

### Course Outline

**COURSE:** CARP 210      **DIVISION:** 50      **ALSO LISTED AS:**

**TERM EFFECTIVE:** Fall 2016      **Inactive Course**

**SHORT TITLE:** STRUCTURAL CONCRETE

**LONG TITLE:** Concrete- Precast and Prestressed

<u>Units</u>	<u>Number of Weeks</u>	<u>Type</u>	<u>Contact Hours/Week</u>	<u>Total Contact Hours</u>
1	1	Lecture:	6	6
		Lab:	30	30
		Other:	0	0
		Total:	36	36

#### **COURSE DESCRIPTION:**

This course covers concrete components and the effect of component proportions on the workability and strength of concrete. The type of cement and admixtures to use in a given situation are discussed. Detail and build tilt-up panel forms. Construct a bridge deck and the forms for a box beam girder.

**PREREQUISITES:**

**COREQUISITES:**

**CREDIT STATUS:** C - Credit - Degree Non Applicable

**GRADING MODES**

L - Standard Letter Grade

**REPEATABILITY:** N - Course may not be repeated

**SCHEDULE TYPES:**

02 - Lecture and/or discussion

03 - Lecture/Laboratory

04 - Laboratory/Studio/Activity

#### **STUDENT LEARNING OUTCOMES:**

1. The students will describe, evaluate, and construct concrete structures.

Measure: Class Performance, Quizzes, Written Exams

PLO: 1

ILO: 1, 2, 3, 7

GE-LO:

Year assessed or anticipated year of assessment: 2012-13

2. The students will use a set of construction drawings to detail and construct a tilt-up panel.

Measure: Class Performance, Written Exams

PLO: 1

ILO: 1, 2, 3, 7

GE-LO:

Year assessed or anticipated year of assessment: 2012-13

#### PROGRAM LEARNING OUTCOMES:

1. Demonstrate journey level skills, including those skills necessary to build all concrete infrastructures that comprise the California transportation system.
2. Locate on the blueprints and in the specifications, the information needed to construct various types of structures and assemble its various components.
3. Perform horizontal layout and vertical layout of wood framed wall components. Install interior and exterior trims and moldings. Construct various types of roofs and stairs.

#### CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Inactive Course: 11/28/2016

Out-of class assignments: For each topic, the student will read chapters and do homework assignments at the end of those chapters.

2 lec/10 lab hours

- A. Introduction to concrete
  1. The fundamentals of concrete
    - a. Definition
    - b. Fresh concrete
    - c. Green concrete
    - d. Hardened concrete
  2. Codes and standards
  3. Quality concrete and engineering
    - a. Quality concrete
    - b. Loads
    - c. Stresses
  4. Math review and estimating
  5. Plans and specifications
- B. Cement and water
  1. Cement types
  2. Composition of Portland cement
    - a. Plastic cement
    - b. Air-entrained cement
    - c. Pozzolan cement
  3. Water
    - a. Water-cement ratio

4. The hydration reaction
  - a. Mechanism of hydration
  - b. Heat of hydration
- C. Aggregates and admixtures
  1. Gradation of aggregates
    - a. Maximum aggregate sizes
  2. Aggregate shape
  3. Aggregate quality
- D. Admixtures
  1. Accelerators
  2. Air-entrained agents
  3. Pozzolans
  4. Retarders
  5. Water-reducing admixtures

SLO: The students will describe, evaluate, and construct concrete structures. The students will describe, evaluate, and use aggregates and admixtures.

Assignments: Read the chapters covered in the lecture and do the homework exercises at the end of the chapters. Answer the study guide questions on the assigned subject.

Describe and evaluate the stages and types of concrete. Describe, evaluate and use aggregates and admixtures.

2 lec/10 lab hours

- E. Handling and curing concrete
  1. Handling concrete
  2. Mixing concrete
    - a. Meeting structural design criteria
    - b. Mixing requirements
    - c. Economy
    - d. Job mixed concrete
  3. Transporting concrete
    - a. Ready mix trucks
    - b. Buckets and chutes
    - c. Buggies
    - d. Conveyors
    - e. Cranes
    - f. Pumps
  4. Placing concrete
    - a. Subgrade
    - b. Treating subgrade and forms
    - c. Reinforcement
    - d. Segregation
    - e. Forms
    5. Consolidation
    6. Workability
    7. Controlling mixture behavior
    8. Concrete joints
      - a. Control joints
      - b. Isolation joints
    9. Finishing

- 10. Curing
- F. Reinforced concrete and formwork
- A. Reinforcement
  - 1. Reinforced concrete strength
  - 2. Steel reinforcement bars
  - 3. Bending, splicing, and welding reinforcement bars.
- B. Formwork
  - 1. Quality
  - 2. Safety
  - 3. Shoring
  - 4. Economy
  - 5. Form materials
  - 6. Bending plywood
  - 7. Placing concrete in formwork
  - 8. Removal of forms

SLO: The students will select and mix concrete batches of concrete to specifications.

