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	Elective
Course Description	Fundamentals of the 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 (CLOs)	*Related Student Outcomes (SO)*
CLO1. Recognize the plastic behavior, plastic collapse, and the basics of plastic analysis and design concepts of structural members. K1	**SO1**
CLO2. Recognize the plastic hinge assumption to evaluate the plastic collapse loads. K1	**SO1**
CLO3. Implement the plastic failure mechanisms, and calculate the collapse load of slabs, beams, and frames using the basic plastic analysis theorems. S1	**SO2**
CLO4. Use the plastic design methods for evaluating the collapse load factor and bending moments at the plastic hinges of beams. S1	**SO2**
CLO5. Develop load-deflection relations to estimate defections in plastic collapse conditions. S1	**SO2**
CLO6. Use the plasticity module of computer software to simulate the plastic failure mechanisms of structures. S1	**SO2**
CLO7. Demonstrate professional engineering and ethical values in assigned projects and assignments, with high academic integrity. V1	**SO6**

Student Outcomes related to this Course	SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems. SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors. SO 6 Demonstrate scientific integrity, ethical responsibility, and academic values in scientific publications, research projects, and thesis work.

Topics Covered	**List of Topics**	**Related CLOs**
	1. Plastic hinge and plastic collapse concepts	**CLO1, CLO2, CLO3**
	2. Simple cases of plastic collapse	**CLO2**
	3. Basic theorems of plastic analysis of structures	**CLO3, CLO4**

	4. Methods of Plastic Design	**CLO4, CLO5, CLO6**
	5. Estimation of defection in collapse conditions	**CLO5**
	6. Yield line analysis of one-, and two-way reinforced concrete slabs	**CLO3, CLO4**
	7. Computer applications	**CLO6, CLO7**
	8. A workshop on related topics	**CLO6, CLO7**
Textbook(s) and Other Required Material	• 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	
Grading System	Assignments and HWs Lecture Attendance Written midterm exam Project Computer Assignment Final exam	05% — 40% 10% 05% 40%
Instructors	Prof. Yassir M. Abbas; Office 2A65; Email: yabbas@ksu,edu.sa	
Date of Review	March 2025	