



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

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Learning Outcomes:

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:

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

FEDTASKS

Federation University Federation recognises that students require key transferable employability skills to prepare them for their future workplace and society. FEDTASKS (**T**ransferable **A**tttributes **S**kills and **K**nowledge) provide a targeted focus on five key transferable Attributes, Skills, and Knowledge that are embedded within curriculum, developed gradually towards successful measures and interlinked with cross-discipline and Co-operative Learning opportunities. *One or more FEDTASK, transferable Attributes, Skills or Knowledge must be evident in the specified learning outcomes and assessment for each FedUni Unit, and all must be directly assessed in each Course.*

FEDTASK attribute and descriptor		Development and acquisition of FEDTASKS in the Unit	
		Learning Outcomes (KSA)	Assessment task (AT#)
FEDTASK 1 Interpersonal	Students at this level will demonstrate an advanced ability in a range of contexts to effectively communicate, interact and work with others both individually and in groups. Students will be required to display high level skills in-person and/or online in: <ul style="list-style-type: none"> • Using and demonstrating a high level of verbal and non-verbal communication • Demonstrating a mastery of listening for meaning and influencing via active listening • Demonstrating and showing empathy for others • High order skills in negotiating and conflict resolution skills • Demonstrating mastery of working respectfully in cross-cultural and diverse teams. 	Not applicable	Not applicable
FEDTASK 2 Leadership	Students at this level will demonstrate a mastery in professional skills and behaviours in leading others. <ul style="list-style-type: none"> • Creating and sustaining a collegial environment • Demonstrating a high level of self-awareness and the ability to self-reflect and justify decisions • Inspiring and initiating opportunities to lead others • Making informed professional decisions • Demonstrating initiative in new professional situations. 	Not applicable	Not applicable
FEDTASK 3 Critical Thinking and Creativity	Students at this level will demonstrate high level skills in working in complexity and ambiguity using the imagination to create new ideas. Students will be required to display skills in: <ul style="list-style-type: none"> • Reflecting critically to generate and consider complex ideas and concepts at an abstract level • Analysing complex and abstract ideas, concepts and information • Communicate alternative perspectives to justify complex ideas • Demonstrate a mastery of challenging conventional thinking to clarify complex concepts • Forming creative solutions in problem solving to new situations for further learning. 	Not applicable	Not applicable
FEDTASK 4 Digital Literacy	Students at this level will demonstrate the ability to work competently across a wide range of tools, platforms and applications to achieve a range of tasks. Students will be required to display skills in: <ul style="list-style-type: none"> • Mastering, exploring, evaluating, managing, curating, organising and sharing digital information professionally • Collating, managing complex data, accessing and using digital data securely • Receiving and responding professionally to messages in a range of professional digital media • Contributing competently and professionally to digital teams and working groups • Participating at a high level in digital learning opportunities. 	Not applicable	Not applicable
FEDTASK 5 sustainable and Ethical Mindset	Students at this level will demonstrate a mastery of considering and assessing the consequences and impact of ideas and actions in enacting professional ethical and sustainable decisions. Students will be required to display skills in: <ul style="list-style-type: none"> • Demonstrate informed judgment making that considers the impact of devising complex solutions in ambiguous global economic environmental and societal contexts • Professionally committing to the promulgation of social responsibility • Demonstrate the ability to evaluate ethical, socially responsible and/or sustainable challenges and generating and articulating responses • Communicating lifelong, life-wide and life-deep learning to be open to the diverse professional others • Generating, leading and implementing required actions to foster sustainability in their professional and personal life 	Not applicable	Not applicable

Learning Task and Assessment:

Learning Outcomes Assessed	Assessment Tasks	Assessment Type	Weighting
K2, K3, S1	Undertake simple analysis of mechanical and structural systems modelled by finite element method. Articulate solution procedure through written/oral means.	Quizzes and/or Tests	30% - 50%
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](#)