MONASH University | MONASH College

Unit Guide

Diploma of Engineering

Monash College

Effective 3 July 2026 for T2 2026 programs

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Overview

The Diploma of Engineering provides the foundational scientific and mathematical skills and knowledge required in developing and improving new technology, and prepares students to pursue further study in engineering. The course includes core engineering design units, plus units in related disciplines including mathematics, computing, physics and chemistry or biology.

There are two entry points into the Diploma of Engineering - Part One and Part Two - with the entry point for each applicant determined by their academic background and English language level.

Diploma of Engineering Course Outcomes

On completion of the Diploma of Engineering, students should be able to demonstrate the following skills and knowledge and their application:

1. Knowledge of technical and theoretical issues in a variety of engineering disciplines, underpinned by scientific and mathematical theory.
2. Identify and communicate advice in a variety of engineering disciplines to address technical problems in accord with management requirements
3. Utilise technical skills to demonstrate understanding and problem solving in relation to engineering issues involving diverse stakeholders
4. With depth in some areas, critically apply theoretical and technical skills to solve problems in relation to a range of engineering disciplines
5. Manage work priorities and coordinate the work of others in accord with parameters set by management in a number of engineering contexts.

Monash College Diplomas Graduate Attributes

All Monash College courses will develop the following graduate attributes:

- Communication - demonstrated by effective communication in a variety of contexts
- Collaboration - demonstrated by working positively with others to achieve common goals
- Social and Cultural Engagement - demonstrated by respect for diversity and recognition of ethical responsibilities, including towards knowledge creation and academic integrity
- Critical Thinking and Problem Solving - demonstrated by the ability to analyse, evaluate and synthesise information to solve problems and innovate
- Independent Learning - demonstrated by the initiative, reflective practice and resilience necessary for self-directed learning, and possession of the foundational discipline knowledge and skills appropriate to commence their destination studies
- Academic Skills - demonstrated by understanding and appropriate application of scholarly practices and standards.

DIPLOMA PART 1			
Unit Code	**Unit Name**	**Unit EFTSL[1]**	**Credit Points[2]**
MCD1160	Introductory Engineering Computing	0.125	6
MCD1170	Introductory Chemistry	0.125	6
MCD1180	Introductory Physics	0.125	6
MCD1190	Chemistry A	0.125	6
MCD1200	Physics A	0.125	6
MCD1520	Introduction to Academic Communication	0.125	6
MCD1530	Functions and Their Applications	0.125	6
MCD1700	Introductory Mathematics	0.125	6
DIPLOMA PART 2			
Unit Code	**Unit Name**	**Unit EFTSL[1]**	**Credit Points[2]**
MCD2130	Functions and their Applications	0.125	6
MCD4160	Physics for Engineering	0.125	6
MCD4390	Chemistry 1	0.125	6
MCD4490	Advanced Mathematics	0.125	6
MCD4500	Engineering Mathematics	0.125	6
MCD4520	Engineering Methods	0.125	6
MCD4530	Engineering Design	0.125	6
MCD4540	Engineering Smart Systems	0.125	6
MCD4550	Engineering Numerical Analysis	0.125	6
MCD4600	Intermediate Physics	0.125	6

1. *EFTSL: Effective Full-time Student Load. Each part of the Diploma is equivalent to one year of full-time study. Monash College Diplomas are delivered in an accelerated mode, so you can study more than a standard full-time load in a year.*

2. *Most Monash units are 6 credit points. To complete a full Monash College Diploma you must pass 96 credit points; if you start in Part 2 you must pass 48 credit points and may also have to complete the Preparatory Maths unit (MCD4510). Credit points in Part 2 units count towards the first year of your Monash University degree.*

MCD1160 – Introductory Engineering Computing

Description

Today's engineers rely heavily on the use of computers. To solve problems of practical significance, you need to apply scientific and technical knowledge, common sense, and experience. This unit will provide you with an understanding of basic computer software and programming concepts, and how it is used within the engineering environment. You will learn how to effectively communicate technical information using modern document editing, spreadsheet and presentation applications, and execute professional oral presentations to share your findings. Further, you will develop skills to solve real-world problems using microcontrollers with a programming language.

Prerequisites

Nil

Learning Outcomes

When you have completed this unit, you are expected to be able to:

1. Use the formatting features of a word processor.
2. Use utilities and advanced features provided with a word processor.
3. Create professional technical reports using word processors.
4. Demonstrate competency in academic writing and referencing.
5. Create and format a spreadsheet.
6. Use formulas to perform calculations in a spreadsheet.
7. Use graphics in a spreadsheet to aid data analysis and visualisation.
8. Designing professional presentation slides, incorporating text and graphics.
9. Communicate technical content in effective oral presentations.
10. Construct and test simple microcontroller programs.
11. Apply programming concepts and debug programs.
12. Use prototyping theory to create technical drawings and 3D designed models optimised for 3D printing.
13. Recognise the importance of good practices in programming.
14. Decompose problems into simpler problems.
15. Implement problem solving strategies and understand how real-word problems can be addressed by the digital world
16. Work collaboratively within group project settings.

