

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

EP.10.16

Office of the Provost and Vice Chancellor  
for Academic Affairs

Swanlund Administration Building  
601 East John Street  
Champaign, IL 61820



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OCT 21 2009

OFFICE OF THE SENATE

October 20, 2009

Abbas Aminmansour, Chair  
Senate Committee on Educational Policy  
Office of the Senate  
228 English Building, MC-461

Dear Professor Aminmansour:

Enclosed is a copy of a proposal from the College of Engineering to revise the BS in Civil Engineering.

This proposal has been approved by the College of Engineering Executive Committee. It now requires Senate review.

Sincerely,

Kristi A. Kuntz  
Assistant Provost

KAK/dkk

Enclosures

c: I. Adesida  
R. Dennis  
A. Elnashai  
D. Lange  
C. Livingstone  
M. Pleck  
M. Rood  
A. Valocchi

UNIVERSITY OF ILLINOIS  
AT URBANA-CHAMPAIGN

College of Engineering  
Executive Committee  
306 Engineering Hall, MC-266  
1308 West Green Street  
Urbana, IL 61801



RECEIVED  
OCT 19 2009  
OFFICE OF THE PROVOST

October 14, 2009

Kristi Kuntz  
Assistant Provost  
217 Swanlund Administration Building  
MC-304

Via: Ilesanmi Adesida, Engineering College

Dear Ms. Kuntz:

The College of Engineering Executive Committee has reviewed and approved the following:

B.S. in Civil Engineering

Attached is a copy of the request.

Sincerely yours,

Samuel N. Kamin, Secretary  
Executive Committee

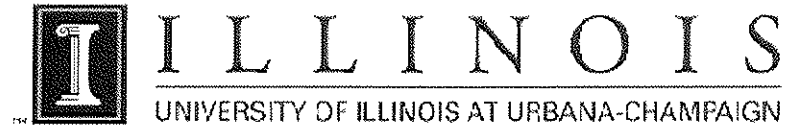
Approval Recommended:

Ilesanmi Adesida, Dean  
College of Engineering

10/15/09  
Date

SNK/bro  
Enclosure

c: Amr Elnashai  
Michael Pleck  
Mark Rood  
David Lange  
Robin Dennis



## Proposal to the Senate Educational Policy Committee

**PROPOSAL TITLE:** Civil Engineering Undergraduate Curriculum Revision, College of Engineering

**SPONSOR:** Professor David Lange, Associate Head for Undergraduate Affairs  
Department of Civil and Environmental Engineering  
1116 Newmark Civil Engineering Laboratory  
Ph: 333-4816  
dlange@illinois.edu

**COLLEGE CONTACT:**  
Charles Tucker III, Associate Dean  
206 Engineering Hall  
Ph. 244-3822  
ctucker@illinois.edu

### BRIEF DESCRIPTION:

The curriculum revision encompasses the following:

- An overall reduction in the required hours from 133 to 128.
- Change in the title of the elective category “Mathematics, Basic Science and Engineering Science Electives” to “Mathematics and Sciences Electives.”
- Requirements dropped from the curriculum (reduction of 6 hours)
  - PHYS 214 *Quantum Physics* (2 hrs)
  - 3 hour reduction of “Mathematics and Sciences Electives” (from 6 to 3)
  - 1 hour reduction in the Civil Engineering Technical Electives (from 35 to 34 hours)
- Required courses restructured (addition of 1 hour)
  - One hour credit increase for CEE 195 (from zero to 1)

### JUSTIFICATION:

The Civil and Environmental (CEE) Department has periodically revised its undergraduate curriculum with the goal of delivering a contemporary and relevant curriculum that

reflects our stature as one of the leading CEE departments in the nation. The main impetus for this revision is the recommendation by the College of Engineering Executive Committee, Ad-hoc Subcommittee on Undergraduate Education (February 8, 2008) that all engineering undergraduate programs target 128 hours for graduation while ensuring strength in basic sciences as well as interdisciplinary concepts and engineering systems design.

