CA8018M: MODELLING AND COMPUTATIONAL TECHNIQUES

Effective Term
Semester A 2026/27

Part I Course Overview

Course Title
Modelling and Computational Techniques

Subject Code
CA - Civil and Architectural Engineering
Course Number
8018M

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
CA8022M Research Methodology and Ethics
Students must have attempted (including class attendance, coursework submission, and examination) the precursor course(s) so identified.

Equivalent Courses
BC8018M 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 researches 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 (intensive teaching)

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	-	No
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) Not even reaching marginal levels

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) Not even reaching marginal levels

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) Not even reaching marginal levels

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.