MCD1160 – Introductory Engineering Computing *CONTINUED*

Assessments

Assessment Task	Weight
A1: Test 1	10%
A2: Assignment 1	20%
A3: Assignment 1 Oral Presentation	5%
A4: Test 2	10%
A5: Assignment 2 Project	28%
A6: Assignment 2 Oral Presentation	7%
A7: Lab Participation	10%
A8: Weekly Quizzes	10%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD1170 – Introductory Chemistry

Description

Chemistry is the science of matter and the transformations it can undergo. It plays a central role in medicine, engineering and many sciences. It helps us understand our surroundings and the way we function. Students will investigate the various analytical techniques that are used to analyse substances depending on their properties. The knowledge and skills gained in this unit will be further extended in MCD1190 Chemistry A.

Prerequisites

Students should have completed an equivalent to Victorian VCE Year 11 Chemistry, Units 1 & 2.

Learning Outcomes

On completion of this unit, students should be able to:

1. Express chemical reactions symbolically, qualitatively and quantitatively.
2. Explain the concepts of bonding between atoms and relate this to the properties of compounds.
3. Explain the factors affecting the rate of a reaction and perform calculations for thermochemical equations
4. Calculate equilibrium constants and explain how the position of equilibrium can be altered, including examples from industry.
5. Explain acids and bases and perform calculations related to pH
6. Explain the structure and naming of simple organic molecules.
7. Explain the gas laws and apply calculations related to these
8. Demonstrate proficiency in communicating scientific results through a range of formats (written and oral);
9. Develop practical, report writing and scientific inquiry skills by the investigation of chemical experiments in the laboratory.

Assessments

Assessment Task	Weight
A1: Test 1	10%
A2: Test 2	20%
A3: In-class Activities and Quizzes	20%
A4: Group Presentation	15%
A5: Laboratory Work	20%
A6: Scientific Communication	15%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD1180 – Introductory Physics

Description

Through the study of physics, we are able to gain a greater understanding of the nature of the universe. Physics strives to reveal nature's underlying simplicity and establish the rules which cause galaxies to form, the toast to burn, or what holds the component parts of a proton together. Physics underlies all of the life and physical sciences, as well as engineering and technology. You will be engaged in practical work to allow you to explore and measure key theories.

Prerequisites

Nil

Learning Outcomes

On completion of this unit, students should be able to:

1. Describe the difference between qualitative and quantitative techniques Record accurate observations and select measuring equipment of appropriate accuracy
2. Recognize the measurement error in selected equipment Identify sources of error in analytical procedures
3. Distinguish between displacement, speed, velocity and acceleration and calculate each of these parameters
4. Demonstrate knowledge of mass, force and their relationship through Newton's laws
5. Identify force and draw free body diagram
6. Differentiate between scalar and vector
7. Differentiate between work, energy, kinetic energy, potential energy and power
8. Define an impulse and its relation to a change of momentum
9. Differentiate between force and torque and apply the laws of equilibrium to practical situations
10. Discuss elastic properties of materials
11. Distinguish between displacement, amplitude, period, frequency and wavelength of a wave
12. Describe behaviour of waves in terms of reflection, refraction, diffraction and interference
13. Calculate properties of standing waves on a string or in a pipe
14. Distinguish between energy, intensity and intensity level in a wave

Assessments

Assessment Task	Weight
A1: Labs	20%
A2: Test 1	15%
A3: Test 2	25%
A4: Weekly In-Class Activities	20%
A5: Projects	20%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD1190 – Chemistry A

Description

Chemistry is an important branch of science which has a direct impact upon our lives. For example, knowledge of chemical concepts will assist us to explore new and cheaper energy sources, improve health and safety standards, and develop 'greener' and environmentally friendly processes, which reduce pollution and wastage in the environment. You will investigate, explore and discuss chemical concepts and issues, and solve quantitative and qualitative problems in class.

Prerequisites

MCD1170 Introductory Chemistry or VCE Year 11 Chemistry, Unit 2.

