UNSW College

Diploma of Engineering

Program Structure & Course Outlines

Program Structure

- The Diploma of Engineering comprises 8 courses taken over three terms of full-time study. Students must complete 48 Units of Credit (UOC). Each course is 6 UOC.
- DPCA1001, DPCA1002 and DPCA1003 are all one course delivered over 1- 3 terms.
- Pre-requisites must be satisfied before selecting any course within the program.
- A core course is one that must be satisfactorily completed to meet the requirements of the program.
- An elective course is one which must be completed to satisfactorily complete the program and, if relevant, specialisation.
- Students will study a mix of core course and prescribed electives depending on your specialisation.
- Below is sample of a two different Diploma of Engineering Programs.

Diploma of Engineering Sample Program 1

Courses for electrical, quantum and telecommunications engineering specialisation

Course Code	Course Title	UoC	Suggested Enrolment Term	Pre-requisites/ Co-requisites
DPCA1001	Communication and Academic Literacy 1	4	1	
DPMA1013	Mathematics 1A	6	1	
DPPH1023	Higher Physics 1A	6	1	DPMA1013 Mathematics 1A (*Co-requisite)*
DPCA1002	Communication and Academic Literacy 2	1	2	DPCA1001 Communication and Academic Literacy 1 (*Pre-requisite)*
DPMA1014	Mathematics 1B	6	2	DPMA1013 Mathematics 1A (*Pre-requisite)*
DPEG1071	Introduction to Engineering Design and Innovation	6	2 or 3	
DPCP1091	Introduction to Programming	6	2 or 3	
DPCA1003	Communication and Academic Literacy 3	1	3	DPCA1002 Communication and Academic Literacy 1 (*Pre-requisite)*
DPPH1024	Higher Physics 1B	6	2 or 3	DPPH1023 Higher Physics 1A (*Pre-requisite)* OR ≥ 60% in DPPH1021 Physics 1A (*Pre-requisite)*
DPEE1081	Electrical and Telecommunications Engineering	6	2 or 3	

Diploma of Engineering Sample Program 2

Courses for chemical engineering or chemical product engineering specialisation

Course Code	Course Title	UoC	Suggested Enrolment Term	Pre-requisites/ Co-requisites
DPCA1001	Communication and Academic Literacy 1	4	1	
DPMA1013	Mathematics 1A	6	1	
DPPH1021	Physics 1A	6	1	DPMA1013 Mathematics 1A (*Co-requisite)*
DPCA1002	Communication and Academic Literacy 2	1	2	DPCA1001 Communication and Academic Literacy 1 (*Pre-requisite)*
DPMA1014	Mathematics 1B	6	2	DPMA1013 Mathematics 1A (*Pre-requisite)*
DPEG1071	Introduction to Engineering Design and Innovation	6	2 or 3	
DPCP1091	Introduction to Programming	6	2 or 3	
DPCA1003	Communication and Academic Literacy 3	1	3	DPCA1002 Communication and Academic Literacy 1 (*Pre-requisite)*
DPCH1031	Chemistry A: Atoms, Molecules and Energy	6	2 or 3	
DPCH1032	Chemistry B: Elements, Compounds and Life	6	3	DPMA1031 Chemistry A: Atoms, Molecules and Energy (*Pre-requisite)*

Course Outlines

Course Outline Quick Links
DPMA1013 Mathematics 1A
DPMA1014 Mathematics 1B
DPPH1021 Physics 1A
DPPH1023 Higher Physics 1A
DPPH1022 Physics 1B
DPPH1024 Higher Physics 1B
DPEG1071 Introduction to Engineering Design and Innovation
DPCP1091 Introduction to Programming
DPEE1081 Electrical and Telecommunications Engineering
DPCP1092 Computer Systems Fundamentals
DPCH1031 Chemistry 1A
DPCH1032 Chemistry 1B
DPBA1051 Molecules, Cells and Genes
DPEG1072 Engineering Mechanics 1
DPMS1061 Design and Application of Materials in Science and Engineering
DPCA1001-3 Communication and Academic Literacy

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DPMA1013 Mathematics 1A

Course Description

This course will provide you with a good working knowledge of Calculus and Linear Algebra and will show you how these topics can be applied in interdisciplinary contexts. You will see analytical thinking and problem-solving demonstrated in lectures, and you will have an opportunity to develop your analytical thinking and problem-solving skills in tutorial classes. This course will enhance your ability to solve problems using logical arguments and techniques, which are generic skills that can be applied in multidisciplinary work. The course will also engage you in independent and reflective learning through your homework problems and the Maple computing package. You are encouraged to develop your communication skills through active participation in tutorials, and by writing clear, logical arguments when solving problems.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: State definitions as specified in the syllabus.

CLO2: State and prove appropriate theorems.

CLO3: Explain how a theorem relates to specific examples.

CLO4: Apply the concepts and techniques of the syllabus to solve appropriate problems.

CLO5: Prove specific and general results given specified assumptions.

CLO6: Use mathematical and other terminology appropriately to communicate information and understanding.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
7 hours (2 x 2hrs lectures, 2 x 1.5 hrs tutorials)	7 hours	14 hours

Topics included in the Course

Algebra

1. Introduction to Vectors
2. Vector Geometry
3. Complex Numbers
4. Linear Equations and Matrices
5. Matrices

Calculus

1. Sets, inequalities and functions
2. Limits
3. Properties of continuous functions
4. Differentiable functions
5. The mean value theorem and applications
6. Inverse functions
7. Curve sketching
8. Integration
9. Logarithms and exponentials
10. Hyperbolic functions

Computing

1. Getting Started – Maple
2. The Basics- Arithmetic operations; Brackets; Constants and variables
3. Functions
4. Basic Calculus
5. Collections of Expressions
6. Complex Numbers and Equations
7. Plotting
8. Linear Algebra

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Class tests Two Algebra and two Calculus tests, each covering 2-3 topics and of 35 mins duration.	Year 1, Term 1, Weeks 5, 6, 10, 11	24%	CLO1-6
2. Mobius online tutorials Each covers 4 sets of questions on Algebra / Calculus and one question on Maple, an unlimited number of attempts within 2 weeks, best 8 scores of the 11 quizzes count.	Year 1, Term 1, Weekly	12%	CLO1-6
3. Maple laboratory test Testing knowledge/use of Maple, 40 min.	Year 1, Term 1, Week 12	4%	CLO4, CLO6
4. Assignment Testing Math's writing skills through detailed explanations to 3 different questions, typeset using Equation Editor.	Year 1, Term 1, released in Week 6 and due in Week 10	10%	CLO1-6
5. Final Exam Duration of 2.5h, split into an Algebra and Calculus part.	Year 1, Term 1, Exam Period	50%	CLO1-6

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DPMA1014 Mathematics 1B

Course Description

This course will provide you with a good working knowledge of Calculus and Linear Algebra, and it will show you how these topics can be applied in interdisciplinary contexts. The illustrative examples used in lectures and the problem-based tutorial classes will help you to further develop and improve your analytical thinking and problem-solving skills. Based on logical arguments and specific techniques, these problem-solving skills are generic and can be applied in multidisciplinary work. The course will also encourage you to develop your communication skills through active participation in tutorials, and by writing clear, logical arguments when solving problems.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: State definitions as specified in the syllabus.

