

TO: The Faculty of the College of Engineering

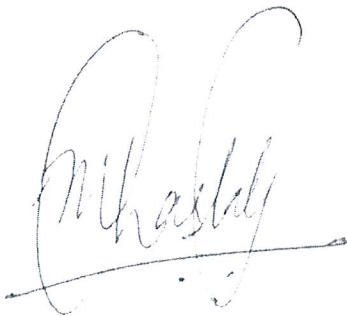
FROM: The Faculty of the Division of Construction Engineering and Management

RE: Change of degree requirements for the Bachelor of Science in Construction Engineering (B.S.CNE) effective for students entering Purdue's Division of Construction Engineering and Management Fall 2014 and later.

The Faculty of the Division of Construction Engineering and Management (CEM) has approved modifications to the curriculum for the Bachelor of Science in Construction Engineering. This action is now submitted to the Engineering Faculty with a recommendation for approval.

Requirements: Refer to pages 2-4.

Reasons: The curriculum was last approved and documented with Engineering Faculty Document 41-03. It is necessary at this time to meet the new requirements defined above, reflect the necessary evolution of the academic environment and internal/external reviews. The goal of this document is to increase student success by creating a deliberate and clear path of course requirements that reflects several institutional requirements as well as accreditation by the Engineering Accreditation Commission of ABET (www.abet.org).



Makarand Hastak, Ph.D., PE, CCP
Professor and Head of Construction Engineering and Management
Professor of Civil Engineering

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes 5/5/14

Date 5/5/14

Chairman ECC Jeff 2 Dy

BSCNE Degree Minimum Requirements

The Bachelor of Science in Construction Engineering (BSCNE) degree requires a total of 130 credit hours and 3 industry sponsored internships as well as meeting University Regulations relative to Graduation Index. Students must qualify for admission into the Division of Construction Engineering and Management by completion of the First-Year Engineering Program with an eligible EAI and GPA, qualifying for Change-of-degree-objective (CODO) to CEM, or meeting CEM transfer requirements.

CEM Core Requirements (106 credit hours):

CEM Core Curriculum (19 credit hours): CEM 20100, CEM 30100, CEM 30200, CEM 32100, CEM 32400, CEM 48500 and CEM 42500.

Advanced Selectives (37 credit hours): CE 20300, CE 23100, CE 27000, CE 29700, CE 29800, CE 34000, CE 34300, CE 37100, CE 38300, CE 47300, ME 20000 and STAT 51100.

Management Selectives (6 credit hours): MGMT 20000 and MGMT 30400.

Technical Electives (6 credit hours):

- a. The Plan of Study for Construction Engineering requires the selection of 6 credit hours of Technical Elective courses. Students in the Division of Construction Engineering and Management are encouraged to choose Technical Electives that are consistent with their career objectives. In many cases, this can involve courses that are offered outside of the Division or School. The purpose of this policy is to provide general criteria for appropriate selection of Technical Elective courses offered by other departments, divisions and/or schools.
- b. All Technical Elective courses must be taken for a grade.
- c. Construction Engineering and Management (CEM) or Civil Engineering (CE) courses that are identified as 30000-, 40000- or 50000-level courses satisfy the requirements of this Policy, with the exception that courses with variable titles CE 49700 and CE 59700 must be approved by the Construction Engineering and Management Curriculum Committee.
- d. Technical Elective courses offered outside of the Division of Construction Engineering and Management and the School of Civil Engineering must be approved by the Construction Engineering and Management Curriculum Committee if not satisfying the following criteria:
 - i. 300-, 400- or 500-level courses offered by departments, divisions and/or schools in the College of Engineering.
 - ii. Engineering Projects in Community Service (EPCS) courses or Global Design Teams (GEP), including those at the 100- and 200-level, up to maximum of three (3) credit hours.

General Engineering Selectives (6 credit hours): ENGR 13100*, ENGR 13200* and CGT 16400.

Mathematics Requirement (18 credit hours): MA 16500*, MA 16600*, MA 26100, MA 26600 and MA 26500.

Science Requirement (14 credit hours): CHM 11500*, Science Selective*, PHYS 17200 and PHYS 24100.