Learning Outcomes

On completion of this unit, students should be able to:

1. Demonstrate the importance of energy transformations in thermochemical and electrochemical reactions.
2. Discuss factors which give rise to chemical kinetics; differential and integrated rate laws.
3. Explain the structure and naming of simple organic molecules.
4. Distinguish between the different chromatographic types and various spectroscopic techniques in order to understand their use in qualitative and quantitative chemical analysis.
5. Relate organic chemical structures to observed chemical reactions, using examples from those involved in human nutrition and global cycling of nutrients.
6. Demonstrate proficiency in communicating scientific results through a range of formats (written and oral);
7. Develop practical, report writing and scientific inquiry skills by the investigation of chemical experiments in the laboratory.

Assessments

Assessment Task	Weight
A1: In-class Activities	15%
A2: Online Quizzes	10%
A3: Formative Test	15%
A4: Laboratory	25%
A5: AI Video and Presentation	15%
A6: Final In-class Test	20%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD1200/MCD4600 – Physics A

Description

This unit continues on from MCD1180 Introductory Physics, and considers the analysis of construction materials, and evaluate the effect of forces and loads on structures and materials, basic concepts of practical investigation, rotational motion, gravitational fields, Newton law of universal gravitation, understanding of electric field, charges, simple and complex circuits, magnetic field and magnetism.

Through practical work students relate theory, theoretical knowledge to experimental processes and engage in critical observation and testing of physical phenomena via experimental work

Through Project work students gain communication skills and collaboration skills and soft skills such coordination, time management as it involves group work.

Through a field trip students can experience scientific research on site, bridging the gap between theoretical physics and practical applications.

Prerequisites

MCD1180 Introductory Physics.

Learning Outcomes

- Develop attitudes that include curiosity, open-mindedness, creativity, flexibility, integrity, attention to details and respect for evidence-based study.
- Develop a range of individual and collaborative science inquiry skills through a variety of investigation methodologies in the laboratory and field, refining investigations to improve data quality, analyse and interpret qualitative and quantitative data to provide evidence, recognising patterns, relationships and limitations of data. Demonstrate knowledge of the value of practical work.
- Understand the research, ethical and safety guidelines that govern the study and practice of the discipline and apply these guidelines to generate, collate, analyse and critically evaluate.
- Develop knowledge and understanding of key models, concepts, theories and laws of science to explain scientific processes and phenomena, and apply this understanding in familiar and unfamiliar situations, including personal, sociocultural, environmental and technological contexts
- Communicate clearly and accurately an understanding of the discipline using appropriate terminology, conventions and formats. Communicate effectively through oral and written communication skills
- A field trip for students to experience scientific research first-hand, bridging the gap between theoretical physics and practical applications. SiteVisit plays a vital role in modern science, contributing to breakthroughs in areas such as medical treatments and renewable energy technologies and practical applications of fundamental concepts of Physics.

MCD1200/4600 – Physics A *CONTINUED*

Assessments

Assessment Task	Weight
A1: Test 1	10%
A2: Test 2	20%
A3: Site Visit and Student Interview	10%
A4: Scientific Inquiry	15%
A5: Project Work	20%
A6: Lab work	25%

Requirement to Pass this Unit:

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD1520 – Introduction to Academic Communication

Description

This course develops students' English language proficiency and academic communication skills to support their adaptation to university expectations and conventions. It scaffolds students to build foundations in three focus areas: academic skills, behaviours, and values, while developing academic language skills and knowledge. The unit introduces the language, texts, and conventions specific to Humanities, Business, and Science programs, and emphasises the value of diverse perspectives offered by different disciplines and their contributions to solving contemporary societal issues. Learning and assessment activities are designed to foster both independent and collaborative learning approaches, guiding students to enhance their abilities in reading, listening, writing and speaking as well as critical thinking, and researching in technologically-advancing academic contexts.

This unit will support students in building effective learning strategies using a range of thinking skills, learning approaches and assessment responses.

This is a core unit in the Monash College Diplomas Part 1.

Prerequisites

Nil

Learning Outcomes

On completion of this unit, students are expected to be able to:

1. Critically analyse academic texts to identify key arguments, evidence, and methodologies
2. Accurately interpret and critically evaluate spoken academic content and verbal instructions in academic settings
3. Participate in academic discussions, demonstrating active listening, critical thinking, intercultural understanding and the ability to articulate and sustain viewpoints
4. Deliver a clear, well-organised presentation on an academic topic, presenting and justifying arguments using supporting evidence and examples
5. Write a clear, well-structured academic text, following academic conventions, including structure, register, signposting and discipline-specific referencing conventions
6. Demonstrate critical, analytical and evaluative skills via selecting, synthesising and critically analysing a range of academic sources
7. Employ discipline-specific vocabulary and discourse to convey ideas effectively
8. Use digital and generative AI tools critically and responsibly to support academic production and communication.
9. Collaborate effectively in academic and group settings by communicating respectfully, actively listening, and contributing relevant ideas to achieve shared academic goals.

