1. **Department, number, and title of course**

Department of Civil Engineering, CENG 5312, Advanced Concrete Design

2. **Graduate Course**

3. **Course (catalog) description**

A second course in the design of reinforced concrete structures; advanced concepts in analysis and design of beams, columns and slabs, and an introduction to pre-stressed concrete.

4. **Prerequisite(s)**

CENG 3325 Structural Analysis and CENG 4311 Reinforced Concrete Design

5. **Textbook(s) and/or other required material**


*Building Code Requirements for Structural Concrete (318M-05) and Commentary (318RM-05)*, by American Concrete Institute (ACI). Published by ACI, Farmington Hills, Michigan, 2005.


6. **Course Objectives**

- Determine the design loads on a structure, determine load effects on structural components, and determine the load path through the structure.
- Use the ACI Strength Design methodology.
- Analyze and design one-way and two-way slabs.
- Analyze and design reinforced concrete beams, columns, corbels, lintels, and footings.
- Calculate the deflection of a reinforced concrete beam and determine if the beam meets ACI deflection standards.
- Model, analyze, and design a statically indeterminate reinforced concrete frame.
- Describe how individual structural elements are connected to develop a building design.
- Design a structure using reinforced concrete.

7. **Topics Covered**

- Functional requirements
- Material characteristics and behavior
- Advantages/disadvantages of reinforced concrete as a structural material
- Load and load path analysis
- One-way and two-way slabs
- Shear walls
- Bridge deck
- Diaphragms
- Framing connection configurations

8. **Class/laboratory schedule, i.e., number of sessions each week and duration of each session**
9. **Contribution of course to meeting the professional component**

3.0 Credit Hours (ES=0.5, ED=2.5)

The course reviews quickly and builds upon the design skills developed through CENG 4311, Reinforced Concrete. The student will become familiar with reinforced concrete and how best to use it to design a structure. A design project is the mechanism used to drive the need to learn each topic in the course.

10. **Relationship of course to program outcomes**

The course director’s assessment of how this course contributes to the civil engineering program outcomes is listed below. The following scale is used:

1=No Contribution; 2=Small Contribution; 3=Average Contribution; 4=Large Contribution; 5=Very Large Contribution

<table>
<thead>
<tr>
<th>CIVIL ENGINEERING PROGRAM OUTCOMES</th>
<th>Course Director Assessment</th>
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</thead>
<tbody>
<tr>
<td>Students who qualify for graduation with a civil engineering masters will demonstrate:</td>
<td></td>
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<tr>
<td>Have developed specialized knowledge in civil engineering beyond that normally expected of undergraduates preparing them for advanced professional practice.</td>
<td>5</td>
</tr>
<tr>
<td>When conducting graduate research, have generated new knowledge and engineering methods to serve the State, the Nation, and the global community.</td>
<td>2</td>
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</tbody>
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11. **Person(s) who prepared this description and date of preparation**

Dr. Ronald W. Welch, PE, Professor, 18 October 2007.