



# Unit Outline (Higher Education)

**Institute / School:** Institute of Innovation, Science & Sustainability

**Unit Title:** MODELLING AND SIMULATION IN ENGINEERING

**Unit ID:** ENPGG9102

**Credit Points:** 15.00

**Prerequisite(s):** Nil

**Co-requisite(s):** Nil

**Exclusion(s):** (ENGRG9101)

**ASCED:** 030999

**Description of the Unit:**

This unit introduces students to modeling and simulation techniques in engineering. Students learn to represent real-world systems mathematically, simulate their behavior, and interpret results. Through practical exercises, students gain skills in using modeling tools to solve engineering problems and optimize designs.

**Grade Scheme:** Graded (HD, D, C, P, MF, F, XF)

**Work Experience:**

No work experience: Student is not undertaking work experience in industry.

**Placement Component:** No

**Supplementary Assessment:** Yes

Where supplementary assessment is available a student must have failed overall in the Unit but gained a final mark of 45 per cent or above, has completed all major assessment tasks (including all sub-components where a task has multiple parts) as specified in the Unit Description and is not eligible for any other form of supplementary assessment

**Course Level:**

Level of Unit in Course	AQF Level of Course					
	5	6	7	8	9	10
Introductory	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intermediate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Advanced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### Learning Outcomes:

On successful completion of the unit the students are expected to be able to:

#### Knowledge:

- K1.** Appraise different types of modelling techniques used in engineering and their limitations
- K2.** Describe the basic principles and methodologies of modeling and simulation.
- K3.** Recognize the limitations and assumptions associated with modeling and simulation approaches.

#### Skills:

- S1.** Develop mathematical models to represent engineering problems and apply engineering techniques to solve them.
- S2.** Use engineering simulation software to implement and analyze models.
- S3.** Assess and justify the reliability of simulated results obtained from engineering simulations.
- S4.** Analyze simulation results to draw conclusions and make informed decisions.

#### Application of knowledge and skills:

- A1.** Design and develop engineering models to solve specific problems or optimize designs.
- A2.** Integrate modeling and simulation techniques into engineering projects
- A3.** Evaluate the effectiveness of modeling and simulation in improving engineering processes and outcomes.
- A4.** Propose innovative solutions based on insights gained from modeling and simulation analyses.

#### Unit Content:

Topics may include:

- Introduction to computer modelling and simulation
- Finite element formulation for one-dimensional potential-based problems
- Finite element formulation for two-dimensional potential-based problems
- Application of energy principles in the finite element method: truss elements & beam elements
- Finite element formulation for continuum problems in elasticity
- Isoparametric finite element formulation
- Modelling issues in finite element simulations
- Application of finite-element software/programming in engineering

#### Learning Task and Assessment:

Learning Outcomes Assessed	Assessment Tasks	Assessment Type	Weighting
K2, K3, S1	Engagement in all learning activities including attendance and participation in classes, exercises, recommended and supplementary readings and other activities as suggested.	Combination of Quizzes or Class test or Assessed tutorials or Written Test or Written Examination or Oral Test or Oral Exam	50% - 60%
K1, S2, S3, S4, A1, A2, A3, A4	Undertake literature review of current trends in computer modelling. Apply engineering analysis software or algorithms to solve complex engineering problems.	Written report and presentation	50% - 70%

**Adopted Reference Style:**

IEEE

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