MCD1520 – Introduction to Academic Communication *CONTINUED*

Assessments

Assessment Task	Weight
A1: Socratic Seminar	25%
A2: Research Task Draft	10%
A3: Research Task Final	25%
A4: 3 Minute Thesis	20%
A5: Collaboration & Communication	20%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD1530 – Functions and Their Applications

Description

The focus of this unit will be on the behaviour of functions and examining some of their applications to the real world. The way that functions will be introduced is by individually describing the characteristics of families of different function types (linear, polynomial, rational, exponential, logarithmic and trigonometric). The composition of functions through possible combinations of different types of functions will also be investigated. Other operations on functions, such as transformations via shifting, scaling and reflection, will be presented, along with the existence and meaning of inverse functions.

This initial part of the course will then be used to provide a foundation for examining the rate of change of a function. Principally, this involves defining the elementary principles of differential calculus and then utilising these with respect to the types of functions mentioned above. As a final topic, an introduction to integral calculus is presented.

Prerequisites

It is assumed that students have studied mathematics to at least Year 11 or equivalent level.

Learning Outcomes

On completion of this unit, students will have acquired knowledge of:

1. The notion of functions and their representation as tables, graphs or mathematical expressions;
2. The basic characteristics of polynomial, rational, exponential, logarithmic and trigonometric functions;
3. The algebra of functions;
4. The concepts of composition functions and inverse functions;
5. The transformation of functions, algebraically and graphically;
6. The concepts of rate of change of a function and derivative of a function
7. The concept of anti-differentiation of a function and its main application: The Fundamental Theorem of Calculus.

And will have developed skills in:

1. Identifying different types of functions behaviour by means of neat sketch-graphs; determining basic properties and behaviour of functions by analytic and by means of neat sketch graphs.
2. Using function algebra.
3. Calculating composition functions and inverse functions; using functions as models of real-life behaviour; calculating simple derivatives and integrals; communicating and interpreting mathematical results.

Assessments

Assessment Task	Weight
A1: In-class Engagement	40%
A2: Knowledge Booster	10%
A3: Test 1	10%
A4: Test 2	20%
A5: Test 3	20%

MCD1530 – Functions and Their Applications *CONTINUED*

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

Mode of study

This unit is taught face-to-face. There is no work placement component.

MCD1700 – Introductory Mathematics

Description

This unit will provide students with the pre-requisite knowledge and skills to progress to the higher levels of mathematics in the STEM diplomas and subsequently in the relevant degree programs.

Prerequisites

Nil

Learning Outcomes

On completion of this unit, students should be able to:

1. Utilize set and interval notations to describe and represent number sets and express these sets on the real number line and through Venn diagrams.
2. Perform mathematical operations on complex numbers, including addition, subtraction, multiplication division and represent t then in the argand diagram.
3. Solve linear and simultaneous linear equations using both graphical and algebraic methods and apply these equations to model and solve real-world problems.
4. Apply the factor theorem to factorize polynomial functions and solve polynomial and quadratic equations using various methods, including factorization, the quadratic formula, and completing the square.
5. Sketch and interpret graphs of exponential, logarithmic and circular functions, and use these functions to model application problems.
6. Convert between radians and degrees, and apply trigonometric ratios, the sine rule, and the cosine rule to solve problems in geometric and analytical contexts.
7. Classify vectors and scalars, express vectors using Cartesian coordinates and components, and apply vector algebra to solve problems in geometry

Assessments

Assessment Task	Weight
A1: In-class Assessment	40%
A2: Test 1	10%
A3: Test 2	15%
A4: Oral Presentation	10%
A5: Test 3	25%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD2130 – Functions and Their Applications

Description

The focus of this unit will be on the behaviour of functions and examining some of their applications to the real world. The way that functions will be introduced is by individually describing the characteristics of families of different function types (linear, polynomial, rational, exponential, logarithmic and trigonometric). The composition of functions through possible combinations of different types of functions will also be investigated. Other operations on functions, such as transformations via shifting, scaling and reflection, will be presented, along with the existence and meaning of inverse functions.

This initial part of the course will then be used to provide a foundation for examining the rate of change of a function. Principally, this involves defining the elementary principles of differential calculus and then utilising these with respect to the types of functions mentioned above. As a final topic, an introduction to integral calculus is presented.

Prerequisites

It is assumed that students have studied mathematics to at least Year 11 or equivalent level.

Learning Outcomes

On completion of this unit, students will have acquired knowledge of:

1. The notion of functions and their representation as tables, graphs or mathematical expressions;
2. The basic characteristics of polynomial, rational, exponential, logarithmic and trigonometric functions;
3. The algebra of functions;
4. The concepts of composition functions and inverse functions;
5. The transformation of functions, algebraically and graphically;
6. The concepts of rate of change of a function and derivative of a function
7. The concept of anti-differentiation of a function and its main application: The Fundamental Theorem of Calculus.