CLO2: State and prove appropriate theorems.

CLO3: Explain how a theorem relates to specific examples.

CLO4: Apply the concepts and techniques of the syllabus to solve appropriate problems.

CLO5: Prove specific and general results given specified assumptions.

CLO6: Use mathematical and other terminology appropriately to communicate information and understanding.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
7 hours (2 x 2hrs lectures, 2x 1.5 hrs tutorials)	7 hours	14 hours

Topics included in the Course

Algebra

1. Vector spaces
2. Linear Transformations
3. Eigenvalues and Eigenvectors
4. Probability and Statistics

Calculus

1. Functions of several variables
2. Integration techniques
3. Ordinary differential equations
4. Taylor series
5. Application of integration

Computing

1. Application of integration
2. Further calculus
3. Further linear algebra
4. Geometry
5. Programming in Maple

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. **Class tests** Two Algebra and two Calculus tests, each covering 1-2 topics and of 35 mins duration.	Year 1, Term 2, Weeks 5, 6, 10, 11	24%	CLO1-6

Assessment Tasks

2. Mobius online tutorials Each covers 4 questions on Algebra/Calculus and one question on Maple, an unlimited number of attempts within 2 weeks, best 8 scores of the 12 quizzes count.	Year 1, Term 2, Weekly	12%	CLO1-6
3. Maple laboratory test Testing knowledge/use of Maple, 40 min.	Year 1, Term 2, Week 12	4%	CLO4, CLO6
4. Assignment Testing Math's writing skills through detailed explanations to 3 different questions, typeset using Equation Editor.	Year 1, Term 2, released in Week 6 and due in Week 10	10%	CLO1-6
5. Final Exam Duration of 2.5h, split into an Algebra and Calculus part.	Year 1, Term 2, Exam Period	50%	CLO1-6

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DPPH1021 Physics 1A

Course Description

This course builds on elementary knowledge of physics (Year 12 physics or equivalent). It introduces mechanics, thermal physics, waves, and the techniques of analysis and problem-solving in the physical world. Students will develop their ability to use mathematics and fundamental physical concepts to solve problems related to the world around them. It is a calculus-based course where concepts and principles are learned in context, by example, and then developed through practice solving problems. Throughout the course, the skills of problem-solving are refined by learning when and how to apply different principles of physics, mathematics and other relevant tools. Students are encouraged to develop their communication skills through active participation in tutorials and laboratory exercises. This course is examined at two levels, with DPPH1021 being the lower and DPPH1023 being the higher of the two levels.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Analyse motion in two dimensions using vectors. Apply Newton's laws of motion to objects undergoing uniform translational or rotational acceleration.

CLO2: Analyse problems involving friction and the forces and deformations described by Hooke's law.

CLO3: Explain the difference between kinetic and potential energy and use the law of conservation of energy and the work-energy theorem to solve mechanics problems.

CLO4: Apply the conservation laws of momentum and energy to solve mechanics problems, including problems involving collisions, extended objects and their centers of mass.

CLO5: Apply the law of universal gravitation in combination with other laws covered in this course to describe, predict and explain the motion of satellites, planets, stars and galaxies.

CLO6: Explain how energy conservation is related to the first law of thermodynamics. Apply the first law to solve problems.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO7: Recognise and solve problems relating to different thermodynamic processes, including adiabatic, isothermal, isobaric and isovolumetric processes. For cyclic processes, calculate changes in internal energy, work done and heat transferred in cycles.

CLO8: Describe different heat transfer mechanisms and calculate the amount of heat transferred in different processes.

CLO9: Identify physical systems that can be understood using models of simple harmonic oscillation and write down equations to describe this motion.

CLO10: Write down and solve equations describing wave motion, and use these equations to explain physical phenomena such as (but not limited to) standing waves and interference.

CLO11: Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
8 hours (3 x 1hr lectures, 2 x 1 hr tutorials, 1 hr workshop, 2 hrs Lab (8 labs total))	8 hours	16 hours

Topics included in the Course

Mechanics

1. Motion along a straight
2. Vectors
3. Motion in two and three dimensions
4. Force and motion
5. Work and energy
6. Centre of mass and linear
7. Rotation and torque
8. Gravitation

Thermal Physics

1. Temperature
2. Kinetic theory of gases
3. Heat and the first law of

Waves

1. Oscillations
2. Wave motion
3. Sound waves

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Term Test 1 Covers all of the Mechanics.	Week 8	10%	CLO1-11
2. Term Test 2 Covers all of Thermal Physics and Oscillations.	Week 13	10%	CLO1-11
3. Online Quizzes 6 quizzes each with an unlimited number of attempts, and the best score counts.	Starting week 2; approximately every 2 weeks	10%	CLO1-11
4. Laboratory Work 8 laboratory exercises.	Starting week 3; approximately every week.	20%	CLO11
5. Final Exam	Exam period of the relevant term	50%	CLO1-11

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DPPH1023 Higher Physics 1A

Course Description

This course builds on elementary knowledge of physics (Year 12 physics or equivalent). It gives an introduction to mechanics, thermal physics, waves, and the techniques of analysis and problem-solving in the physical world. Students will develop their ability to use mathematics and fundamental physical concepts to solve problems related to the world around them. It is a calculus-based course where concepts and principles are learned in context, by example, and then developed through practice solving problems. Throughout the course, the skills of problem-solving are refined by learning when and how to apply different principles of physics, mathematics and other relevant tools. Students are encouraged to develop their communication skills through active participation in tutorials and laboratory exercises. This course is examined at two levels, with DPPH1021 being the lower and DPPH1023 being the higher of the two levels.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Analyse motion in two dimensions using vectors. Apply Newton's laws of motion to objects undergoing uniform translational or rotational acceleration.

CLO2: Analyse problems involving friction and the forces and deformations described by Hooke's law.

CLO3: Explain the difference between kinetic and potential energy and use the law of conservation of energy and the work-energy theorem to solve mechanics problems.

CLO4: Apply the conservation laws of momentum and energy to solve mechanics problems, including problems involving collisions, extended objects and their centers of mass.

CLO5: Apply the law of universal gravitation in combination with other laws covered in this course to describe, predict and explain the motion of satellites, planets, stars and galaxies.

CLO6: Explain how energy conservation is related to the first law of thermodynamics. Apply the first law to solve problems.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO7: Recognise and solve problems relating to different thermodynamic processes, including adiabatic, isothermal, isobaric and isovolumetric processes. For cyclic processes, calculate changes in internal energy, work done and heat transferred in cycles.