College of Engineering General Education Program (24 credit hours):

General Education Electives (24 credit hours): ENGL 10800*, COM 11400*, CEM 28000*, CEM 38000* and 15 credit hours which meet the following:

- a. The Plan of Study for Construction Engineering notes a variety of General Education Electives. These courses satisfy a portion of the 24 credit hour (minimum) requirement as defined by the College of Engineering's General Education Program. This requirement has two components:
 - i. Foundational Learning Outcomes: select from courses approved by the Undergraduate Curriculum Council for the pertinent learning outcomes.
 - ii. Programmatic Requirement: select from courses approved by the CEM Curriculum Committee.
- b. The 24 credit hour requirement is accomplished with the following considerations in addition to the Colleges' Program:
 - i. First-Year Engineering required course work accounts for 6 credit hours with Foundational Learning Outcomes: Written Communication and Oral Communication.
 - ii. Construction Engineering core courses CEM 28000 and CEM 38000 account for 3 credit hours under the provision of the College's Program (EFD-43-13): "To these ends, all B.S. students in the Schools of Engineering are required to complete a general education program of at least 24 credit hours, of which, at least 18 credit hours must be taken outside of the Colleges of Engineering, Science, and Technology."

Additional Requirements: The following information is provided to clarify specific policies that shall be in place relative the Plan of Study for Construction Engineering in conjunction with the courses outlined above:

1. Core Course Policy (C- Policy)

- a. A student must earn a grade of "C-" or better in all core courses. CEM Core Requirement courses are defined as those required to meet degree requirements for the Bachelor of Science in Construction Engineering.
- b. A student shall be dismissed from the Division of Construction Engineering and Management after three attempts to complete a core course where each attempt resulted

in a grade of “D+”, “D”, “D-”, “E”, “F”, “W” or “WF”. Re-Entry will be solely at the discretion of the Construction Engineering and Management Undergraduate Committee and will be reviewed on a case-by-case basis. The Undergraduate Committee has the prerogative to set the requirements, if any, for re-entry.

- c. Note, the current requirements are a grade of D- or better with no limit on the number of attempts. The Construction Engineering and Management Faculty believes this new policy will facilitate progression toward the degree and improve competency in basic Construction Engineering material.

2. Internship Policy

- a. The Plan of Study for Construction Engineering requires the successful completion of 36 weeks of experiential learning facilitated and administered by the Division of Construction Engineering and Management. Historically this requirement has been met by 3 internship periods as noted by CEM 19100, CEM 29100 and CEM 39100 found within the Plan of Study.
- b. No exception to this Policy is permitted without the prior approval of the Construction Engineering and Management Curriculum Committee. The only pre-approved exception is for Purdue ROTC program students who complete one (1) summer of “training” directly associated with the Purdue ROTC program commitments. The student will be required to produce a report with respect to the summer experience as if it were the standard 12-week internship period. This exception is included to promote inclusivity of a student population that has historically been unable to participate in the Construction Engineering and Management program.

3. First-Year Engineering Requirements: The Plan of Study for Construction Engineering acknowledges the course requirements of the First-Year Engineering Plan of Study and will accept those requirements as they are stated in EFD #35-14. Course recommendations are noted within the BSCNE Degree Minimum Requirements with an asterisk (*).

The change of degree requirements for the Bachelor of Science in Construction Engineering (B.S.CNE) is driven by the motivation of the Faculty to promote student success. The new requirements detailed within reflect changes to the last approved curriculum, EFD 41-30. The changes are summarized to include the following:

1. A number of historical adjustments since EFD 41-30 relative to accreditation reviews
2. Engineering Faculty Document 43-13 – Update of College of Engineering General Education Program (Approved 4/19/2013)
3. Engineering Faculty Document 35-14 – Change in Requirements for Completion of First-Year Engineering (currently under review)
4. Engineering Faculty Document 39-14 – Modification of College of Engineering General Education Program (currently under review)
5. C- Policy for course requirements
6. Revised sophomore class CEM 29000 to meet requirements of a general education elective
7. Reduction in total credit hours for degree from 134 to 130 hours

Sample Plan of Study for Construction Engineering – Effective Fall Semester 2014

Credit Hours Required for Graduation: 130

Freshman Year (Recommendations provided below. Refer to First-Year Engineering Plan of Study for course requirements which if met will successfully fulfill Freshman Year requirements.)