And will have developed skills in:

1. Identifying different types of functions behaviour by means of neat sketch-graphs; determining basic properties and behaviour of functions by analytic and by means of neat sketch graphs.
2. Using function algebra.
3. Calculating composition functions and inverse functions; using functions as models of real-life behaviour; calculating simple derivatives and integrals; communicating and interpreting mathematical results.

Assessments

Assessment Task	Weight
A1: In-class Engagement	40%
A2: Knowledge Booster	10%
A3: Test 1	10%
A4: Test 2	20%
A5: Test 3	20%

MCD2130 – Functions and Their Applications *CONTINUED*

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

Mode of study

This unit is taught face-to-face. There is no work placement component.

MCD4160 – Physics for Engineering

Description

Through the study of this unit, you will explore engineering concepts such as energy, momentum and angular momentum with applications to planetary orbits, rocket propulsion, precession and flywheels. Applications of oscillations and waves within engineering applications will also be explored. Students will consider: resonance, transmission of energy, Doppler effect and speed measurement, polarization and stress models, diffraction and non-structures, thin film interference and anti-reflecting films together with Quantum Physics, Uncertainty Principle, wave functions, atomic force microscope, lasers and stimulated emission. The practical component develops measurement, analysis, and communication skills.

Prerequisites

MCD1200 Physics A (For Part 2 entry students, Part 1 pre-requisites are not applicable).

Learning Outcomes

On completion of this unit, students should be able to:

1. Apply energy and momentum methods to analyse motion of systems.
2. Explain behaviours involving oscillations and waves and do appropriate analysis and calculations.
3. Explain, and apply basic quantum principles to, situations which are relevant in engineering and technology contexts; do appropriate analysis and calculations.
4. Demonstrate an ability to describe and explain advanced techniques used in relevant engineering or physics contexts.
5. Make reliable measurements, estimate uncertainties, analyse, evaluate and interpret data in cases appropriate to engineering and related to the theory studied.
6. Show an improved ability to work in teams and to communicate and discuss physics concepts, measurements and applications related to engineering and developments in technologies.
7. Approach new problems and find solutions on the basis of general principles, and evaluate the appropriateness of their proposed models or solutions.

Assessments

Assessment Task	Weight
A1: Tutorial Activities	10%
A2: Post Tutorial Quizzes	10%
A3: Test 1	25%
A4: Test 2	20%
A5: Test 3	10%
A6: Laboratory Work	25%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD4390 – Chemistry 1

Description

This unit has been designed to provide a fundamental understanding, as well as the ability to gain knowledge in different aspects of chemistry including physical chemistry principles, theoretical and practical tasks that are relevant to the university level of learning.

Prerequisites

MCD1190 Chemistry A or VCE year 12 Chemistry

Learning Outcomes

On completion of this unit, students should be able to:

1. Discuss the features of atomic structure and the construction of the periodic table of elements.
2. Interpret relationships between electronic structure and bonding.
3. Explore a wide range of molecular structures and investigate aspects of stereochemistry such as isomerism and chirality.
4. Distinguish between ideal gasses and real gases.
5. Recognise factors which give rise to polarity and its relationship to intermolecular bonding.
6. Define the first and second laws of thermodynamics and apply enthalpy and entropy.
7. Discuss factors which give rise to chemical kinetics.
8. Apply acid-base chemistry in the understanding of dynamic equilibria.
9. Foster the acquisition of practical skills by exploiting an inquiry-based approach to the chemistry laboratory experience.
10. Communicate chemistry and discuss the social and environmental responsibility of chemists in the global community.

Assessments

Assessment Task	Weight
A1: Online Tutorial Tests	10%
A2: Labs	30%
A3: Online Quizzes	10%
A4: Final Examination	50%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.
- Achieve a minimum mark of 45% in the lab component

MCD4490 – Advanced Mathematics

Description

Functions and coordinate geometry: types of functions, composite functions, inverse functions, modeling of periodic phenomena with trigonometric functions, complex numbers. Differentiation and integration: concepts and techniques, applications to related rate of change and optimization problems, areas, volume and centre of mass. Vectors in two and three-dimensional space, application to motion and kinematics.

Prerequisites

MCD2130 Functions and Their Applications or Mathematical Methods Units 3 & 4 equivalent.

