# Unit Outline (Higher Education)

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|---|---|
| **Institute / School:** | Institute of Innovation, Science & Sustainability |
| **Unit Title:** | Modelling and Simulation in Engineering |
| **Unit ID:** | ENGRG9101 |
| **Credit Points:** | 15.00 |
| **Prerequisite(s):** | (MATHS2100 or ENGRG2301) or (enrolled in EZ9 Master of Engineering Technology degree) |
| **Co-requisite(s):** | Nil |
| **Exclusion(s):** | (ENGIN5302) |
| **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 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Intermediate | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

| Level of Unit in Course | AQF Level of Course | | | | | |
|---|---|---|---|---|---|---|
| | 5 | 6 | 7 | 8 | 9 | 10 |
| Advanced | | | | | ✔ | |

## 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% |

| Learning Outcomes Assessed | Assessment Tasks | Assessment Type | Weighting |
|---|---|---|---|
| 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

Refer to the library website for more information

Fed Cite - referencing tool