CA8025: ELASTICITY

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Elasticity

Subject Code
CA - Civil and Architectural Engineering
Course Number
8025

Academic Unit
Architecture and Civil Engineering (CA)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Additional Information
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.

Part II Course Details

Abstract

The course intends to provide students with knowledge on Linear-elastic fracture mechanics, fundamental concepts of viscoelasticity with applications, elastic-viscoelastic analogies, variational principles, thick-walled cylinders under pressure and vibration of bars, plates and shells.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	learn and discover fundamental principles of elastic solids to analyze and design structural members under axial load, shear load, bending moment and torsional moment	25	x		
2	model and analyze the elastic behavior of structural components subjected to various loading and support conditions based on principles of equilibrium and material constitutional relationships	25		x	
3	discover appropriate approximate solutions in linear elasticity to solve practical boundary-value problems of structures	25		x	
4	discover the advanced topics in elastic dynamics, viscoelasticity with applications, variation principles, thickwalled cylinders under pressure, propagation of viscoelastic waves, nonlinear viscoelastic stress-strain laws, creep rupture, and nonlinear analysis of plates and shells	25		x	

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 real-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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Address the basic principles and theories for elastic plates and shells.	1, 2, 3, 4	2 hours/week

2	Tutorial	Explain how to get the solutions of elastic plates and shells.	1, 2, 3, 4	1 hour/week

Additional Information for LTAs

Semester Hours: 3 hours per week

Lecture/Tutorial/Laboratory Mix: Lecture (2); Tutorial (1); Laboratory (0)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignment	1, 2, 3, 4	30	
2	Mid-term test	2	20	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

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%

Assessment Rubrics (AR)

Assessment Task

Assignment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

ABILITY to USE suitable techniques to solve an engineering problem.

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Mid-term test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
ABILITY to APPLY the basic principle and the scientific techniques in solving the Elastic problems of structures.

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
CAPACITY to UNDERSTAND the mathematical theories and USE them in solving an engineering problem.

Excellent
(A+, A, A-) High

Good
(B+, B, B-) Significant

Fair
(C+, C, C-) Moderate

Marginal
(D) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Assignment (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
ABILITY to USE suitable techniques to solve an engineering problem.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Mid-term test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
ABILITY to APPLY the basic principle and the scientific techniques in solving the Elastic problems of structures.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
CAPACITY to UNDERSTAND the mathematical theories and USE them in solving an engineering problem.

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus
Linear-elastic fracture mechanics: Introduction, Griffith's approach, Stress intensity factor, and Energy release rate; finite-element method for two- and three-dimensional boundary-value problems in linear elasticity; fundamental concepts of viscoelasticity with applications: elastic-viscoelastic analogies, creep and relaxation functions, Poisson's ratio, thermomechanical reciprocity relations, variational principles, model fitting, shear center motion, thick-walled cylinders under pressure and inertia loads with material annihilation, sandwich plates, propagation of viscoelastic waves, vibration

of bars, plates and shells, nonlinear elastic-viscoelastic analogy, properties of nonlinear viscoelastic stress-strain laws, creep rupture, and torsion of nonlinear bars and shells.

Reading List

Compulsory Readings

	Title
1	Gould, PL 2013, Introduction to linear elasticity, 3rd edn Springer, New York.
2	Bhavikatti, SS 2012, Theory of plates and shells, New Age International, New Delhi.

Additional Readings

	Title
1	Thomas, JR, Hughes & Hinton, E 1986, Finite element methods for plate and shell structures, Pineridge, Swansea.