Learning Outcomes

On completion of this unit, students should be able to:

1. Demonstrate understanding of the properties of common functions and their graphs, use composition of functions, and inverse functions; use trigonometric functions to model periodic behavior.
2. Represent complex numbers in Cartesian, polar and exponential forms, and on the complex plane.
3. Perform arithmetic and algebra on complex numbers, including finding powers and complex roots of polynomials.
4. Perform operations with two and three-dimensional vectors, interpret them geometrically, calculate dot products, find vector resolute, and apply them to motion of a particle.
5. Demonstrate understanding of the concepts of limit, continuity, differentiable and integrable functions.
6. Evaluate limits of piecewise functions and of rational functions at infinity.
7. Use differentiation rules to find derivatives of implicit and explicit functions.
8. Apply differentiation techniques to related rates of change problems and optimisation problems.
9. Use simple integration techniques to find definite and indefinite integrals, including by substitution and partial fractions.
10. Apply integration techniques to calculate areas, average values, volumes, and centres of mass or moment.
11. Solve kinematics problems, and set up and solve problems involving Newton's laws of motion.
12. Express and explain mathematical techniques and arguments clearly in words.

Assessments

Assessment Task	Weight
A1: Test 1	15%
A2: Workshop Quizzes	20%
A3: Tutorial Interactions	15%
A4: Final Examination	50%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result

MCD4500 – Engineering Mathematics

Description

Vector algebra and geometry: equations of lines and planes. Linear algebra: matrix operations, up to 3x3 systems of linear equations, eigenvalues and eigenvectors. Calculus: improper integrals, integration by parts. Sequences and series: fundamentals of convergence, Taylor series: single and multivariable series. Use in error analysis. Ordinary differential equations: first order, second order and higher order ODE with constant and non-constant coefficients, repeated roots, simple non-homogeneous cases. Various techniques of solving ODEs. Variation of parameters. Systems of differential equations. Engineering Applications. Multivariable calculus: partial derivatives, gradient and directional derivatives, maxima and minima.

This is a core unit in the Monash College Diploma of Engineering, Part 2.

Prerequisites

MCD4490 Advanced Mathematics

Learning Outcomes

On completion of this unit, students should be able to:

1. Perform matrix algebra, solving systems of linear equations using Gaussian elimination with back substitution.
2. Determine eigenvalues and eigenvectors. Perform matrix algebra and comprehend how matrices represent spatial transformations.
3. Evaluate the cross products of vectors and use them to represent lines and planes. Calculate cross products and triple products.
4. Find contours of functions of two variables. Calculate partial derivatives, use the gradient vector to find directional derivatives, and determine extreme values of multivariable functions. Calculate tangent planes.
5. Calculate higher derivatives of functions of several variables. Identify and characterise critical points. Use Lagrange multipliers to find local maxima and minima of a function subject to an equality constraint.
6. Perform basic manipulations of sequences and series. Appreciate the convergence of the numeric and power series. Construct Taylor series and use truncated Taylor series to approximate functions. Estimate errors in numerical approximations for single-variable functions.
7. Solve first-order ordinary differential equations, including those with separable variables and integrating factors. Evaluate and apply integration by parts.
8. Solve second-order linear differential equations with constant coefficients. Categorise ODEs as linear or nonlinear and identify their order. Solve the first-order linear ODEs.
9. Use differential equations to model simple engineering problems.
10. Solve homogeneous and non-homogeneous ordinary differential equations. Use variation of parameters to solve linear ODEs. Understand linear dependence and independence of a set of functions. Use the Wronskian to determine linear dependence or independence.
11. Find Taylor series for multivariable functions and. Taylor series as finite-order polynomials. Use l'Hôpital's rule to find limits and find Taylor series for given multivariable functions.
12. Express and explain mathematical techniques and arguments clearly in words.

MCD4500 – Engineering Mathematics *CONTINUED*

Assessments

Assessment Task	Weight
A1: Test	20%
A2: Lecture Quiz and Attendance	10%
A3: Tutorial Participation	20%
A4: Examination	50%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.

MCD4520 – Engineering Methods

Description

This unit develops methods for analysing complex problems. The basics of statics and material properties are introduced and used to analyse structures such as beams, cantilevers and truss sections. This knowledge is used to design, analyse, build and test a structural component. Simplifications are implicit in the methods used in this analysis. These simplifications will be examined carefully and scrutinised in a broader cross-disciplinary context through problems related to the system being designed. The methods considered will include: the use of simplifications, assumptions, constraints, boundary conditions and levels of required precision.

The outcome of the structural analysis and testing will be compared and the suitability of the simplifications used will be scrutinised. You will gain knowledge about the methods engineers use to address complex problems across disciplines. Alongside this “engineering thinking”, you will also gain insight into the role of different specialisations of engineering in society. Communication and teamwork skills will be developed through teamwork tasks.