CLO8: Describe different heat transfer mechanisms and calculate the amount of heat transferred in different processes.

CLO9: Identify physical systems that can be understood using models of simple harmonic oscillation and write down equations to describe this motion.

CLO10: Write down and solve equations describing wave motion, and use these equations to explain physical phenomena such as (but not limited to) standing waves and interference.

CLO11: Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
8 hours (3 x 1hr lectures, 2 x 1 hr tutorials, 1 hr workshop, 2 hrs Lab (8 labs total))	8 hours	16 hours

Topics included in the Course

Mechanics

1. Motion along a straight
2. Vectors
3. Motion in two and three dimensions
4. Force and motion
5. Work and energy
6. Centre of mass and linear
7. Rotation and torque
8. Gravitation

Thermal Physics
1 Temperature 2 Kinetic theory of gases 3 Heat and the first law of
Waves
1 Oscillations 2 Wave motion 3 Sound waves

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. **Term Test 1** Covers all of Mechanics.	Week 8	10%	CLO1-11
2. **Term Test 2** Covers all of Thermal Physics and Oscillations.	Week 13	10%	CLO1-11
3. **Online Quizzes** 6 quizzes each with an unlimited number of attempts, and the best score counts.	Starting week 2; approximately every 2 weeks	10%	CLO1-11
4. **Laboratory Practical's** 8 laboratory exercises.	Starting week 3; approximately every week.	20%	CLO11
5. **Final Exam**	Exam period of the relevant term	50%	CLO1-11

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DPPH1022 Physics 1B

Course Description

This course builds on the physics learnt in Physics/Higher Physics 1A to further develop an understanding of the mathematical description of the laws of nature. It gives an introduction to electromagnetism, physical optics, quantum physics, and the techniques of analysis and problem-solving in the physical world. Students will develop their ability to use mathematics and fundamental physical concepts to solve problems related to the world around them. It is a calculus-based course where concepts and principles are learned in context, by example, and then developed through practice solving problems. Throughout the course, the skills of problem-solving are refined by learning when and how to apply different principles of physics, mathematics and other relevant tools. Students are encouraged to develop their communication skills through active participation in tutorials and laboratory exercises. This course is examined at two levels, with DPPH1022 being the lower and DPPH1024 being the higher of the two levels.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Use Coulomb's law and Gauss's law to calculate electric fields for configurations of charges, use these electric fields to calculate electric potentials. Compare and contrast electric fields to gravitational fields covered in Physics/Higher Physics 1A.

CLO2: Be able to state the definition of capacitance and use this definition with equations for electric field and voltages to calculate the capacitance of different geometries.

CLO3: Calculate the electrostatic and magnetic fields produced by moving charges in a variety of configurations using the Laws of Biot-Savart and Ampère. Relate electric and magnetic fields using Faraday's law; use this to calculate induced currents and voltages.

CLO4: Use equations to describe and explain the properties of electromagnetic waves (such as wavelength, frequency, intensity, power and radiation pressure) and relate these to electric and magnetic fields and the speed of light.

CLO5: Use equations and diagrams to solve advanced problems about electromagnetic waves related to polarisation, interference and diffraction.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO6: Discuss and explain (qualitatively and quantitatively) the key observations and events that led to the development of quantum mechanics.

CLO7: Relate emission and absorption spectra to the energy change of electrons between states in an atom, calculate the energy levels of electrons in Hydrogen-like atoms, and relate this to quantum mechanical laws.

CLO8: Describe and explain the physics relating to modern devices and technologies including semiconductors, transistors, LEDs and solar cells.

CLO9: Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
8 hours (3 x 1hr lectures, 2 x 1 hr tutorials, 1 hr workshop, 2 hrs Lab (8 labs total))	8 hours	16 hours

Topics included in the Course

Electricity and Magnetism

1. Coulomb's law
2. Electric fields
3. Gauss's law
4. Electric potential
5. Capacitance
6. Magnetic fields
7. Magnetic fields due to currents
8. Induction and inductance

Physical Optics

1. Electromagnetic waves
2. Interference
3. Diffractions

Introductory Quantum Physics and Solid State Physics
1 Photons and matter waves 2 Conduction and electricity in solids

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Term Test 1 Covers all of Electricity and Magnetism.	Week 13	10%	CLO1-9
2. Term Test 2 Covers all of Physical Optics Introductory Quantum Physics and Solid State Physics.	Starting week 2; approximately every 2 weeks	10%	CLO1-9
3. Online Quizzes 6 quizzes each with an unlimited number of attempts, and the best score counts.	Starting week 3; approximately every week.	20%	CLO9
4. Laboratory Practical's 8 laboratory exercises.	Exam period of the relevant term	50%	CLO1-9
5. Final Exam	Week 13	10%	CLO1-9

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DPPH1024 Higher Physics 1B

Course Description

This course builds on the physics learnt in Physics/Higher Physics 1A to further develop an understanding of the mathematical description of the laws of nature. It gives an introduction to electromagnetism, physical optics, quantum physics, and the techniques of analysis and problem-solving in the physical world. Students will develop their ability to use mathematics and fundamental physical concepts to solve problems related to the world around them. It is a calculus-based course where concepts and principles are learned in context, by example, and then developed through practice solving problems. Throughout the course, the skills of problem-solving are refined by learning when and how to apply different principles of physics, mathematics and other relevant tools. Students are encouraged to develop their communication skills through active participation in tutorials and laboratory exercises. This course is examined at two levels, with DPPH1022 being the lower and DPPH1024 being the higher of the two levels.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Use Coulomb's law and Gauss's law to calculate electric fields for configurations of charges, use these electric fields to calculate electric potentials. Compare and contrast electric fields to gravitational fields covered in Physics/Higher Physics 1A.

CLO2: Be able to state the definition of capacitance and use this definition with equations for electric field and voltages to calculate the capacitance of different geometries.

CLO3: Calculate the electrostatic and magnetic fields produced by moving charges in a variety of configurations using the Laws of Biot-Savart and Ampère. Relate electric and magnetic fields using Faraday's law; use this to calculate induced currents and voltages.

CLO4: Use equations to describe and explain the properties of electromagnetic waves (such as wavelength, frequency, intensity, power and radiation pressure) and relate these to electric and magnetic fields and the speed of light.

CLO5: Use equations and diagrams to solve advanced problems about electromagnetic waves related to polarisation, interference and diffraction.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO6: Discuss and explain (qualitatively and quantitatively) the key observations and events that led to the development of quantum mechanics.

CLO7: Relate emission and absorption spectra to the energy change of electrons between states in an atom, calculate the energy levels of electrons in Hydrogen-like atoms, and relate this to quantum mechanical laws.