<i>First Semester</i>	<i>Second Semester</i>
(4) MA 16500 (Analytic Geometry & Calculus I)	(4) MA 16600 (Analytic Geometry & Calculus II)
(4) CHM 11500 (General Chemistry)	(3) Science Selective
(3) ENGL 10800 (First Year Composition)	(3) COM 11400 (Fundamentals of Speech Communication)
(2) ENGR 13100 (Transforming Ideas to Innovations I)	(2) ENGR 13200 (Transforming Ideas to Innovation II)
	(4) PHYS 17200 (Modern Mechanics)
(13 credits total)	(16 credits total)

Summer Session One

(0) CEM 19100 (Construction Internship I)
 (0 credits total)

Sophomore Year

<i>Third Semester</i>	<i>Fourth Semester</i>
(4) MA 26100 (Multivariate Calculus)	(3) MA 26600 (Ordinary Differential Equations)
(3) CE 29700 (Basic Mechanics I: Statics)	(4) CE 27000 (Introductory Structural Mechanics)
(3) CEM 20100 (Life Cycle Engineering and Management of Constructed Facilities)	(3) MGMT 20000 (Introductory Accounting)
(4) CE 20300 (Principles and Practice of Geomatics)	(3) CE 23100 (Engineering Materials I)
(2) CGT 16400 (Graphics for Civil Engineering and Construction)	(3) PHYS 24100 (Electricity and Optics) (or ME 20000)
	(2) CEM 28000 (Construction Eng. Prof. Development I)
(16 credits total)	(18 credits total)

Summer Session Two

(0) CEM 29100 (Construction Internship II)
 (3) General Education Elective
 (3 credits total)

Junior Year

<i>Fifth Semester</i>	<i>Sixth Semester</i>
(3) MA 26500 (Linear Algebra)	(3) Technical Elective
(3) CE 29800 (Basic Mechanics II: Dynamics)	(4) CE 34000/CE 34300 (Hydraulics & Elem. Hydr. Lab)
(3) STAT 51100 (Statistical Methods)	(3) CE 37100 (Structural Analysis I)
(3) CEM 30100 (Project Control and Life Cycle Execution of Constructed Facilities)	(3) CE 38300 (Geotechnical Engineering I)
(1) CEM 32100 (Construction Engineering Materials Lab)	(3) CEM 30200 (Practical Applications for Const. Eng.)
(1) CEM 38000 (Construction Eng. Prof. Development II)	
(14 credits total)	(16 credits total)

Summer Session Three

(0) CEM 39100 (Construction Internship III)
 (3) General Education Elective
 (3 credits total)

Senior Year

<i>Seventh Semester</i>	<i>Eighth Semester</i>
(3) CEM 32400 (Human Resource Management in Construction)	(3) CEM 48500 (Legal Aspects in Construction Eng.)
(3) CEM 42500 (Construction Practice Project)	(3) MGMT 30400 (Introduction to Financial Management)
(4) CE 47300 (Reinforced Concrete Design)	(3) ME 20000 (Thermodynamics I) (or PHYS 24100)
(3) Technical Elective	(3) General Education Elective
(3) General Education Elective	(3) General Education Elective
(16 credits total)	(15 credits total)

Note: PHYS 24100 and ME 20000 option is meant to facilitate elective coursework for which ME 20000 is a pre-requisite. (e.g., Mechanical and/or Architectural Engineering Minor.)

