

CA8018: MODELLING AND COMPUTATIONAL TECHNIQUES

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Modelling and Computational Techniques

Subject Code

CA - Civil and Architectural Engineering

Course Number

8018

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

CA8022 Research Methodology and Ethics

Students must have attempted (including class attendance, coursework submission, and examination) the precursor course(s) so identified.

Equivalent Courses

BC8018 Modelling and Computational Techniques for Built Environment

Exclusive Courses

Nil

Part II Course Details

Abstract

The course provides the knowledge about the theories and computer implementations of the modeling and computational techniques. It allows students to appreciate the application of computational techniques to model problems in engineering research and the use of commercial software packages.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	understand and apply the modeling techniques and computer software packages to solve problems related to engineering researches,		x	x	x
2	discover and explain the properties of different modelling techniques,		x	x	x
3	explore the significance and limitations of empirical approach, and the use of simulation models for engineering research problems.		x	x	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	Lectures and class Tests understand and apply Finite element method, finite difference method, finite volume method, numerical optimization algorithm, system dynamics, Artificial Neural Network (ANN), fuzzy logic	1, 2, 3	27
2	Presentation Assignment Presentations	1, 2	12

Additional Information for LTAs

Semester Hours: - hours per week

Lecture/Tutorial/Laboratory Mix:

- Lecture (Mixed); Tutorial (Mixed); Laboratory (Mixed)

- 39 contact hours

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?
1	Assignments	1, 2, 3	50	-	Yes
2	Class Tests	1, 2, 3	30	-	Yes
3	Presentation	1, 2	20	-	Yes

Continuous Assessment (%)

100

Examination (%)

0

Minimum Continuous Assessment Passing Requirement (%)

40

Minimum Examination Passing Requirement (%)

0

Assessment Rubrics (AR)**Assessment Task**

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

Criterion

Ability to appreciate CILO 1 to 3

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Low

Assessment Task

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

Criterion

Ability to appreciate CILO 1 to 3

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Low

Assessment Task

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

Criterion

Ability to appreciate CILO 1 to 2

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Low

Assessment Task

Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to appreciate CILO 1 to 3

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Class Tests (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to appreciate CILO 1 to 3

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Presentation (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Ability to appreciate CILO 1 to 2

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

Finite element method, finite difference method, finite volume method, numerical optimization algorithm, system dynamics, Artificial Neural Network (ANN), fuzzy logic.

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	Reddy, J.N. (2005) An Introduction to the Finite Element Method, third edition
2	Stasa, F.L. (1995) Applied finite element analysis for engineers

3	Epton, J. (1994) Expert System and Optimisation, Aldershot, Hants, England, Avebury Technical.
4	Harvey, R.L., (1994) Neural Network Principles, Englewood Cliffs, Prentice Hall.
5	Stauffer, D. (1993) Computer Simulation and Computer Algebra: Lectures for Beginners, 3rd Edition, Berlin, Springer-Verlag.
6	Coyle R.G. (1996) System Dynamics Modeling: A Practical Approach, Chapman & Hall, London.