COURSE SYLLABUS

Course number: CIVE 528
Course title: Design of Masonry Structures

Course Designation
Technical Elective for Civil and Construction Engineering Majors

Course Description
Properties and characteristics of reinforced concrete masonry; design of structural components. Design project includes identification of forces and structural components as well as structural design of a masonry building.

Pre-Requisite
CIVE 321

Textbook

Reference

Course Learning Outcomes
To develop a fundamental understanding of the behavior, analysis and design of reinforced concrete masonry structural elements and systems based on structural design principles using TMS Code.

Topics Covered
- Introduction and Masonry Materials.
- Strength Design Method vs. Allowable Stress Method.
- Structural Analysis of Reinforced Concrete Masonry.
- Design of Masonry Beams in Flexure.
- Retaining Walls.
- Shear Design.
- Columns.
- Combined Bending and Axial Forces.
- Bearing Walls.
- Shear Walls.
- Design of Masonry Buildings.
- Introduction to Segmental Walls.
- Exams and Review.

Lectures/Laboratory Schedule
Lecture – 3 Sessions per Week, 50 Minutes per Session

Relationship of Course Outcomes to Program Outcomes
This course is one of many that you will take towards your degree in Civil, Construction or Environmental Engineering. Each of our courses is designed to prepare you for your careers in Civil Engineering, and to contribute to some specific Program Outcomes. Program Outcomes are statements that describe what students are expected to know and are able to do by the time of graduation. Each course in the curriculum emphasizes particular aspects of the overall body of knowledge you are expected to acquire. Although other outcomes may also be addressed, this course is intended to have a particular emphasis on the following Program Outcomes. For each numbered Program Outcome, the course-specific interpretation is shown as the indented lettered Course Outcomes that will be used for assessment.
**OUTCOME 1:** Apply knowledge to problems in mathematics through differential equations, multi-variable calculus, calculus-based physics, chemistry and one additional area of science. Assessed by: Homework Assignment, Quizzes and Exams

A. Apply knowledge of geometry, calculus and physics to solve problems in analysis of member loading conditions and selection of most critical situation.
B. Apply knowledge of geometry, calculus and physics to solve problems in reinforced masonry load-deformation behavior.
C. Apply knowledge of geometry, calculus and physics to analyze service and limit conditions in reinforced masonry members for the purpose of structural design.

**OUTCOME 4:** Design a complex system or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health & safety, manufacturability, and sustainability. Assessed by: Homework Assignment, Quizzes and Exams

A. Work out problems in design of masonry structural members and systems based on TMS code provisions and building architectural budget and constructability constraints.
B. Design a fully integrated masonry building based on critical loading conditions as well as structural system definition and analysis based on reading and understanding the ACI and TMS codes.
C. Design of structural members based bending moment, shear, bond, deflection, axial compression, etc.
D. Detail structural members to determine dimensions, steel reinforcement arrangements, spacing etc.
E. Use social, political, ethical, health & safety, manufacturability, and sustainability consideration to optimize the sought design.

**OUTCOME 6:** Apply knowledge of four technical areas appropriate to civil engineering to identify, formulate and Solve problems in civil, construction and environmental engineering. Assessed by: Homework Assignment, Quizzes and Exams

A. Design of structural members based bending moment, shear, bond, deflection, axial compression, etc. utilizing software, spread sheet and design aids based on code provisions.
B. Detail structural members to determine dimensions, steel reinforcement arrangements, spacing etc.
C. Work out problems focused on analyzing code dictated loading conditions for structural members to determine the most critical loading condition for member design in bending, shear, axial forces, bond, etc.
D. Optimization of member design based on economic analysis and construction friendliness based on design and construction friendliness using standard guidelines.
E. Consider environmental issues in design such as energy input of masonry vs. other materials and proper size of steel buildings for best environmental utilization of space.

**OUTCOME 9:** Apply relevant techniques, skills, and modern engineering tools to solve a simple problem. Assessed by: Homework Assignment, Quizzes and Exams

A. Work out problems in masonry utilizing software, spread sheet and design aids based on code provisions.
B. Selection of structural member details based on existing standard details.
C. Optimization of member design based on economic analysis and construction friendliness based on design and construction friendliness using standard guidelines.

**OUTCOME 11:** Recognize the need for and demonstrate an ability to engage in life-long learning and explain the Importance of professional licensure. Assessed by: Homework Assignment, Quizzes and Exams

A. Work out problems that involve review of standard code provisions and guidelines to produce an efficient design of reinforced masonry members.
B. Research and Review of code portions not covered in class and utilizes such portions in member design.
C. Detail structural members to determine sizes, member arrangements, spacing etc. based on review and analysis of standard details available of different sources.
D. Learn the process of getting a building permit and realize the importance of professional license.
E. Design a fully integrated masonry building based on critical loading conditions as well as structural system definition and analysis based on reading and understanding TMS code.

**CONTRIBUTION OF COURSE TO MEETING THE PROFESSIONAL COMPONENT**

Engineering Design: 3 units or 100%

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