The CEE Curriculum Committee met repeatedly over a period of 18 months to evaluate the curriculum and explore ways to strengthen the curriculum and to reduce the overall hours. Members of the committee met regularly with the faculty to solicit input. The two Associate Heads also solicited input from senior undergraduate students enrolled in the required course on Professional Practice. Based upon these discussions, the Curriculum Committee developed a "Curriculum Reform White Paper" which outlined the proposed changes to the curriculum along with background information and rationale. The White Paper was distributed to the faculty to solicit further comments. These additional comments and the White Paper were discussed at a faculty meeting held on April 29, 2009. Following the meeting, there was a 10 day period for faculty to formally register their vote. The CEE faculty approved the proposed curriculum change by a vote of 23-1-1 (approve-disapprove-abstain).

There are four major elements to our curriculum revision to reduce the required hours from 133 to 128:

- 1) Removal of the requirement for PHYS 214 *Quantum Physics*. Quantum mechanics emerged as a core element of the undergraduate engineering curriculum in the 1960's in response to the onset of the "nuclear age." However, there is no direct connection between material covered in PHYS214 and other courses in our curriculum. Further, no leading peer CEE program includes quantum mechanics in BSCE requirements.
- 2) Reduction of "Mathematics and Sciences Electives" from 6 to 3 hours. Our program currently has two categories of electives: Mathematics, Basic Sciences and Engineering Sciences (6 hr.) and Free Electives (6 hr.). We will not reduce the Free Electives, as the freedom they allow is a key part of the undergraduate experience. Therefore, we propose reduction of the Mathematics and Sciences Electives from 6 to 3 hours, essentially from two to one course.
- 3) Reduction in the Civil Engineering Technical Electives from 35 to 34 hours. Our technical program is comprised of *civil engineering core courses* and *advanced technical electives*. Currently the total requirement is 35 hours with at least 15 hours of *civil engineering core courses*, and the remaining *advanced technical electives* divided between *primary* and *secondary fields*. Although most undergraduate courses are 3 credit hours, only some *primary* and *secondary fields* had one or more 4-hour courses. Thus students in certain *primary* and *secondary fields* would often need to take more than 11 courses. Now each path through the curriculum requires exactly 11 courses of Civil Engineering Technical Electives, of which at least one is 4 credit hours. The 4-hour course will occur in either the *civil engineering core courses* or the *primary field*, depending upon the choice of *primary field*. The proposal to reduce the CEE engineering technical program from 35 to 34 hours may be seen as a small change that reflects the original intent of requiring 11 courses. Now each path through the curriculum requires exactly 11 courses of Civil Engineering Technical Electives, of which at least one is 4 credit hours for most primary fields. For some primary fields the 4-hour course will occur in the *civil engineering core courses*, CEE 300 being required.
- 4) Increase CEE 195 from zero to one hour. CEE 195 "About Civil Engineering" is our required introductory class for all freshman and transfer students. In its current form as a

zero hour class, it requires only attendance to learn about general departmental policies and the curriculum. There is much discussion in the college on ways to improve the freshman experience. There are exciting possibilities to engage the students in the department early in their studies so they can gain a greater understanding of civil and environmental engineering. However, this is not realistic unless credit is given.

Overall, we believe that these revisions improve our undergraduate program by pruning credit hours that were weakly justified while bolstering our first introductory course. The reduction of our program to 128 credit hours places it closer to the average of our peers and removes a potential competitive disadvantage as viewed by top applicants to our program. The 128 credit hour program will be easier for students to complete within the typical 4-year college experience, and will allow our students to more fully engage in extra-curricular activities.

**BUDGETARY AND STAFF IMPLICATIONS:**

- a. Additional staff and dollars needed: None.
- b. Internal reallocations (e.g., change in class size, teaching loads, student-faculty ratio, etc.) The instructor for CEE 195 will experience an increase in teaching load since there will be additional responsibilities associated with the change from a zero to one hour class. The department will need to commit TA support for the class.
- c. Effect on course enrollment in other units and explanations of discussions with representatives of those departments. PHYS 214 will be removed as a required course, and this will have an impact on enrollment in that course. Currently about 130 CEE students per year take PHYS 214, and we would anticipate that almost no CEE students will take the course after this change is implemented. This should have little impact on the overall enrollment of PHYS 214, which is offered every semester with typical enrollments greater than 400.
- d. Impact on the University Library. Not a new program so there is no significant impact.
- e. Impact on computer use, laboratory use, equipment, etc. No significant impact.

