006:** students may consider [500.211 \(Technical Communication\)](#) as the second writing-intensive course.

In their Junior year, students are normally expected to register for [560.491-494 \(Civil Engineering Seminar\)](#). These count as technical electives. Students with an interest in Environmental Engineering may register for the seminars offered at the [Department of Geography and Environmental Engineering](#).

## Technical Electives

Technical electives are courses in mathematics (Q), basic sciences (N) or engineering (E) and are to be selected by students in consultation with their advisor (see the page on Technical Courses for a partial but non-exhaustive list of acceptable technical electives). The course used to satisfy the computer programming requirement may be counted as a technical elective. Other than this programming course and courses specifically listed in Technical Courses, courses below the 200 level cannot be counted as technical electives except with the approval of the advisor. Civil Engineering Seminars (560.491-494) count as technical electives.

### For students entering JHU in Fall 2006 or later:

Students must have at least 16 credits of technical electives. Students are expected to select either Structural/Geotechnical Engineering or Environmental Engineering as areas of concentration. Within these areas of concentration, the technical electives must include the following courses:

- For students selecting [Structural/Geotechnical Engineering](#)
  - Must include the following:

560.325	Concrete Structures

- For students selecting [Environmental Engineering](#)
  - Must include the following:

570.305	Environmental Engineering Systems Design

These requirements are denoted with an 'OR' in the Sign-off Form. Students who opt for the Minor in Environmental Engineering should consult the Department of Geography and Environmental Engineering for current requirements.

### For students enrolled prior to Fall 2006:

Students must have at least 20 credits of technical electives. Students are expected to select either Structural/Geotechnical Engineering or Environmental Engineering as areas of concentration. Within these areas of concentration, the technical electives must include the following courses:

- For students selecting [Structural/Geotechnical Engineering](#)
  - Must include BOTH of the following:

560.325	Concrete Structures, AND
560.330	Foundation Design

- For students selecting Environmental Engineering
  - Must include BOTH of the following:

570.305	Environmental Engineering Systems Design, AND
	One course from group B in the program of the environmental engineering Minor

These requirements are denoted with an 'OR' in the Sign-off Form. Students who opt for the Minor in Environmental Engineering should consult the Department of Geography and Environmental Engineering for current requirements.

## Non-Technical Electives

Students are encouraged to explore their non-engineering interests, which the faculty views as an integral part of a sound education. Furthermore, since civil engineers provide professional services to the public and have significant influence on society, it is important that they have an appreciation of societal concerns and humanistic issues. Requirements are as follows:

- **Courses used for the H and S elective requirements**
  - Must total at least 24 credits;
  - May include any course labeled as H and/or S;
  - Can include only **ROTC courses** labeled as H and/or S.
- **Courses used for the H elective requirements**
  - Must total at least 9 credits;
  - Must include one of the following:

<a href="#">060.113</a>	Practical Composition I, OR
<a href="#">220.105</a>	Introduction to Fiction and Poetry Writing I

(See notes below for further information of the writing requirement)

- The first semester course of a foreign language is not labeled as H and cannot be included.
- **Courses used for the S elective requirements**
  - Must total at least 9 credits;
  - Must include one of the following:

<a href="#">180.102</a>	Elements of Microeconomics OR (must be taken in the Freshman or Senior year to avoid scheduling conflicts)
<a href="#">570.493</a>	Economic Foundations for Public Decision Making (this course substitution requires approval of the student's Advisor)

- May include the following suggested elective:

<a href="#">500.150</a>	Ethical Questions in Engineering
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Other restrictions are listed in the [JHU Catalog](#). Credits for courses not counting toward H or S or T electives can be counted toward unspecified (U) electives.

Students should develop coherent programs featuring reasonable depth. Students shall not satisfy the non-technical electives requirement by taking exclusively introductory (100-level) courses. Faculty advisors have sample programs in a document entitled "Making the most of Distribution Credits" that may prove helpful.

Through an appropriate selection of courses reflecting a well-planned program, students may gain an appreciation of societal and cultural issues, philosophy and the arts, in addition to communication and economic values. For those desiring general guidance on the philosophy of such program selection, the Department of Civil Engineering has a copy of Social Responsibilities in Engineering and Science; A Guide for Selecting General Education Courses by R.H. McCuen and J.M. Wallace. This is available for loan in the Department office.

