

CA8027: FINITE ELEMENT ANALYSIS

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Finite Element Analysis

Subject Code

CA - Civil and Architectural Engineering

Course Number

8027

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 basic principle of finite element method and its application to truss and frame structures, heat conduction, and linear elasticity; use of application software; overview of advanced topics such as structural dynamics, fluid flow, and nonlinear structural analysis.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	learn and discover fundamental principles of finite element to analyze and design structural members under axial load, shear load, bending moment and torsional moment	25	x		
2	establish finite element model for structural analysis	25		x	
3	discover appropriate finite element model in linear elasticity to solve practical boundary-value problems of structures	25		x	
4	discover the advanced topics in elastic dynamics, variation principles, thick-walled cylinders, 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 Finite Element Method	1, 2, 3, 4	2 hours/week
2	Tutorial	Explain how to use commercial software for structural analysis	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 (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

ABILITY to USE commercial software to solve an engineering problem.

Excellent

(A+, A, A-): High

Good

(B+, B, B-): Significant

Fair

(C+, C, C-): Moderate

Marginal

(D): Marginal

Failure

(F): Not even reaching marginal levels

Assessment Task

Mid-term test (Applicable to 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 plate and shell 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 (Applicable to 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 (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

ABILITY to USE commercial software 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 (Applicable to 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 plate and shell 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 (Applicable to 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

The finite element method and its application to engineering problems: truss and frame structures, heat conduction, and linear elasticity; use of application software; overview of advanced topics such as structural dynamics, fluid flow, and nonlinear structural analysis.

Reading List**Compulsory Readings**

Title	
1	Thomas, JR, Hughes & Hinton, E 1986, Finite element methods for plate and shell structures, Pineridge, Swansea.
2	Zienkiewicz, OC, Taylor, RL & Zhu, JZ 2013, Finite element method: its basis and fundamentals, 7th edn, Butterworth-Heinemann, Oxford.

Additional Readings

Title	
1	Moaveni S 2015, Finite element analysis: theory and application with Ansys, 4th edn, Pearson Education, Harlow.