**GUIDELINES FOR UNDERGRADUATE EDUCATION:**

The proposed revision will meet the goals of the College of Engineering Executive Committee, Ad-hoc Subcommittee on Undergraduate Education recommendation that 128 hours should be the graduation requirement for undergraduate programs in the College. The revisions also place our program more in line with our peer institutions in terms of required hours and physics requirements.

**DESIRED EFFECTIVE DATE:** Fall 2010

**STATEMENT FOR PROGRAMS OF STUDY CATALOG:** See Appendix.

**CLEARANCES:**

Signatures:

\_\_\_\_\_  
Unit Representative:

\_\_\_\_\_  
Date:

\_\_\_\_\_  
College Representative:

\_\_\_\_\_  
Date:

\_\_\_\_\_  
Graduate College Representative:

\_\_\_\_\_  
Date:

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Provost Representative:

\_\_\_\_\_  
Date:

\_\_\_\_\_  
Educational Policy Committee Representative:

\_\_\_\_\_  
Date:

## Appendix: Statement for the Programs of Study Catalog

Reviewer Note: The *Overview of Curricular Requirements* section is shown with Track Changes mark up to the existing 2009-10 Programs of Study statement to facilitate comparison with the *Brief Description* section of the proposal narrative. The *Suggested Sequence* is shown in final form without Track Changes since it is just a roadmap of the typical progress toward the degree and a display of the edits, with inherent visual clutter, is not of importance.

## Civil and Environmental Engineering

[cee.illinois.edu](http://cee.illinois.edu)

Head of Department: Amr S. Elnashai.

Department Office: 1114 Newmark Civil Engineering Laboratory, 205 North Mathews Avenue, Urbana, (217) 333-8038

### Curriculum in Civil Engineering

[cee.illinois.edu](http://cee.illinois.edu)

#### **For the Degree of Bachelor of Science in Civil Engineering**

Civil engineering is a profession that applies the basic principles of science in conjunction with mathematical and computational tools to solve problems associated with developing and sustaining civilized life on our planet. Civil engineering works are generally one-of-a-kind projects; they are often grand in scale; and they usually require cooperation among professionals of many different disciplines. The completion of a civil engineering project involves the solution of technical problems in which uncertainty of information and myriad non-technical factors often play a significant role. Some of the most common examples of civil engineering works include bridges, buildings, dams, airports, highways, tunnels, and water distribution systems. Civil engineers are concerned with flood control, landslides, air and water pollution, and the design of facilities to withstand earthquakes and other natural hazards.

The civil engineering program comprises seven main disciplines: construction engineering and management, construction materials engineering, environmental engineering, geotechnical engineering, environmental hydrology and hydraulics, structural engineering, and transportation engineering. Although each discipline has its own special body of knowledge and engineering tools, they all rely on the same fundamental core principles. Civil engineering projects often draw expertise from many of these disciplines.

#### **Program Review and Approval**

To qualify for the degree of Bachelor of Science in Civil Engineering, each student's academic program plan must be reviewed by a standing committee of the faculty (the Program Review Committee) and approved by the Associate Head of Civil and Environmental Engineering in charge of undergraduate programs. This review and approval process ensures that individual programs satisfy the educational objectives and

all of the requirements of the civil engineering program, that those programs do not abuse the substantial degree of flexibility that is present in the curriculum, and that the career interests of each student are cultivated and served.

## Overview of Curricular Requirements

The curriculum requires 128 hours for graduation and is organized as follows.

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### Orientation and Professional Development

These courses introduce the opportunities and resources your college, department, and curriculum can offer you as you work to achieve your career goals. They also provide the skills to work effectively and successfully in the engineering profession.