Plan of Study for Construction Engineering – Clarification of Current vs Proposed Changes

Tabular Summary of Changes

Year	Current (134 credit hours)	Proposed (130 credit hours)
Freshman	Refer to EFD 35-14	Refer to EFD 35-14
Sophomore (Fall)	CE 203 CE 220 CE 297 MA 261 CGT 164	CE 20300 CEM 20100 CE 29700 MA 26100 CGT 16400
Sophomore (Spring/Summer)	CE 221 CE 270 CE 333 MA 265 PHYS 241 CEM 290 CEM 291	CE 23100 CE 27000 MGMT 20000 MA 26600 PHYS 24100 or ME 20000 CEM 28000 CEM 29100 General Education Elective
Junior (Fall)	CE 399 CE 321 CE 298 MA 266 STAT 511 General Education Elective	CEM 32100 CEM 30100 CE 29800 MA 26500 STAT 51100 CEM 38000
Junior (Spring/Summer)	ME 200 MGMT 200 3-4 Technical Electives General Education Elective CEM 391	CEM 30200 CE 38300 CE 37100 CE 34000/34300 Technical Elective CEM 39100 General Education Elective
Senior (Fall)	CE 424 CE 425 CE 521 Technical Elective 2 General Education Electives	CEM 32400 CEM 42500 CE 47300 Technical Elective General Education Elective
Senior (Spring/Summer)	CE 524 2 Technical Electives 2 General Education Electives	CEM 48500 MGMT 30400 ME 20000 or PHYS 24100 2 General Education Electives

Changes to the curriculum based on New Requirements are detailed as follows:

- Change 1:** Removed Specialty Areas of Emphasis from the Plan of Study.
Reason: ABET audit compliance.
- Change 2:** Added information related to the First Year Engineering Plan of Study under the Freshman Year section.
Reason: Define recommendations required and accepted courses specific to the Plan of Study for Construction Engineering that First Year Engineering (FYE) students enrolling in Construction Engineering and Management must successfully complete.
- Change 3:** Modification of all course designations to a five-digit format.
Reason: Compliance with current University requirements with respect to nomenclature.
- Change 4:** Third Semester added CEM 20100 and deleted CE 220.
Reason: CEM 20100 replaced CE 220 course via EFD 40-09.
- Change 5:** Fourth Semester deleted CE 221.

Reason: CE 221 no longer offered and replaced by CEM 30100 per EFD 41-09 which will be taken in the Fifth Semester.

Change 6: Fourth Semester modified the course designation CE 333 to CE 23100.

Reason: CE 23100 reflects the current course designation for the engineering materials course.

Change 7: Fourth Semester added CEM 28000 and deleted CEM 290.

Reason: Two-part adjustment:

1. EFD 21-10 changed CEM 29000 from zero (0) to one (1) credit hour. The Plan of Study was not officially updated.
2. Concurrently with this Change of Course requirement, EFD 43-14 is being submitted for creation of CEM 28000.

Change 8: Fourth Semester added MGMT 20000.

Reason: Course moved from the Sixth Semester for sequencing purposes.

Change 9: Fourth and Fifth Semester exchange of MA 265 and MA 266.

Reason: Per student interviews and internal review, adjusted sequence promotes consistent course content between MA 26100 to MA 26600 promoting student success.

Change 10: Summer Session Two included a General Education Elective requirement.

Reason: This follows a trend of most students who are taking distance learning courses. Additionally, the inclusion of a General Education Elective during the summer session is in concert with the University's move to a trimester schedule as well as the Division of Construction Engineering and Management's pledge for student success by reducing the fall and spring semester credit hour load.

Change 11: Fifth Semester deleted CE 399.

Reason: Course was eliminated by the School of Civil Engineering and both programs incorporated the content in different courses to supplement this action. Specifically, the Division of Construction Engineering and Management had included content in a variety of courses, including CEM 29000. Plan of Study will be further enhanced by CEM 28000 and CEM 38000. It should be noted, associated with the deletion of CE 399 and modification of CEM 29000, that CE 39800 had been introduced unofficially into the Plan of Study during the spring of 2010 but will not be continued moving forward with the Plan of Study described herein.

Change 12: Fifth Semester deleted CE 321 and added CEM 30100

Reason: CE 220, CE 221 & CE 321 series replaced by CEM 201, CEM 301 & CEM 302 via EFD's 40-09, 41-09 and 42-09.

Change 13: Fifth Semester added CEM 32100 and CEM 38000.

