City University of Hong Kong
Course Syllabus

offered by
Department of Architecture and Civil Engineering
with effect from Semester A 2022 / 2023

Part I Course Overview

Course Title:	Plasticity
Course Code:	CA8026
Course Duration:	1 Semester (Some courses offered in Summer Term may start a few weeks earlier than the normal University schedule. Please check the teaching schedules with CLs before registering for the courses.)
Credit Units:	3
Level:	R8
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

The course intends to provide students with knowledge on mathematical formulation of the constitutive laws of plasticity; yield criteria and their experimental verification; plastic stress-strain relations and their associated flow rules; correspondence between rate-independent and rate-dependent plasticity; solutions to basic boundary-value problems, including plane problems and those involving cylindrical and spherical symmetries; variational and minimum principles; limit analysis; plane-strain problems and crystal plasticity; finite-strain theory.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs [#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	learn and discover fundamental principles of plasticity to analyze and design structural members under axial load, shear load, bending moment and torsional moment	25%	✓		
2.	model and analyze the plastic behavior of structural components subjected to various loading	25%		✓	
3.	discover appropriate approximation to solve plastic boundary-value problems of structures	25%		✓	
4.	discover the advanced topics in plastic mechanics, variation principles, and nonlinear analysis of plates and shells	25%		✓	
** If weighting is assigned to CILOs, they should add up to 100%.*		100%			

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

TLA	Brief Description	CILO No.				Hours / week (if applicable)
		1	2	3	4	
Lecture	Address the basic principles and theories for Plastic Mechanics	✓	✓	✓	✓	2 hours/week
Tutorial	Explain how to get the solutions of plastic rods, beams and plates	✓	✓	✓	✓	1 hour/week

Semester Hours:	3 hours per week
Lecture/Tutorial/Laboratory Mix:	Lecture (2); Tutorial (1); Laboratory (0)

4. Assessment Tasks/Activities

Assessment Tasks / Activities	CILO No.				Weighting*	Remarks
	1	2	3	4		
Continuous Assessment: 50%						
Assignment	✓	✓	✓	✓	30%	
Mid-term test		✓			20%	
Examination: 50% (duration: 2 hour(s))						
Examination					50%	
* The weightings should add up to 100%.					100%	

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%

5. Assessment Rubrics

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
Assignment	ABILITY to Use plasticity to do extreme design of rods and beams in structural engineering	High	Significant	Basic	Not even reaching marginal levels
Mid-term test	ABILITY to APPLY the basic principle and the scientific techniques in solving the plastic rods, beams and plates	High	Significant	Basic	Not even reaching marginal levels
Examination	CAPACITY to UNDERSTAND the mathematical theories and USE them in solving an engineering problem	High	Significant	Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
Assignment	ABILITY to Use plasticity to do extreme design of rods and beams in structural engineering	High	Significant	Moderate	Basic	Not even reaching marginal levels
Mid-term test	ABILITY to APPLY the basic principle and the scientific techniques in solving the plastic rods, beams and plates	High	Significant	Moderate	Basic	Not even reaching marginal levels
Examination	CAPACITY to UNDERSTAND the mathematical theories and USE them in solving an engineering problem	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Phenomenological and mathematical formulation of the constitutive laws of plasticity; yield criteria and their experimental verification; plastic stress-strain relations and their associated flow rules; correspondence between rate-independent and rate-dependent plasticity; solutions to basic boundary-value problems, including plane problems and those involving cylindrical and spherical symmetries; variational and minimum principles; limit analysis; plane-strain problems and crystal plasticity; finite-strain theory.

2. Reading List

2.1 Compulsory Readings

1.	Han, WM & Reddy, BD 2013, Plasticity: mathematical theory and numerical analysis, 2nd edn, Springer, New York.
2.	Salençon J 2013, Yield design, ISTE Ltd, London.

2.2 Additional Readings

1.	Shabana AA 2012, Computational continuum mechanics, 2nd edn, Cambridge University Press, Cambridge.