Hours	Requirements
1	CEE 195—About Civil Engineering
0	CEE 495—Professional Practice
0	ENG 100—Engineering Orientation <sup>1</sup>
1	Total

Deleted: 0

Deleted: 0

1. External transfer students take ENG 300—Engrg Transfer Orientation instead.

### Foundational Mathematics and Science

These courses stress the basic mathematical and scientific principles upon which the engineering discipline is based.

Hours	Requirements
3	CHEM 102—General Chemistry I
1	CHEM 103—General Chemistry Lab I
3	CHEM 104—General Chemistry II
1	CHEM 105—General Chemistry Lab II
4	MATH 221—Calculus I <sup>1</sup>
2	MATH 225—Introductory Matrix Theory
3	MATH 231—Calculus II
4	MATH 241—Calculus III



3	MATH 285—Intro Differential Equations
4	PHYS 211—University Physics: Mechanics
4	PHYS 212—University Physics: Elec & Mag
2	PHYS 213—Univ Physics: Thermal Physics
34	Total

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1. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

### Civil Engineering Technical Core

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of civil engineering.

Hours	Requirements
3	CEE 201—Systems Engrg & Economics
3	CEE 202—Engineering Risk & Uncertainty
3	CS 101—Intro Computing: Engrg & Sci
3	GE 101—Engineering Graphics & Design
3	TAM 211—Statics
3	TAM 212—Introductory Dynamics
3	TAM 251—Introductory Solid Mechanics
4	TAM 335—Introductory Fluid Mechanics
25	Total

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### Mathematics and Science Electives

These electives allow the student either to gain additional depth in mathematics or science or to gain breadth in mathematics or science essential to specialization in one of the branches of civil engineering. The specific choices of courses in this category are made through the submission of the *Plan of Study*, which is subject to approval by the faculty Program Review Committee.

Hours	Requirements
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3	Mathematics and science electives, selected in accord with recommendations for the chosen primary field in civil engineering as outlined in the <u>Civil Engineering Undergraduate Handbook</u> .
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**Civil Engineering Technical Electives**

This course work is designed to give each student a broad background in the disciplines of civil engineering through the core courses and to allow each student to develop a focused program through advanced technical electives in chosen primary and secondary fields. The primary fields are:

- Construction Engineering and Management
- Construction Materials Engineering
- Environmental Engineering
- Environmental Hydrology and Hydraulic Engineering
- Geotechnical Engineering
- Structural Engineering
- Transportation Engineering

The fundamental principles of civil engineering design and the behavior of civil engineering systems are emphasized throughout the course work. The specific choices of courses in this category are made through the submission of the *Plan of Study*, which is subject to approval by the faculty Program Review Committee.

Hours	Requirements
34 to include at least:	Civil engineering technical courses, selected as follows:
15-16	<i>Civil Engineering Core Courses</i> . The courses that are required and recommended for the primary and secondary fields are listed in the <u>Civil Engineering Undergraduate Handbook</u> . Select at least 5 courses from the following list:
4	CEE 300—Behavior of Materials
3	CEE 310—Transportation Engineering
3	CEE 320—Construction Engineering
3	CEE 330—Environmental Engineering

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3	CEE 350—Water Resources Engineering
3	CEE 360—Structural Engineering
3	CEE 380—Geotechnical Engineering
13-12	<i>Primary Field Advanced Technical Electives.</i> Select courses from approved lists for appropriate programs of study within one of the seven disciplines of civil engineering. Course lists can be found in the <a href="#">Civil Engineering Undergraduate Handbook</a>
6	<i>Secondary Field Advanced Technical Electives.</i> Select courses from approved lists to complement the primary area and add breadth to the program of study. Course lists can be found in the <a href="#">Civil Engineering Undergraduate Handbook</a>

### Social Sciences and Humanities

The social sciences and humanities courses, as approved by the College of Engineering, ensure that students have exposure in breadth and depth to areas of intellectual activity that are essential to the general education of any college graduate.

Hours	Requirements
3	ECON 102—Microeconomic Principles* or ECON 103—Macroeconomic Principles
15	Electives in social sciences and humanities approved by the College of Engineering and satisfying the campus general education requirements for social sciences and humanities, including cultural studies western and non-western.
18	Total

\* Recommended

### Composition

These courses teach fundamentals of expository writing.