### **Writing Requirement**

Two writing-intensive courses (at least 6 credits) are required, one of which must be 060.113 (Practical Composition I) or 220.105/106 (Introduction to Fiction and Poetry Writing I and II). These should be taken early in the student's program (they must be taken for a letter grade and passed with a grade of C or better). **Students entering JHU in Fall 2006 and beyond:** the second writing course of at least 3 credits must be taken from the Krieger School of Arts and Sciences. **Students enrolled prior to Fall 2006:** students may consider 500.211 (Technical Communication) as the second writing-intensive course.

### **Oral Presentation Proficiency**

Effective oral communication skills are essential for academic and professional success. Students will be evaluated on their ability to deliver oral presentations in 560.141 Perspectives on the Evolution of Structures and 560.380 Introduction to Ocean Science and Engineering. Students with an average oral presentation grade below B will be required to take a course with a significant oral presentation component. The course will be selected by the student and faculty advisor.



## Computer Electives

A working knowledge of scientific computer programming is required for graduation. This requirement can be met by taking one of the following courses:

<u>500.200</u>	Introduction to Computing for Engineers and Scientists, OR
<u>600.109</u>	Introduction to Programming in C, OR
<u>600.107</u>	Introduction to Programming in Java

One of these courses may count as a technical elective. Students who can demonstrate a working knowledge of a scientific programming language (FORTRAN, PASCAL, C, etc.) need not take one of these courses, but may take another technical elective instead.

## Technical Courses List

A partial but non-exhaustive list of acceptable technical electives. See [Technical Electives](#) description for more information.

### Natural Sciences, Mathematics, and Engineering Science

<a href="#">030.106</a>	Introductory Chemistry Laboratory
<a href="#">270.321</a>	Introductory Oceanography
<a href="#">270.327</a>	Introduction to Seismology
<a href="#">270.350</a>	Sedimentary Rocks
<a href="#">270.360</a>	Introduction to Planetary Atmospheres
<a href="#">270.375</a>	Groundwater
<a href="#">270.391</a>	Nature of the Solid Earth
<a href="#">500.101</a>	Introduction to Engineering
<a href="#">500.303</a>	Applied Mathematics I
<a href="#">500.304</a>	Applied Mathematics II
<a href="#">520.213</a>	Circuits
<a href="#">540.203</a>	Thermodynamics

### Civil Engineering

560.325	Concrete Structures
560.330	Foundation Design ( <i>students enrolled prior to Fall 2006 only</i> )
560.445	Advanced Structural Analysis
560.455	Structural Mechanics
560.465	Fundamentals of Soil Behavior
565.605	Advanced Reinforced Concrete Design
565.620	Advanced Steel Design
565.625	Advanced Foundation design
565.630	Prestressed Concrete Design

### Environmental Engineering

570.305	Environmental Engineering Systems Design
570.352	Open-Channel Hydraulics
570.411	Environmental Microbiology
570.432	Sediment Transport
570.443	Aquatic Chemistry
570.445	Physical and Chemical Processes for Water and

	Wastewater Treatment
570.446	Biological Processes for Water and Wastewater Treatment
570.447	Physical and Chemical Concepts for Environmental Process Analysis
570.491	Hazardous Waste Treatment and Disposal
570.493	Economic Foundations for Public Decision Making
570.495	Mathematical Foundations for Public Decision Making

## Pass-Fail Information

Consistent with the [JHU Catalog](#), no more than one course (other than courses of 1 credit or less) may be taken pass-fail in any term. No course listed as a requirement in this Advising Manual for Undergraduate Majors in Civil Engineering may be taken pass-fail. This includes cases where alternative courses are specified.

Any course to be included in the student's program as a non-technical (H or S) or unspecified (U) elective may be taken pass-fail, other than [180.102 \(Elements of Microeconomics\)](#), the courses taken to satisfy the writing requirement, and elementary language courses.

A technical elective (mathematics, natural science, or engineering) may only be taken pass-fail with the approval of the advisor. Generally, such approval will be granted only if the course is outside of the student's major field of interest or is an advanced level course intended primarily for graduate students.

The University has special requirements that limit the number of D-credits students are allowed to accumulate. Students should consult the [JHU Catalog](#) for guidelines. In addition, the Department requires that no graduating student have more than 2 grades of D in the required engineering courses and technical electives.