This is core unit in the Monash College Diploma of Engineering, Part 2.

Prerequisites

This is a core unit in the Monash College Diploma of Engineering, Part 2.

Learning Outcomes

On successful completion of this unit, students will be able to:

1. Determine reactions and internal member forces in simple truss and beam systems and carry out limit state design to select appropriately sized members.

2. Determine the strength of structural materials to inform engineering designs with considerations to performance, cost, sustainability and societal impact.

3. Determine the steady-state performance of simple systems involving levers, gears, springs and pulleys using appropriate engineering problem-solving methodologies.

4. Propose concept designs that solve engineering problems and justify finalised design with considerations of key variables, assumptions and system boundaries.

5. Identify appropriate engineering tools and techniques to develop, validate and convey designs and solutions.

6. Identify roles and responsibilities within a team and reflect on self and team behaviours that contribute to the successful conduct of a project.

MCD4520 – Engineering Methods *CONTINUED*

Assessments

Assessment Task	Weight
A1: Pre-Workshop Quizzes	5%
A2: Post workshop work	5%
A3: Test 1	5%
A4: Test 2	10%
A5: Labs and Projects	25%
A6: Final Exam	50%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.
- Achieve at least 45% in the total continuous assessments A1-A5 component.

MCD4530 – Engineering Design

Description

This unit covers the engineering design process, which is a method used by engineers from all disciplines to determine a solution to a problem or address a need. You will use design thinking models to define the problem, create innovative conceptual designs, prototype possible design solutions, refine several designs to a single final design, and determine the specifications of the final design. In order to simulate a real-world experience, you are required to determine the role of the stakeholders in the project, and consider the economic, environmental, Indigenous, social and ethical aspects of your proposal.

You will be working in a team throughout the semester to gain the communication skills which are highly desired by industries. You will be required to reflect on your work to help improve your interpersonal and teamwork skills contributing to your personal growth. You will also consider the value of engineering ethics and the Code of Ethics whilst learning the engineering design process. Engineers need to submit proposals and pitch their ideas to stakeholders within communities and their team members. They will give presentations to their peers, to their project managers, and to possible stakeholders to develop these presentation skills

Prerequisites

Nil

Learning Outcomes

1. Discern fundamental chemical, materials, mechanical and environmental engineering knowledge, principles and concepts to propose solutions to a humanitarian engineering problem.

2. Identify design requirements from a provided brief and analyse potential solutions using first principles of mathematics and natural and engineering sciences.

3. Identify societal, health, safety, legal and cultural issues relevant to your project including the Indigenous context, and your consequent responsibilities as an engineer.

4. Determine appropriate principles of sustainable design and development, including embodied energy, renewable materials, availability, costs, etc, of a proposed solution using a systems approach to design.

5. Discern the ethical considerations of working with diverse communities and stakeholders, and demonstrate your commitment to the Engineers Australia Code of Ethics and established norms of professional conduct throughout your project.

6. Describe project progress and outputs to stakeholders verbally through pitches, in writing through professional engineering documentation, and graphically through drawings and visualizations.

7. Describe the principles of team norms, collaboration and dynamics, define your professional goals and discern the practices that lead to successful teamwork in a multicultural context.

MCD4530 – Engineering Design *CONTINUED*

Assessments

Assessment Task	Weight
A1: Weekly Progress Reports (WPR) - INDV	15%
A2: Project Self-Reflection and Evaluation - INDV	15%
A3: Process Engineering Design Report	15%
A4: EWB Design Video Report - INDV	15%
A5: Pitch Presentation	10%
A6: Prototype	5%
A7: Final Design Report	15%
A8: Professional Identity Reflection - INDV	10%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.
- Achieve at least 45% in the total individual assessment items (INDV).

MCD4540 – Engineering Smart Systems

Description

This unit aims to introduce the fundamentals of software, electrical, electronic and mechatronics engineering, required to prepare students for engineering studies. The fundamental stages in the software and hardware development life cycle will be introduced, including requirements analysis, functional analysis, design integration and verification. Concepts such as Boolean Logic, Ohm's and Kirchhoff's Laws, Nodal Analysis and Thevenin Equivalence will also be introduced. These will be used to analyse and design solutions that contain electrical components including capacitors, semiconductor devices such as diodes, transistors and basic microcontrollers.

Prerequisite

Co-requisite

Learning Outcomes

On completion of this unit, students should be able to:

1) Discuss requirements of a smart system from component to integrated perspective.
2) Define programs using Python, discern problem-solving strategies in decomposing problems using algorithms and describe software engineering processes.
3) Select fundamental circuit analysis techniques to solve problems in circuits that contain common electrical and electronic components.
4) Propose a design solution in response to a given scenario through requirements and functional analysis, evaluate that solution from an integrated system perspective.
5) Identify appropriate engineering tools and techniques to develop and validate a solution.
6) Identify the ethical considerations of data collection and analysis in engineering designs that may impact the suitability of solutions.
7) Describe project progress and outputs to stakeholders in review meetings, demonstrations and documentation.
8) Identify roles and responsibilities within a team and reflect on self and team behaviours that contribute to the successful conduct of a project.