CLO8: Describe and explain the physics relating to modern devices and technologies including semiconductors, transistors, LEDs and solar cells.

CLO9: Recognise that physics is an experimental science, plan and conduct experiments and analyse the outcomes, and include reliable estimates of uncertainties in measurements.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
8 hours (3 x 1hr lectures, 2 x 1 hr tutorials, 1 hr workshop, 2 hrs Lab (8 labs total))	8 hours	16 hours

Topics included in the Course

Electricity and Magnetism

1. Coulomb's law
2. Electric fields
3. Gauss's law
4. Electric potential
5. Capacitance
6. Magnetic fields
7. Magnetic fields due to currents
8. Induction and inductance

Physical Optics

1. Electromagnetic waves
2. Interference
3. Diffractions

Introductory Quantum Physics and Solid State Physics

1. Photons and matter waves
2. Conduction and electricity in solids

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Term Test 1 Covers all of Electricity and Magnetism.	Week 8	10%	CLO1-9
2. Term Test 2 Covers all of Physical Optics Introductory Quantum Physics and Solid State Physics.	Week 13	10%	CLO1-9
3. Online Quizzes 6 quizzes each with an unlimited number of attempts, and the best score counts.	Starting week 2; approximately every 2 weeks	10%	CLO1-9
4. Laboratory Practical's 8 laboratory exercises.	Starting week 3; approximately every week.	20%	CLO9
5. Final Exam	Exam period of the relevant term	50%	CLO1-9

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DPEG1071 Introduction to Engineering Design and Innovation

Course Description

In this course, students will experience one of the major things that engineers do: designing and building creative solutions to problems. They will learn to think the way that engineers think, coming up with good solutions to problems despite being limited by budget, time and resources, the requirement to also meet environmental and social objectives and of course the limitations of the laws of physics. This will help them to appreciate the central ideas of engineering design as an on-time, on-budget and fit-for-purpose solution to a poorly specified, open-ended problem. They will be assigned to a team to work over twelve weeks to solve a practical problem. The projects on offer change from year to year. In doing all this they will start to build key skills for engineers that will be called upon repeatedly in their academic and professional lives, including concept development, critical thinking and evaluation skills, clear communication, research and information literacy skills and the skills involved in successfully functioning within a team environment to complete a given task.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Demonstrate an understanding of the process of engineering design and the use of design methods for defining an open-ended design problem; generating alternative and innovative conceptual solutions; and evaluating these solutions.

CLO2: Understand the dynamics of collaborative teams and how to work effectively within a team to accomplish tasks within given deadlines.

CLO3: Understand the basic elements of project management and be able to plan and schedule work activities following standard practice.

CLO4: Be able to convey your thoughts and ideas effectively in an engineering design report.

CLO5: Become familiar with the tangible elements of design within a specific engineering discipline: demonstrate the effective use of the tools, equipment, and materials of the specific discipline; and recognize some basic engineering materials, devices and mechanisms which form the “building blocks” of much of the world’s machinery, circuitry, and engineering systems in general.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
7 hours (2 x 2hrs lectures, 1x 1hr tutorials, 1 x 2hrs Lab)	7 hours	14 hours

Topics included in the Course

The Engineering Design Process

1. Problem Statement
2. Pairwise Comparison Chart
3. Conceptual Design
4. Brainstorming Methods
5. Morph Chart
6. Concept Evaluation Methods

Project Management

1. Project Management
2. Risk Management
3. Technical drawings
4. Oral Presentations

Design Reports

1. Nodal Analysis
2. Super-node Concept
3. Mesh Analysis
4. Super-mesh Concept

Technical lectures

1. Introduction to Electronics
2. Diodes
3. Transistors
4. DC Motors, Electric Drive Circuits and Op Amps
5. Arduino Introduction
6. Sensors and Filtering Circuits

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. **Impromptu Design Writing Task** (Individual assessment, 400 words, 40 mins)	Week 1 of the term	5%	CLO1-5
2. **Problem Statement Presentation** (Individual assessment, 2 mins, 50:50 evaluated by Tutor and Peers)	Week 3 of the term	5%	CLO1-3
3. **Concept Generation Presentation** (Group assessment, 15 mins, 50:50 evaluated by Tutor and Peers)	Week 5 of the term	5%	CLO1-3
4. **Concept Generation Writing Task** (Individual assessment, 1 page)	Week 6 of the term	5%	CLO3-4
5. **Design Journal** (Individual assessment, Via OneNote)	Week 6 and 11 of the term	10%	CLO3-4
6. **Design Proposal** (Group assessment, 10 pages)	Week 8 of the term	10%	CLO1-4
7. **Compliance Testing** (Group assessment, Initial Performance check of design prototypes)	Week 9 of the term	10%	CLO1-5
8. **Final Testing** (Group assessment, Final Performance check of design prototypes)	Week 12 of the term	20%	CLO1-5
9. **Final Design Report** (Group 9% & Individual 21%)	Week 12 of the term	30%	CLO1-4
10. **Team Evaluation** (Used to moderate students' final marks and pick up non-cooperative team members)	Week 7 and 12 of the term	± 25%	CLO2

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DPCP1091 Introduction to Programming

Course Description

This course introduces students to the basics of programming. Topics covered include fundamental programming concepts, the C programming language and use of a C compiler, programming style, program design and organization concepts, program testing and debugging. The course does not assume any previous programming experience. The course aims for students to become proficient in programming using a high-level language, C. By the end of the course, students should be able to construct C programs to solve problems.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Understand the core syntax & semantics of the C programming language including types, I/O, arrays, functions, pointers, structs, file manipulation and dynamic memory allocation.

CLO2: Given a problem, solve it by proficiently constructing (designing, testing, debugging) a secure, reliable, and correct C program.

CLO3: Understand & employ fundamental data structures including stacks, queues and linked lists.

CLO4: Use Linux and Unix-like operating systems to develop and test software.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
8 hours (1 x 2hrs lectures, 2 x 1hr lectures, 1x 1 hr tutorials, 1 x 2hrs lab, 1 x 1hr lab)	8 hours	16 hours

Topics included in the Course

Unit 1: Introduction to course/Linux/C; data types; variables, simple I/O, expressions, If Statements
Unit 2: Structs, Loops and Code Style
Unit 3: Functions and Arrays
Unit 4: Memory and Pointers
Unit 5: Debugging, Strings, Character functions and multi-file projects
Unit 6: Dynamic memory allocation and extra C (for loops, pre/post increment, multi-file compilation), Linked Lists
Unit 7: Abstract Data Types, including stacks and queues
Unit 8: Recursion including recursion with linked lists

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. **Programming assignment** *(Arrays)*	Week 4 to week 7	15%	CLO1-2, CLO4
2. **Programming assignment** *(Linked data structures)*	Week 7 to week 12	25%	CLO1-4
3. **Lab exercises** *(The best 10 out of 11 will be taken)*	Throughout the semester every week	10%	CLO1-4
4. **Weekly Tests** *(The best 6 out of 7 will be taken)*	Week 4 to week 11	10%	CLO1-4
5. **Final Exam**	Exam period of the relevant term	40%	CLO1-4