The students will cast three concrete beams with the rebar at the top, middle, and bottom respectively. The students will perform a break test on each beam.

Assignments: Read the chapters covered in the lecture and do the homework exercises at the end of the chapters. Answer the study guide questions on the assigned subject.

Cast three concrete beams with the rebar at the top, middle, and bottom respectively. Perform a break test on each beam. Describe the effect of rebar placement on beam strength.

2 lec/10 lab hours

- G. Specifications and testing
  - 1. Concrete ordering
  - 2. Specifications
    - 1. By prescription
    - 2. By performance
  - 3. Ingredient specifications
  - 3. Testing
    - 1. Ingredient test
    - 2. Slump test
    - 3. Compressive strength test
    - 4. Pull test
- H. Precast concrete
  - 1. Precast structural elements
  - 2. Tilt-up construction
    - a. Design
    - b. Historical background
    - 3. Typical tilt-up project
      - a. Footing and slab concrete
      - b. Panel forming
      - c. Panel preparation
      - d. Panel inserts
      - e. Brace points
      - f. Brace inserts
      - g. Brace loading
      - h. Brace charts

- i. Ledgers
- j. Lifting inserts
- k. Panel connectors
- l. Panel reinforcement
- m. Strongbacks
- n. Panel concrete
- o. Panel erection and bracing
- l. Prestressed concrete
  - 1. Historical background
  - 2. Basic principle of prestressing
  - 3. Benefits of prestressing
  - 4. Prestressed concrete construction
    - a. Forms
    - b. Pre-tensioning concrete
    - c. Post-tensioning concrete
    - d. Bond strength
    - e. Reinforcement for prestressed concrete
  - 5. Types of prestressed construction
    - a. Interior shear wall
    - b. Exterior shear wall
    - c. Rigid frame
  - 6. Formwork used for prestressing
    - a. Forms for post-tensioning
    - b. Effect of post-tensioning on forms
    - c. Forms for pre-tensioning
  - d. Tolerances for precast prestressed members
  - e. Erection and removal
  - f. Safety

SLO: The students will use a set of construction drawings to detail and construct a tilt-up panel. The students will install the ledgers, pilaster beam seat, panel connectors, feature strips, brace inserts, and lifting inserts

Assignments: Read the chapters covered in the lecture and do the homework exercises at the end of the chapters. Answer the study guide questions on the assigned subject.

Using a set of construction drawings, detail a tilt-up panel. The panel detail will show all of the information necessary to layout and form the tilt-up panel.

Form a tilt-up panel. Install the ledgers, pilaster beam seat, panel connectors, feature strips, brace inserts, and lifting inserts.

2.0 Hours

Final exam

**METHODS OF INSTRUCTION:**

- A. Lecture and discussion
- B. Visual aids
- C. Demonstrations
- D. Group hands-on exercise
- E. Individual hands-on exercise
- F. One-on-one hands-on instruction

**METHODS OF EVALUATION:**

The types of writing assignments required:

Written homework

Reading reports

Lab reports

Essay exams

The problem-solving assignments required:

Homework problems

Field work

Lab reports

Quizzes

Exams

The types of skill demonstrations required:

Class performance

Field work

Performance exams

The types of objective examinations used in the course:

Multiple choice

True/false

Matching items

Completion

Other category:

None

The basis for assigning students grades in the course:

Writing assignments: 5% - 20%

Problem-solving demonstrations: 5% - 30%

Skill demonstrations: 20% - 80%

Objective examinations: 5% - 30%

Other methods of evaluation: 0% - 0%

**REPRESENTATIVE TEXTBOOKS:**

Required:

Barclay, CTCNC. Construction Safety Orders 1 & 2, Concrete- Precast & Prestressed, Concrete -Precast & Prestressed Lesson Book. Thomas West, CTCNC, 2013. Or other appropriate college level text.

Reading level of text, Grade: 10 Verified by: publisher/dvt

**ARTICULATION and CERTIFICATE INFORMATION**

Associate Degree:

CSU GE:

IGETC:

CSU TRANSFER:

Not Transferable

UC TRANSFER:

Not Transferable

**SUPPLEMENTAL DATA:**

Basic Skills: N

12/5/2016

Classification: Y  
Noncredit Category: Y  
Cooperative Education:  
Program Status: 1 Program Applicable  
Special Class Status: N  
CAN:  
CAN Sequence:  
CSU Crosswalk Course Department:  
CSU Crosswalk Course Number:  
Prior to College Level: Y  
Non Credit Enhanced Funding: N  
Funding Agency Code: Y  
In-Service: N  
Occupational Course: A  
Maximum Hours:  
Minimum Hours:  
Course Control Number: CCC000500343  
Sports/Physical Education Course: N  
Taxonomy of Program: 095210