Reason: CEM 32100 (EFD 46-14) has been offered as CEM 49700-11 CEM Materials Lab, other forms as well including CE 333, since the 2008 academic year. The creation of the course fulfills additional content desired for the Construction Engineering Plan of Study. CEM 38000 (EFD 44-14) represents the final component of Change 7 and the conformance to the General Education Policy described above.

- Change 14:** Fifth Semester removed General Education Elective.
Reason: General Education removed in conjunction with the creation of CEM 28000 and CEM 380. Detail provided in the General Education Policy described above.
- Change 15:** Sixth Semester relocated MGMT 200 to the Fourth Semester and updated the course number to specifically identify MGMT 20000.
Reason: Refer to Change 8.
- Change 16:** Sixth Semester relocated ME 200 to the Eighth Semester (or Fourth Semester) and updated the course number to ME 20000.
Reason: This follows a trend by students who have taken the course in their final semesters as well as the Division of Construction Engineering and Management's pledge for student success by reducing and balancing fall and spring semester credit hour loads. Additionally, PHYS 24100 and ME 20000 options is provided to facilitate elective coursework for which ME 20000 is a pre-requisite. (e.g. Mechanical and/or Architectural Engineering Minor.)
- Change 17:** Sixth Semester reduced the number of Technical Elective hours from ten (10) to three (3) and added CE 34000, CE 34300, CE 37100 and CE 38300.
Reason: This is an adjustment to distribute the planned Technical Elective hours to properly represent the fact that a significant amount of Technical Elective courses offered in CEM and CE (Civil Engineering) are Fall or Spring only courses.
- Change 18:** Sixth Semester added CEM 30200
Reason: CE 220, CE 221 & CE 321 series replaced by CEM 20100, CEM 30100 & CEM 30200 via EFD's 40-09, 41-09 and 42-09.
- Change 19:** Summer Session Three included a General Education Elective requirement.
Reason: This follows a trend of most students who are taking distance learning courses. Additionally, the inclusion of a General Education Elective during the summer session is in concert with the University's move to a trimester schedule as well as the Division of Construction Engineering and Management's pledge for student success by reducing the fall and spring semester credit hour load.
- Change 20:** Seventh Semester deleted CE 424 and CE 425 and added CEM 32400 and CEM 42500.
Reason: This adjustment reflects EFD 22-10 and EFD 65-07 respectively.
- Change 21:** Seventh Semester deleted Technical Elective and added CE 47300.
Reason: The Faculty determined it should be a required course for the successful completion of the Bachelor of Science in Construction Engineering.
- Change 22:** Seventh Semester removed three (3) credit hours of General Education Elective.
Reason: General Education removed in conjunction with previously detailed additions of General Education Elective hours in Summer Sessions.
- Change 23:** Seventh Semester deleted CE 521 and added MGMT 30400 to the Eighth Semester.
Reason: Although CE 521 (current designation CE 52100) is still an acceptable course for this Financial Management requirement, the course is offered on a random basis between the Fall and Spring Semesters. Consistent with the Division of Construction

Engineering and Management's pledge for student success, the alternate MGMT 30400 promotes a predictable and deliberate Plan of Study.

- Change 24:** Eighth Semester deleted CE 524 and added CEM 48500.
Reason: CE 524 (current designation CE 52400) content differs from CEM 48500 (EFD 45-14) and hence the Plan of Study reflects the appropriate course for students in the Division of Construction Engineering and Management.
- Change 25:** Eighth Semester deleted Technical Electives.
Reason: Technical Electives relocated to alternate semesters.
- Change 26:** Eighth Semester added ME 20000 or PHYS 24100.
Reason: Refer to Change 16.