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DPEG1071 Introduction to Engineering Design and Innovation

Course Description

In this course, students will experience one of the major things that engineers do: designing and building creative solutions to problems. They will learn to think the way that engineers think, coming up with good solutions to problems despite being limited by budget, time and resources, the requirement to also meet environmental and social objectives and of course the limitations of the laws of physics. This will help them to appreciate the central ideas of engineering design as an on-time, on-budget and fit-for-purpose solution to a poorly specified, open-ended problem. They will be assigned to a team to work over twelve weeks to solve a practical problem. The projects on offer change from year to year. In doing all this they will start to build key skills for engineers that will be called upon repeatedly in their academic and professional lives, including concept development, critical thinking and evaluation skills, clear communication, research and information literacy skills and the skills involved in successfully functioning within a team environment to complete a given task.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Demonstrate an understanding of the process of engineering design and the use of design methods for defining an open-ended design problem; generating alternative and innovative conceptual solutions; and evaluating these solutions.

CLO2: Understand the dynamics of collaborative teams and how to work effectively within a team to accomplish tasks within given deadlines.

CLO3: Understand the basic elements of project management and be able to plan and schedule work activities following standard practice.

CLO4: Be able to convey your thoughts and ideas effectively in an engineering design report.

CLO5: Become familiar with the tangible elements of design within a specific engineering discipline: demonstrate the effective use of the tools, equipment, and materials of the specific discipline; and recognize some basic engineering materials, devices and mechanisms which form the “building blocks” of much of the world’s machinery, circuitry, and engineering systems in general.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
7 hours (2 x 2hrs lectures, 1x 1hr tutorials, 1 x 2hrs Lab)	7 hours	14 hours

Topics included in the Course

The Engineering Design Process

1. Problem Statement
2. Pairwise Comparison Chart
3. Conceptual Design
4. Brainstorming Methods
5. Morph Chart
6. Concept Evaluation Methods

Project Management

1. Project Management
2. Risk Management
3. Technical drawings
4. Oral Presentations

Design Reports

1. Nodal Analysis
2. Super-node Concept
3. Mesh Analysis
4. Super-mesh Concept

Technical lectures

1. Introduction to Electronics
2. Diodes
3. Transistors
4. DC Motors, Electric Drive Circuits and Op Amps
5. Arduino Introduction
6. Sensors and Filtering Circuits

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. **Impromptu Design Writing Task** (Individual assessment, 400 words, 40 mins)	Week 1 of the term	5%	CLO1-5
2. **Problem Statement Presentation** (Individual assessment, 2 mins, 50:50 evaluated by Tutor and Peers)	Week 3 of the term	5%	CLO1-3
3. **Concept Generation Presentation** (Group assessment, 15 mins, 50:50 evaluated by Tutor and Peers)	Week 5 of the term	5%	CLO1-3
4. **Concept Generation Writing Task** (Individual assessment, 1 page)	Week 6 of the term	5%	CLO3-4
5. **Design Journal** (Individual assessment, Via OneNote)	Week 6 and 11 of the term	10%	CLO3-4
6. **Design Proposal** (Group assessment, 10 pages)	Week 8 of the term	10%	CLO1-4
7. **Compliance Testing** (Group assessment, Initial Performance check of design prototypes)	Week 9 of the term	10%	CLO1-5
8. **Final Testing** (Group assessment, Final Performance check of design prototypes)	Week 12 of the term	20%	CLO1-5
9. **Final Design Report** (Group 9% & Individual 21%)	Week 12 of the term	30%	CLO1-4
10. **Team Evaluation** (Used to moderate students' final marks and pick up non-cooperative team members)	Week 7 and 12 of the term	± 25%	CLO2

UNSW College

DPCP1092 Computer Systems Fundamentals

Course Description

This course provides a programmer's view on how a computer system executes programs, manipulates data and communicates. It enables students to become effective programmers in dealing with issues of performance, portability, and robustness.

This course aims to give students an overview of the structure and behaviour of modern computer systems and to provide a foundation for later courses on operating systems, computer architecture and compilers, where a deeper understanding of systems-level issues is required.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Describe the layers of architecture in modern computer systems from hardware device levels upwards.

CLO2: Describe the principles of memory management and explain the workings of a system with virtual memory management.

CLO3: Explain how the major components of a CPU work together, including how data (including instructions) is represented in a computer.

CLO4: Design, implement and analyse small programs at the assembly/machine level.

CLO5: Describe the relationship between high-level procedural languages (e.g., C) and assembly/machine language in the conventional machine layer, including how a compiled program is executed in a classical von Neumann machine.

CLO6: Explain how input/output operations are implemented, and describe some basic I/O devices.

CLO7: Describe the components comprising and the services offered by an operating system.

CLO8: Implement simple programs involving communication and concurrency.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
8 hours (2 hrs + 2x1 hr lectures, 2x 1 hr tutorials, 2 hrs lab)	8 hours	16 hours

Topics included in the Course
Unit 1: Bit manipulation
Unit 2: Data representation
Unit 3: Instruction set architecture and MIPS assembly programming
Unit 4: Systems Calls
Unit 5: File Systems
Unit 6: Processes and Signals
Unit 7: Virtual Memory
Unit 8: Parallelism, concurrency, synchronisation, coordination, communication

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Weekly tests	Weeks 3, 4, 5, 6, 8, 9, 10, and 11 of the term	10%	CLO1-8
2. Assignment 1 (MIPS)	Weeks 4 - 8	9%	CLO4
3. Assignment 2 (C Programming)	Weeks 8 - 12	11%	CLO2, CLO5, CLO8
4. Labs	Weekly throughout term	10%	CLO1-5, CLO8
5. Final Exam Students must get >=40% in the exam to pass, otherwise, a UF will be given for the course.	Exam Period of the relevant term	60%	CLO1-8

DPCH1031 Chemistry 1A

Course Description

This course builds on elementary knowledge of chemistry (equivalent to HSC chemistry, or Foundations Chemistry at UNSW Global) to explore the quantum mechanical structure of atoms leading to an understanding of the periodic trends in the properties of the elements. This knowledge is applied to understanding chemical bonding and intermolecular forces which together are responsible for determining the properties of materials. General principles of chemical equilibrium are developed and applied to chemical reactions involving acids and bases. The applications of the laws of Thermodynamics to chemical processes are described and ultimately linked to chemical equilibrium and chemical reactions involving electron transfer. The course concludes with an overview of the application of the principles to the production and storage of energy.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Apply the language of chemistry to the naming and formulae of chemical substances and chemical equations.