Hours	Requirements
4	RHET 105—Principles of Composition
3	BTW 261—Principles Tech Comm
7	Total

### Free Electives

These unrestricted electives, subject to certain exceptions as noted at the [College of Engineering advising Web site](#), give the student the opportunity to explore any

intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.

Hours	Requirements
6	Free electives. Additional unrestricted course work, subject to certain exceptions as noted at the <a href="#">College of Engineering advising Web site</a> , so that there are at least 128 credit hours earned toward the degree.

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### Suggested Sequence

The schedule that follows is illustrative, showing the typical sequence in which courses would be taken by a student with no college course credit already earned and who intends to graduate in four years. Each individual's case may vary, but the position of required named courses is generally indicative of the order in which they should be taken.

#### First year

Hours	First Semester
1	CEE 195—About Civil Engineering <sup>1</sup>
3	CHEM 102—General Chemistry I
1	CHEM 103—General Chemistry Lab I
0	ENG 100—Engineering Orientation
4-3	GE 101—Engineering Graphics & Design or RHET 105—Principles of Composition <sup>2</sup>
4	MATH 221—Calculus I <sup>3</sup>
3	Elective in social sciences or humanities <sup>4</sup>
15-16	Total

Hours	Second Semester
3	CHEM 104—General Chemistry II
1	CHEM 105—General Chemistry Lab II
2	MATH 225—Introductory Matrix Theory
3	MATH 231—Calculus II
4	PHYS 211—University Physics: Mechanics

4-3	RHET 105—Principles of Composition or GE 101—Engineering Graphics & Design <sup>2</sup>
17-16	Total

**Second year**

Hours	First Semester
3	CEE 201—Systems Engrg & Economics
4	MATH 241—Calculus III
4	PHYS 212—University Physics: Elec & Mag
3	TAM 211—Statics
3	Free Electives
17	Total

Hours	Second Semester
3	CEE 202—Engineering Risk & Uncertainty
3	CS 101—Intro to Computing, Eng & Sci
2	PHYS 213—Univ Physics: Thermal Physics
3	TAM 212—Introductory Dynamics
3	TAM 251—Introductory Solid Mechanics
3	Elective in social sciences or humanities <sup>4</sup>
17	Total

**Third year**

Hours	First Semester
3	MATH 285—Intro Differential Equations
4	TAM 335—Introductory Fluid Mechanics
6	Civil engineering technical courses <sup>5</sup>

3	Mathematics and science elective <sup>6</sup>
16	Total

Hours	Second Semester
3	BTW 261—Principles Tech Comm
9	Civil engineering technical courses <sup>5</sup>
3	Elective in social sciences or humanities <sup>4</sup>
15	Total

#### Fourth year

Hours	First Semester
0	CBE 495—Professional Practice
9	Civil engineering technical courses <sup>5</sup>
6	Electives in social sciences or humanities <sup>4</sup>
15	Total

Hours	Second Semester
10	Civil engineering technical courses <sup>5</sup>
3	Elective in social sciences or humanities <sup>4</sup>
3	Free elective
16	Total

1. Offered in the fall semester only and should be taken no later than the first or second semester of enrollment in Civil Engineering.
2. RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is GE 101.
3. MATH 220—Calculus may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.
4. Each student must satisfy the 18-hour social sciences and humanities requirements of

the College of Engineering and the campus general education requirements for social sciences and humanities.

5. Civil engineering technical courses are defined as core courses and advanced technical electives and must total 34 hours of credit. Five courses and a minimum of fifteen hours must be core courses as outlined in the Civil Engineering Undergraduate Handbook.

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Advanced technical electives are selected to correspond with chosen primary and secondary areas of emphasis in civil engineering as outlined in the Civil Engineering Undergraduate Handbook. A minimum of twelve and six hours must be taken for the primary and secondary areas, respectively.

6. Mathematics and science electives are selected in accord with recommendations for the chosen primary area of emphasis in civil engineering as outlined in the Civil Engineering Undergraduate Handbook

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PHYS 214—Univ Physics: Quantum Physics