Curriculum in Construction Engineering – Current Plan of Study (per EFD #41-03)
 Credit Hours Required for Graduation: 134

	<i>Credit Hours</i>
Mathematics and Physical Sciences: Calculus: MA 165, 166, 261, 265, 266 Stochastics: STAT 511 Chemistry: CHM 115, 116 Physics: PHYS 152, 241	 18 3 8 7
Computing: ENGR 106, CS 156, CGT 164	 6
Seminars: ENGR 100, CEM 290	 1
Communication and General Education: English Composition: Speech: COM 114 Technical Communication: CE 399 Humanities and Social Sciences: Courses are selected according to an approved list with the help of a faculty advisor.	 3 3 3 18
Core Engineering Courses: Surveying: CE 203 Basic Mechanics/Materials: CE 333, 270, 297, 298 Thermodynamics: ME 200 Construction: CE 220, 221, 321, 424, 521, 524 Final Design Project: CE 425 This course must be taken during the student's final fall semester.	 4 13 3 18 3 3
Management Course: Management: MGMT 200	 3
Technical Electives: Courses are selected with the help of a faculty advisor to accommodate the student's professional goals and to provide the student with sufficient design background.	 20

Plan of Study for Construction Engineering – Current (per EFD #41-03)

Credit Hours Required for Graduation: 134

Freshman Year (See First Year Engineering Plan of Study)

Summer Session

(0) CEM 191 (Construction Internship I)

Sophomore Year

Third Semester

Fourth Semester

(4) CE 203 (Fundamentals of Surveying)
 (3) CE 220 (Construction Management)
 (3) CE 297 (Basic Mechanics I: Statics)
 (4) MA 261 (Multivariate Calculus)
 (2) CGT 164 (Graphics for Civil Engineers and Construction)

(3) CE 221 (Construction Plans and Estimates)
 (4) CE 270 (Introductory Structural Mechanics)
 (3) CE 333 (Engineering Materials)
 (3) PHYS 241 (Electricity and Optics)
 (3) MA 265 (Linear Algebra)
 (0) CEM 290 (Construction Seminar)

(16)

(16)

Summer Session

(0) CEM 291 (Construction Internship II)

Junior Year

Fifth Semester

Sixth Semester

(3) CE 399 (Oral and Written Communications for Civil Engineers)
 (3) CE 321 (Construction Planning and Scheduling)
 (3) CE 298 (Basic Mechanics II: Dynamics)
 (3) STAT 511 (Statistical Methods)
 (3) MA 266 (Ordinary Differential Equations)
 (3) General education elective*

(3) MGMT 200 (Introductory Accounting)
 (3) ME 200 (Thermodynamics)
 (10) Technical Elective**
 (3) General education elective*

(18)

(19)

Summer Session

(0) CEM 391 (Construction Internship III)

Senior Year

Seventh Semester

Eighth Semester

(3) CE 424 (Human Resource Management in Construction)
 (3) CE 425 (Construction Practice Project)
 (3) CE 521 (Construction Business Management)
 (4) Technical Elective**
 (6) General education elective*

(3) CE 524 (Legal Aspects in Engineering Practice)
 (6) Technical Elective**
 (6) General education elective*

(19)

(15)

*Eighteen credit hours of general education electives are chosen in accordance with the general education requirement of the Schools of Engineering.

**Technical electives vary depending on the specialty area of interest and career objectives. A list of acceptable technical electives is available from the CEM Division.

Plan of Study for Construction Engineering – Current (per EFD #41-03) (continued)

Specialty Areas of Emphasis

Candidates for the Bachelor of Science in Construction Engineering and Management degree are to select technical electives within the specialty areas of emphasis according to the following guidelines:

Building/Heavy Highway Construction Specialty

- (3) CE 340 (Hydraulics)
- (1) CE 344 (Drainage Design Laboratory)
- (3) CE 371 (Structural Analysis I)
- (3) CE 383 (Geotechnical Engineering I)
- (4) CE 473 (Theory of Reinforced Concrete)

Plus at least 6 credits from the current approved technical electives list available from the CEM Division.

Electrical Construction Specialty

- (3) EE 201 (Linear Circuit Analysis I)
- (1) EE 207 (Electronic Measurement Techniques)
- (3) EE 432 (Elements of Power System Engineering)

Plus at least 12 credits from the current approved technical electives list available from the CEM Division.

Mechanical Construction Specialty

- (3) EE 201 (Linear Circuit Analysis I)
- (3) ME 309 (Fluid Mechanics)

Plus at least 12 credits from the current approved technical electives list available from the CEM Division.