CLO2: Perform calculations to quantify substances relating to chemical reactions

CLO3: Apply theory and laws to predict the properties and behaviour of chemical substances.

CLO4: Demonstrate proficiency in defined core chemistry laboratory skills by safely investigating chemical reactions in first-hand scientific investigations.

CLO5: Gather, analyse and interpret data from first-hand scientific investigations to draw valid conclusions.

No. timetabled hours per week	No. personal study hours	Total workload hours per week
9 hours (3 x 1hr lectures per week, 2x 1.5 hrs tutorials per week, 1 x 1-hour consultation class, 1 x 3hrs lab in 8 weeks of term)	9 hours	16 hours

Topics included in the Course

Unit 1: Atomic Spectroscopy
Unit 2: Quantum Mechanics
Unit 3: Electron Configurations
Unit 4: Periodicity
Unit 5: Bonding and Lewis Structures
Unit 6: Shapes of Molecules
Unit 7: Valence bond theory
Unit 8: Intermolecular Forces
Unit 9: States of Matter
Unit 10: Ideal and Real Gases
Unit 11: Raoult’s Law
Unit 12: Equilibrium
Unit 13: Pressure Equilibria
Unit 14: Acids and Bases
Unit 15: Acid Ionisation Constant and Buffers
Unit 16: Titration
Unit 17: Energy, Heat Capacity and Calorimetry
Unit 18: Enthalpy
Unit 19: Entropy and Free Energy
Unit 20: Redox Reactions
Unit 21: Galvanic Cells
Unit 22: Electrochemical Thermodynamics
Unit 23: Batteries and Electrolysis

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Online weekly quiz x 8 Each quiz covers a limited range of topics. Each quiz consists of 10 multiple choice questions randomly selected from a question bank. Some questions are conceptual some are calculation based. Unlimited attempts are permitted per quiz. 100% required to pass.	Weeks 1 - 11 of the term	0% Formative assessment is required for students to gain access to validation tests	CLO1-3
2. Online Validation test x 3 Students can attempt one attempt per week. Each quiz covers a limited range of topics. Each quiz consists of 20 multiple choice questions randomly selected from a question bank. Some questions are conceptual some are calculation based. Students are given 45 minutes to complete the quiz. 90% required to pass.	Weeks 2 - 12 of the term	40%	CLO1-3

3. Laboratory reports Students are required to perform experiments, collect data and then perform calculations, interpret data and answer questions. Students are required to submit a written report through an online portal. Students must attend and complete the reports for at least 6 out of 8 Laboratory classes. Students are also required to successfully demonstrate that they can perform the key laboratory skills: weigh compounds by difference, use a volumetric flask, use a pipette, correctly set up and perform a titration, use a steam bath and ice bath and correctly graph data.	During the lab weeks (8 per term)	20%	CLO4-5
4. Final Exam The final exam is 2 hours in duration. It consists of 20% multiple choice questions, 35% short answer questions and 45% extended response questions.	Exam period of the relevant term	40%	CLO1-3

DPCH1032 Chemistry 1B

Course Description

This course builds on elementary knowledge of chemistry (equivalent to HSC chemistry, or Foundations Chemistry at UNSW Global) to explore the quantum mechanical structure of atoms leading to an understanding of the periodic trends in the properties of the elements. This knowledge is applied to understanding chemical bonding and intermolecular forces which together are responsible for determining the properties of materials. General principles of chemical equilibrium are developed and applied to chemical reactions involving acids and bases. The applications of the laws of Thermodynamics to chemical processes are described and ultimately linked to chemical equilibrium and chemical reactions involving electron transfer. The course concludes with an overview of the application of the principles to the production and storage of energy.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Apply the language of chemistry to the naming and formulae of chemical substances and chemical equations.

CLO2: Perform calculations to quantify substances relating to chemical reactions.

CLO3: Apply theory and laws to predict the properties and behaviour of chemical substances.

CLO4: Demonstrate proficiency in defined core chemistry laboratory skills by safely investigating chemical reactions in first-hand scientific investigations.

CLO5: Gather, analyse and interpret data from first-hand scientific investigations to draw valid conclusions.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
9 hours (3 x 1hr lectures per week, 2x 1.5 hrs tutorials per week, 1 x 1 hr consultation class, 1 x 3hrs lab in 8 weeks of term)	9 hours	18 hours

Topics included in the Course

Unit 1: Transition metal chemistry
Unit 2: Coordination complexes
Unit 3: Crystal field theory
Unit 4: Isomerism
Unit 5: Stereoisomerism (E/Z and R/S)
Unit 6: Isomeric relationships and properties
Unit 7: Elemental analysis and UV-vis spectroscopy
Unit 8: Mass spectrometry
Unit 9: IR spectroscopy
Unit 10: NMR spectroscopy
Unit 11: Chemical Kinetics and rate laws
Unit 12: Elementary reactions and reaction mechanisms
Unit 13: Collision theory
Unit 14: Electrophiles, Nucleophiles and Organic reaction mechanisms
Unit 15: Nucleophilic addition to carbonyls
Unit 16: Nucleophilic substitution reaction (S_N1 and S_N2)
Unit 17: Electrophilic addition to alkenes
Unit 18: Electrophilic aromatic substitution
Unit 19: Multi-step organic synthesis
Unit 20: Molecular Machines

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Online weekly quiz x 8 Each quiz covers a limited range of topics. Each quiz consists of 10 multiple choice questions randomly selected from a question bank. Some questions are conceptual some are calculation based. Unlimited attempts are permitted per quiz. 100% required to pass.	Weeks 1 - 11 of the term	0% (formative assessment is required for students to gain access to validation tests)	CLO1-3
2. Online validation test x 3 Students can attempt one attempt per week. Each quiz covers a limited range of topics. Each quiz consists of 20 multiple choice questions randomly selected from a question bank. Some questions are conceptual some are calculation based. Students are given 45 minutes to complete the quiz. 90% required to pass.	Weeks 2 - 12 of the term	40%	CLO1-3

3. Laboratory reports Students are required to perform experiments, collect data and then perform calculations, interpret data and answer questions. Students are required to submit a written report through an online portal. Students must attend and complete the reports for at least 6 out of 8 Laboratory classes. Students are also required to successfully demonstrate that they can perform the key laboratory skills: weigh compounds by difference, use a volumetric flask, use a pipette, correctly set up and perform a titration, use a steam bath and ice bath and correctly graph data.	During the lab weeks (8 per term)	20%	CLO4-5
4. Final Exam The final exam is 2 hours in duration. It consists of 20% multiple choice questions, 35% short answer questions and 45% extended response questions.	Exam period of relevant term	40%	CLO1-3

DPBA1051 Molecules, Cells and Genes

Course Description

This course aims to introduce students to the basic concepts of modern biology, with particular emphasis on cell structure, function and genetics. The chemistry of life is examined, with emphasis on how living things construct and break down macromolecules. How the genetic code controls these processes depends to a great extent on the structure and function of cell components, and cell biology is a major component of the course. The final topic is genetics - how the genetic code is inherited and how it can be modified. In the process of understanding these concepts, the student will also develop skills in scientific thinking and critical analysis.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Effectively communicate scientific findings to different audiences using different methods.

