

# CA5018: MODELLING AND COMPUTATIONAL TECHNIQUES FOR BUILT ENVIRONMENT

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## Effective Term

Semester B 2024/25

## Part I Course Overview

### Course Title

Modelling and Computational Techniques for Built Environment

### Subject Code

CA - Civil and Architectural Engineering

### Course Number

5018

### Academic Unit

Architecture and Civil Engineering (CA)

### College/School

College of Engineering (EG)

### Course Duration

One Semester

### Credit Units

3

### Level

P5, P6 - Postgraduate Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

Nil

### Equivalent Courses

BC5018 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 built environment and the use of commercial software packages.

### Course Intended Learning Outcomes (CILOs)

| CILOs |                                                                                                                                    | Weighting (if DEC-A1 app.) |  | DEC-A2 | DEC-A3 |
|-------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--|--------|--------|
| 1     | Understand and apply the modeling techniques and computer software packages to solve problems related to engineering researches    |                            |  |        |        |
| 2     | Discover and explain the properties of different modeling techniques                                                               |                            |  | x      |        |
| 3     | Explore the significance and limitations of empirical approach, and the use of simulation models for engineering research problems |                            |  |        |        |

#### 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 the modeling techniques and computer software packages to solve problems related to engineering researches, the properties of different modeling techniques, Explore the significance and limitations of empirical approach, and the use of simulation models for engineering research problems | 1, 2, 3  |                            |
| 2    | Tutorials                | Tutorials to assistant teaching sessions for above                                                                                                                                                                                                                                                                   | 1, 2, 3  |                            |

### 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 (e.g. Parameter for GenAI use) |
|-----|-------------|----------|---------------|----------------------------------------|
| 1   | Assignments | 1, 2, 3  | 30            |                                        |
| 2   | Class tests | 1        | 20            |                                        |

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

3

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

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

Criterion

Ability to appreciate and apply 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 (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to appreciate CILO 1

Excellent

(A+, A, A-) High

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(B+, B, B-) Significant

**Fair**

(C+, C, C-) Moderate

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**Failure**

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**Assessment Task**

Examination (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

**Criterion**

Ability to appreciate and apply CILO 1 to 3

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(A+, A, A-) High

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(C+, C, C-) Moderate

**Marginal**

(D) Basic

**Failure**

(F) Not even reaching marginal levels

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**Assessment Task**

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

**Criterion**

Ability to appreciate and apply 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

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**Assessment Task**

Class tests (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Ability to appreciate CILO 1

**Excellent**

(A+, A, A-) High

**Good**

(B+, B) Significant

**Marginal**

(B-, C+, C) Basic

**Failure**

(F) Not even reaching marginal levels

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**Assessment Task**

Examination (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

**Criterion**

Ability to appreciate and apply 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

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## 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.                                   |