

Unit Outline (Higher Education)

Institute / School: Institute of Innovation, Science & Sustainability

Unit Title: Modelling Continuous Change (Advanced)

Unit ID: MATHS3016

Credit Points: 15.00

Prerequisite(s): (MATHS1001)

Co-requisite(s): Nil

Exclusion(s): (MATHS2016)

ASCED: 010101

Description of the Unit:

This unit forms part of a general sequence of mathematics units which provides mathematical tools to model phenomena in the physical, engineering, biological and mathematical sciences. It is aimed at an audience with sound mathematical background and interest in solving real world problems. The main focus will be on differential equations, the tools to solve them, and their applications to model motion, growth and change. We will also consider problems whose solution may require both basic and advanced mathematics or statistics techniques. The unit will be particularly valuable to science and engineering students, prospective senior secondary school mathematics teachers, and any student interested in improving their understanding of these commonly encountered concepts and applications of mathematics.

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	■	■	■	■	■	■
Advanced	■	■	✓	■	■	■

Learning Outcomes:

Knowledge:

- K1.** Recognise common principles in a variety of real-life applications of mathematical modelling.
- K2.** Describe how mathematics can model phenomena in nature and science.
- K3.** Describe important concepts of advanced mathematics, including ordinary differential equations.
- K4.** Recognise the importance of rigour and structure when solving mathematics problems.

Skills:

- S1.** Classify and identify different types of differential equations.
- S2.** Apply various methods of solutions for solving advanced ordinary differential equations, systems of ordinary differential equations and partial differential equations.
- S3.** Calculate approximate solutions of differential equations using numerical methods.
- S4.** Use basic statistical concepts and hypothesis testing to solve problems in science and engineering.
- S5.** Utilise MATLAB to assist in the solution and investigation of problems.

Application of knowledge and skills:

- A1.** Formulate advanced problems in science and engineering as mathematical problems involving concepts such as ordinary differential equations, systems of ordinary differential equations and partial differential equations.
- A2.** Analyse and interpret results produced by a mathematical model in the context of differential equations.

Unit Content:

Topics may include:

- Ordinary differential equations.
- Systems of differential equations.
- Partial differential equations.
- Applications of differential equations.
- Mathematical modelling of problems in science and engineering.
- Introduction of advanced concepts and techniques from mathematics or statistics to solve mathematical models.

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 will demonstrate the ability to effectively communicate, inter-act and work with others both individually and in groups. Students will be required to display skills in-person and/or online in: <ul style="list-style-type: none"> Using effective verbal and non-verbal communication Listening for meaning and influencing via active listening Showing empathy for others Negotiating and demonstrating conflict resolution skills Working respectfully in cross-cultural and diverse teams. 	Not applicable	Not applicable
FEDTASK 2 Leadership	Students will demonstrate the ability to apply professional skills and behaviours in leading others. Students will be required to display skills in: <ul style="list-style-type: none"> Creating a collegial environment Showing self-awareness and the ability to self-reflect Inspiring and convincing others Making informed decisions Displaying initiative 	Not applicable	Not applicable
FEDTASK 3 Critical Thinking and Creativity	Students will demonstrate an ability to work 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 Evaluating ideas, concepts and information Considering alternative perspectives to refine ideas Challenging conventional thinking to clarify concepts Forming creative solutions in problem solving. 	K1-K4, S1-S5, A1-A2	A1, A2
FEDTASK 4 Digital Literacy	Students will demonstrate the ability to work fluently across a 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"> Finding, evaluating, managing, curating, organising and sharing digital information Collating, managing, accessing and using digital data securely Receiving and responding to messages in a range of digital media Contributing actively to digital teams and working groups Participating in and benefiting from digital learning opportunities. 	S5	A1
FEDTASK 5 Sustainable and Ethical Mindset	Students will demonstrate the ability to consider and assess the consequences and impact of ideas and actions in enacting ethical and sustainable decisions. Students will be required to display skills in: <ul style="list-style-type: none"> Making informed judgments that consider the impact of devising solutions in global economic environmental and societal contexts Committing to social responsibility as a professional and a citizen Evaluating ethical, socially responsible and/or sustainable challenges and generating and articulating responses Embracing lifelong, life-wide and life-deep learning to be open to diverse others 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
K1-K4, S1-S5, A1-A2	A range of tasks and problems explored individually or in groups to support the understanding of the content and the development of skills and knowledge throughout the unit.	Assignments/Projects/Presentations	40%-60%
K1-K4, S1-S4	Weekly or fortnightly quizzes to promote consolidation of concepts throughout the semester	Quizzes	10%
K1-K4, S1-S5	A test and/or examination on any part of or all the material covered in the unit.	Test(s)/examination(s)	30%-50%

Adopted Reference Style:

APA

Refer to the [library website](#) for more information

Fed Cite - [referencing tool](#)