CLO2: Identify different types of cells, their structures and functions, and compare and contrast them.

CLO3: Outline the processes for energy generation in cells, including the structure and roles of proteins, carbohydrates and lipids.

CLO4: Describe the structures of genetic material, the processes involved in cell division and gene expression, and how these relate to inheritance.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
7 Hours (3 x 1hr lectures, 2 x 1hr tutorials, 3hrs lab for 7 weeks of term)	7 hours	14 hours

Topics included in the Course

Thinking like a scientist

1. Scientific literature
2. Science communication
3. Experimental design

Cell biology and architecture

1. Properties of water and life
2. Prokaryotic and eukaryotic cells
3. Cell structure and function
4. Cell integrity and the plasma membrane

   Nutrient and ion transport

Metabolism

1. Macromolecules: Carbohydrates, lipids, proteins and nucleic acids
2. Metabolic concepts: Catabolism, anabolism, enzymes, redox reactions
3. Cellular respiration and fermentation: Extracting energy from food

   Photosynthesis: Synthesising food from energy

Genetics

1. DNA replication
2. Cell division and reproduction
3. Polymerase Chain Reaction
4. Gene expression: transcription, translation and regulation
5. Mutation
6. Mendel's laws of heredity
7. Mechanisms of inheritance
8. Population genetics

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. Online quizzes Five quizzes comprising multiple choice, drag and drop and fill-in-the-blanks style questions. Topics include prokaryotic and eukaryotic cell structure; osmosis and diffusion; photosynthesis; mitosis and meiosis; DNA replication).	Weeks 2, 4, 6, 8, and 10 of the term.	5%	CLO2-4
2. Science communication project Group project on an advanced biology topic chosen by the students. Consists of 4 components: **Literature review** Individual task; review of literature on group topic; 2000 words limit; 15%. **Group proposal** Group-written submission of ideas on the design, biological content and feasibility of group presentation; max. two A4 pages; 5%. **Group presentation** 6-10 min group presentation on the chosen topic; format optional e.g., video, PowerPoint, web page etc; 15%. **Group portfolio** Group submission; Written record of group meetings; 5%.	Weeks 7, 9 and 12 of the term.	40%	CLO1-4

Assessment Tasks

3. Mid-term exam 40 multiple choice questions; 50 min duration; covers content from weeks 1-5 of the term.	Week 6 of the term	15%	CLO1-3
4. Final Exam 30 x 1-mark multiple choice questions + 14 x 5-mark short answer questions; 2.5 hrs duration. Covers all course content.	Exam Period of relevant term	40%	CLO1-4

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DPEG1072 Engineering Mechanics 1

Course Description

This is my first course in Engineering Mechanics, which is the study of the interaction of matter and forces in engineering contexts. It is evident that all objects in the world around us are composed of matter, and they are all subject to forces. As such, Engineering Mechanics is the foundational tool for engineers and forms the underlying basis for understanding more advanced fields such as Solid Mechanics, Fluid Dynamics, Rigid Body Dynamics, Aerodynamics, Structures, Control and many aspects of Advanced Design. The field of endeavour will be the concepts and applications of Introductory Engineering Mechanics. Additionally, we will not measure our progress as the number of equations or facts or theories that we know. Rather, as our degree of transformation into someone who sees, understands, can make relevant and accurate predictions, and communicates about the world around us through the lens of Engineering Mechanics.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Explain, describe and apply principles and components of Engineering Mechanics. Principles and components include vectors, forces, torques, mass and inertia, particles and rigid bodies in two dimensions, equilibrium conditions, linear momentum and impact, kinetic and potential energy and internal forces and bending moments in beams.

CLO2: Define engineering systems in a mechanically useful way and describe their equilibrium or motion mathematically and graphically and be able to relate this description to the principles of engineering mechanics.

CO3: Discern the relevant principles that must be applied to describe the equilibrium or motion of engineering systems and discriminate between relevant and irrelevant information in the context.

CLO4: Demonstrate an ability to communicate clearly and precisely about technical matters related to Engineering Mechanics.

CLO5: Accomplish hands-on tasks that require the application of knowledge of Engineering Mechanics.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
6 hours (3 hrs lecture and 2 x 1.5 hrs tutorials) + 2 hours of labs in the term	7 hours	14 hours

Topics included in the Course

Unit 1: Fundamentals: vectors, forces and moments, FBDs, Equivalent Loads and Equilibrium
Unit 2: Trusses and determinacy, method of sections and joints
Unit 3: Frames and Machines, pulley systems
Unit 4: Beam bending, shear force and bending moments
Unit 5: Geometric properties of cross-sections
Unit 6: Kinematics and Kinetics of particles
Unit 7: Impulse-momentum and Work-energy methods for particles
Unit 8: Kinematics of rigid bodies
Unit 9: Kinetics of rigid bodies
Unit 10: Impulse-momentum and Work-energy methods for rigid bodies

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. 3 Block tests Each block test is based on topics covered 3 weeks before each test.	Weeks 4, 8, and 12 in a term	18%	CLO1-4
2. 11 PSS hand-ins Weekly homework submissions by each student.	Weekly, in a term	11%	CLO1-4
3. 11 Online MOODLE Quizzes Weekly quizzes with unlimited attempts. The highest grade was recorded.	Weekly, in a term	11%	CLO1-4
4. Truss Assignment Individual assignment submission for each student based on given truss analysis and exploring real trusses around.	Submission in Week 5 of term	5%	CLO1, CLO3-4, CLO5
5. 2 Lab reports Shear force and bending moment experiment and impulse-momentum experiment.	Lab attendance in weeks 5 and 9 respectively. Report submission in weeks 7 and 11 of the term respectively	10%	CLO1, CLO3-5
6. Final Exam	Exam Period of the relevant term	45%	CLO1 - CLO4

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DPMS1061 Design and Application of Materials in Science and Engineering

Course Description

The design and selection of materials for applications in industry and society require an in-depth knowledge of the structures, properties and availability of materials. This course will introduce students to the microstructures and structure-property relationships of the main types of engineering materials (metals, ceramics, polymers and composites), micro-mechanisms of elastic and plastic deformation, fracture mechanisms for ductile, brittle, creep and fatigue modes of failure in service, phase equilibria of alloys, and the properties and applications to commercial engineering materials. It is a course suitable for students pursuing further studies in Materials Science and Engineering as well as some other related engineering disciplines including Mechanical/Mechatronics and Civil Engineering.

Course Learning Outcomes
On successful completion of this course students will be able to:

CLO1: Describe basic property-structure relationships in materials.