Assessments

Assessment Task	Weight
A1: Workshop and practical related activities	5%
A2: Project	25%
A3: Learning Competencies	20% (hurdle)
A4: Content test - Software	5%
A5: Content test – Electrical and Materials	5%
A6: Final Examination	40%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.
- Pass both software and electrical learning competencies

MCD4550 – Engineering Numerical Analysis

Description

This unit introduces computing fundamentals in the context of dynamical systems. Programming structures including arrays, loops, conditional statements, and functions will be presented through the MATLAB environment. This use of MATLAB will initially focus on the analysis of physical systems involving linear and rotational motions that can be solved analytically. These systems will be analysed via kinematic, kinetic, and energy-based methods.

The unit will then examine a wider range of complex engineering and dynamical systems that do not exhibit analytical solutions. Problems related to these systems will be solved using numerical methods for linear regression, root-finding, integration, ordinary differential equations, and systems of linear equations. The underlying assumptions and uncertainties associated with the models and numerical methods will be emphasised.

Prerequisites:

Co-requisites:

MCD4500

Learning Outcomes

On completion of this unit, students should be able to:

1) Identify appropriate programming structures and functions to solve simple computational tasks.
2) Determine the motion of particles and rigid bodies using fundamental concepts of kinematics, kinetics and energy methods to analyse simple physical systems.
3) Select and implement appropriate programming structures and functions to solve problems involving the motion of particles and rigid bodies as well as other engineering problems.
4) Discern mathematical and computational information in prose descriptions of diverse engineering problems and incorporate this into analytically- and numerically-computed solutions.
5) Describe uncertainties and errors associated with numerical models and methods and their implications on the computed results.

Assessments

Assessment Task	Weight
A1: Workshop related activities	10%
A2: Practical work	25%
A3: Test 1	7.5%
A4: Test 2	7.5%
A5: Assignment	10%
A6: Final Examination	40%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.
- Achieve at least 45% in the total internal assessments and the final examination

MCD4600 – Intermediate Physics

Description

This unit continues on from MCD1180 Introductory Physics, and considers the analysis of construction materials, and evaluate the effect of forces and loads on structures and materials, basic concepts of practical investigation, rotational motion, gravitational fields, Newton law of universal gravitation, understanding of electric field, charges, simple and complex circuits, magnetic field and magnetism.

Through practical work students relate theory, theoretical knowledge to experimental processes and engage in critical observation and testing of physical phenomena via experimental work

Through Project work students gain communication skills and collaboration skills and soft skills such coordination, time management as it involves group work.

Through a field trip students can experience scientific research on site, bridging the gap between theoretical physics and practical applications.

Prerequisites

MCD1180 Introductory Physics.

Learning Outcomes

- Develop attitudes that include curiosity, open-mindedness, creativity, flexibility, integrity, attention to details and respect for evidence-based study.
- Develop a range of individual and collaborative science inquiry skills through a variety of investigation methodologies in the laboratory and field, refining investigations to improve data quality, analyse and interpret qualitative and quantitative data to provide evidence, recognising patterns, relationships and limitations of data. Demonstrate knowledge of the value of practical work.
- Understand the research, ethical and safety guidelines that govern the study and practice of the discipline and apply these guidelines to generate, collate, analyse and critically evaluate.
- Develop knowledge and understanding of key models, concepts, theories and laws of science to explain scientific processes and phenomena, and apply this understanding in familiar and unfamiliar situations, including personal, sociocultural, environmental and technological contexts
- Communicate clearly and accurately an understanding of the discipline using appropriate terminology, conventions and formats. Communicate effectively through oral and written communication skills
- A field trip for students to experience scientific research first-hand, bridging the gap between theoretical physics and practical applications. SiteVisit plays a vital role in modern science, contributing to breakthroughs in areas such as medical treatments and renewable energy technologies and practical applications of fundamental concepts of Physics.

MCD4600 – Intermediate Physics *CONTINUED*

Assessments

Assessment Task	Weight
A1: Test 1	10%
A2: Test 2	20%
A3: Site Visit and Student Interview	10%
A4: Scientific Inquiry	15%
A5: Project Work	20%
A6: Lab Work	25%

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve 50% or higher for your overall mark. If you receive a 49N grade, you will automatically be awarded a 48N result.