College of Engineering

Department of Civil Engineering

CE 566 Plasticity in Structural Engineering

Credit and Contact hours	3/ 3 (Lectures), 0 (Tutorials), 0 (Laboratory)
Required, or Elective	Required for a MSCE degree
Course Description	Fundamentals of theory of plasticity; Inelastic behavior of sections, members and structures; Fundamentals and basic theories of limit analysis; Applications of limit analysis applications to plane concrete and metal structures; Plastic design of continuous beams and frames.
Prerequisites or Co-requisites	None
Course Learning Outcomes	Students completing this course successfully will be able to

Course Learning Outcomes	***Related Program Outcomes***
CLO1: Recognize the plastic behavior, plastic collapse, and the basic of plastic analysis and design concepts of structural members	**K1**
CLO2: Recognize the plastic hinge assumption to evaluate the plastic collapse loads	**K1**
CLO3: Formulate and implement the plastic failure mechanisms, and calculate the collapse load of slabs, beams and frames using the basic plastic analysis theorems.	**S1**
CLO4: Use the plastic design methods for evaluating the collapse load factor and bending moments at the plastic hinges of beams and frames.	**S1**
CLO5: Develop load-deflection relations to estimate defections in plastic collapse conditions	**S1**
CLO6: Use plasticity module of a computer software to simulate the plastic failure mechanisms of structures.	**S1**

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<tr><td>Student Outcomes related to this Course</td><td>K1. Recognize advanced engineering knowledge, concepts and techniques to identify, interpret and analyze complex and real-life engineering problems.

S1. Provide solution for complex and real-life engineering problems through critical thinking and using modern engineering tools and identify its impact on social and ethical issues.</td></tr>
<tr><td>Topics Covered</td><td>
<table>
<tr><th>List of Topics</th><th>Related CLOs</th></tr>
<tr><td>1. Basic Hypothesis</td><td>CLO2</td></tr>
<tr><td>2. Plastic hinge and plastic collapse concepts</td><td>CLO1</td></tr>
<tr><td>3. Simple cases of plastic collapse</td><td>CLO3</td></tr>
<tr><td>4. Basic theorems of plastic analysis of structures</td><td>CLO3</td></tr>
<tr><td>5. Methods of Plastic Design</td><td>CLO4</td></tr>
<tr><td>6. Estimation of defection in collapse conditions</td><td>CLO5</td></tr>
<tr><td>7. Yield line analysis of one-, and two-way reinforced concrete slabs</td><td>CLO5</td></tr>
<tr><td>8. Computer applications</td><td>CLO6</td></tr>
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<tr><td>Textbook(s) and Other Required Material</td><td>• Neal, B.G., 1985. The plastic methods of structural analysis. 3rd Ed. John Wiley & Sons.
• Wight, J. K. Reinforced Concrete: Mechanics and Design. Global Edition." (2016)-Chapter 14</td></tr>
<tr><td>Grading System</td><td>Assignments and Homework 5%
Compute Assignment 5%
Presentation of Project 10 %
Two Midterm Exams 40%
Final Exam 40%</td></tr>
<tr><td>Instructors</td><td>Dr. Yassir M. Abbas; Office 2A84/1; Email: yabbas@ksu,edu.sa</td></tr>
<tr><td>Date of Review</td><td>February, 2021</td></tr>
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