CLO2: Explain the different types of deformation that can occur in materials under applied loads and relate the deformation to the atomic structure.

CLO3: Explain different ways that materials may fail under applied loads and the circumstances in which each failure mechanism is most likely.

CLO4: Understand the context of materials science and engineering in design and applications within society.

CLO5: Communicate the above using a range of media.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
6 hours (3 hrs lecture + 2 x 1 hr tutorials + 1 hr consultation) + 3 hours of labs in the term	6 hours	12 hours

Topics included in the Course

Unit 1: Atomic bonding and atomic packing
Unit 2: Mechanical behaviour (Elastic and plastic deformation)
Unit 3: Dislocations, strengthening mechanisms and diffusion
Unit 4: Professional ethics and fast fracture
Unit 5: Atomic structure of metals and phase diagrams
Unit 6: Phase transformations and non-ferrous alloys
Unit 7: Creep and fatigue
Unit 8: Steels and iron-carbide phase diagrams
Unit 9: Polymers and ceramics
Unit 10: Composites and Nanomaterials

Assessment Tasks

Type	When assessed	Weighting	Cross-reference to learning outcomes
1. **11 Online Moodle Quizzes** Weekly one-hour timed quizzes with one attempt allowed.	Weekly in the term	12%	CLO1-4

Assessment Tasks

2. 3 Lab reports Lab experiments and 6 pages report submission.	Report submissions in weeks 5, 9 and 10	9%	CLO1-3
3. In Class Quizzes Participation and in-class quizzes.	Weekly in the term	15%	CLO1-5
4. Professional experience Conference report/conference presentation and weekly activity journal.	Activity journal weekly Conf. report in week 11 Conf. presentation in week 12	19%	CLO4
5. Final Exam	Exam Period of the relevant term	45%	CLO1-5

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DPCA1001-3 Communication and Academic Literacy (Cal) 1, 2 & 3

Course Description

This course is designed to equip learners with the academic literacy and communication skills they require to succeed in their tertiary studies. This course is characterised by a focus on tertiary orientation, academic literacy, critical thinking, and learner autonomy. The study of advanced functional language forms which promote textual coherence and cohesion at a tertiary level are embedded. The aim of this course is to assist the process of acculturation and promote broader engagement in campus life. It also aims to foster a deeper understanding of how word choice, sentence structure, and the organisation of ideas can affect clarity of expression and facilitate greater communicative and academic competence. Students learn to recognise and create texts based on logical organisational patterns and identify expressions commonly used in academic discourse to signal relationships between ideas. There is a strong emphasis on reflection and the learning process. Learners are encouraged to work collaboratively and to develop effective self-directed study skills. Course materials are based on topics and issues which reflect the variety of disciplines students will go on to pursue as part of their future courses of study. Authentic tertiary input and resources are used where appropriate to ensure that learning activities are relevant and meaningful. The themes selected as the context for the learning activities reflect broad topics which may be studied from a variety of disciplinary perspectives. The focus includes macro-language skills, discourse management and academic literacy skills. CAL encourages collaborative and independent work with both peers and teachers to better prepare students for the Australian university context. Learners are engaged in practical task-oriented activities and assessment tasks. They are encouraged to analyse ideas, evaluate claims, and search for answers to self-generated questions. A range of academic spoken and written text types are addressed throughout the course. Some of these texts include: academic readings, case studies, reports, critical reviews, reflections, summaries, annotated bibliographies, short-answer responses, tutorial discussions, presentations, simulations etc. The course, is organised in a series of skills-based modules and is delivered in a fully online or fully face-to-face mode, using blended learning approaches. The spread of hours across the CAL course is 48 to 144 hours dependent of English language proficiency. Student requiring greater English language support may take the course over three terms.

Course Learning Outcomes On successful completion of this course students will be able to:
CLO1: Use & produce language required to operate successfully at an Australian university.
CLO2: Select, analyse and evaluate information, ideas, & academic sources.
CLO3: Clearly express ideas, organise information, & incorporate evidence.
CLO4: Produce written texts demonstrating recognised academic conventions.
CLO5: Engage in group discussions & deliver oral presentations.
CLO6: Communicate with peers & university staff in both academic & social domains.
CLO7: Demonstrate a reflective & self-directed approach to learning.

No. timetabled hours per week	No. personal study hours per week	Total workload hours per week
4-8 hours per week (Term 1)	Approx. 2 – 4 hours per week	6 – 12 hours per week
2 hours per week (Term 1, 2 or 3)	Approx. 1 – 2 hours per week	3 – 6 hours per week
2 hours per week (Term 1, 2, or 3)	Approx. 1 hours per week	3 – 6 hours per week

Topics included in the Course
Unit 1: Developing an academic style: Communicating at university + Being a critical reader.
Unit 2: Critical analysis and expressing ideas clearly: Writing for university + Presenting and supporting claims.
Unit 3: Incorporating different perspectives: Referring to academic sources + Synthesising information from multiple sources.
Unit 4: Negotiating and problem solving: Developing credible arguments.
Unit 5: Negotiating and problem solving: Analysing problems and evaluating responses.
Unit 6: Joining a discourse community: Investigating your field of study.
Unit 7: Joining a discourse community: Reporting on research findings.

Assessment Tasks

		48 Hours		144 Hours – Students who require extra English language support	
Type	**Cross-reference to learning outcome**	**When assessed**	**Weighting (% of total marks for unit)**	**When assessed**	**Weighting (% of total marks for unit)**
Reflection Activities: Reflective video, writing and interview	CLO1-3, 5-7	Week 3, 12, Term 1	20%	Week 3, Term 1 Week 12, Term 2 Week 12, Term 3	10%
Quizzes Quiz 1: Listening Skills Quiz 2: Reading & Writing Quiz 3: Academic Language Quiz 4: Academic Language	CLO1, 3, 6-7	Week 3-12, Term 1	20%	Week 4, Term 1 Week 6, Term 1 Week 7, Term 1 Week 3, Term 2	10%
Seminars Part 1. Critical Reading Seminar Part 2. Group Seminar Presentation	CLO1-7	N/A	0%	Week 8, Term 1 Week 12, Term 1	20%
Case Study Students identify the core issues and pose justifiable solutions to the problem	CLO1-4, 6-7	Week 2, Term 1	20%	Week 6, Term 2	10%
Emergency Summit Students assume the role of a real-world stakeholder in an 'Emergency Summit' and prepare a well-reasoned response to a given 'wicked problem'.	CLO1-7	Week 6, Term 1	20%	Week 11, Term 2	10%

Assessment Tasks

Individual Poster Presentation/Report	CLO1, 7	Week 3, Term 1	20%	Week 6, Term 3 Week 11, Term 3	20%
Integrated Skills Test Reading, Listening & Writing	CLO1-4	N/A	0%	Exam Week, Term 3	20%