

Unit Guide

Diploma of Information Technology

Monash College

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Overview

DIPLOMA PART I		
Unit Code	Unit Name	Unit EFTSL
MCD1160	Introductory Engineering Computing	0.125
MCD1170	Introductory Chemistry	0.125
MCD1180	Introductory Physics	0.125
MCD1190	Chemistry A	0.125
MCD1200	Physics A	0.125
MCD1470	Engineering Practice	0.125
MCD1700	Introductory Mathematics	0.125
MCD1750	Intermediate Mathematics	0.125
DIPLOMA PART II		
Unit Code	Unit Name	Unit EFTSL
MCD1470	Engineering Practice	0.125
MCD2130 or MCD4490 or MCD4500	Functions and Their Applications Advanced Mathematics Engineering Mathematics	0.125 0.125 0.125
MCD4140 or MCD4730	Computing for Engineering Foundations of 3D	0.125 0.125
MCD4700	Introduction to Computer Systems, Networks and Security	0.125
MCD4710	Introduction to Algorithms and Programming	0.125
MCD4720	Fundamentals of C++	0.125
	Plus 2 Electives	0.250

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 grounding in the basic functioning of a computer system and how it is used within the engineering environment. Your knowledge of the following will be extended: advanced Microsoft Word features, Excel, and PowerPoint. Further, you'll learn how to solve real-world problems via the utilisation of a microcontroller and programming language, and you'll create and execute an effective oral presentation to share your findings.

This is a core unit in the Monash College Diploma of Engineering, Part 1.

Prerequisites

Nil

Learning Outcomes

On completion of this unit, students should 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 and format a spreadsheet.
4. Use functions and formulas to perform calculations in a spreadsheet.
5. Use graphics in a spreadsheet.
6. Use advanced facilities of a spreadsheet.
7. Designing slide shows, animation of a slide, slide transitions, use of templates & the auto content wizard.
8. Communicate technical content in effective oral presentations.
9. Implement problem solving strategies.
10. Decompose problems into simpler problems.
11. Construct and test simple computer programs.
12. Analyse and debug existing programs.
13. Recognise the importance of good practices in programming.
14. Understand how real-world problems can be addressed by the digital-word.

Assessments

- Test 1 - 10%
- Test 2 - 10%
- Assignment 1 - 20%
- Presentation 1 - 5%
- Assignment 2 - 30%
- Presentation 2 - 5%
- Lab Participation - 10%
- Weekly Quizzes - 10%
- No Final Examination

Students must achieve an overall mark of 50% or higher in order to pass this unit.

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.

This is a core unit in the Monash College Diploma of Engineering, Part 1.

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. Write rate laws and explain how the position of equilibrium can be altered, including examples from industry.
3. Explain the structure and naming of simple organic molecules.
4. Explain the concepts of bonding between atoms and relate this to the properties of compounds.

Assessments

- Test 1 - 5%
- Test 2 - 10%
- Quizzes (1 – 10) - 10%
- Poster / Presentation - 6%
- Laboratory – 9%
- Final examination - 60%

Students must achieve an overall mark of 50% or higher with a minimum mark of 40% in the final examination in order to pass this unit.

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.

This is a core unit in the Monash College Diploma of Engineering, Part 1.

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.
2. Select measuring equipment of appropriate accuracy.
3. Utilise appropriate numbers of significant figures.
4. Recognise the measurement error in selected equipment; identify sources of error in analytical procedures.
5. Distinguish between displacement, speed, velocity and acceleration.
6. Distinguish between scalar and vector quantities.
7. Apply the laws of motion to practical situations.
8. Demonstrate knowledge of mass, force and their relationship through Newton's laws.
9. Differentiate between work, energy, kinetic energy, potential energy and power.
10. Differentiate between force and torque and apply the laws of equilibrium to practical situations.
11. Distinguish between displacement, amplitude, period, frequency and wavelength of a wave.
12. Describe behavior of waves in terms of reflection, refraction, diffraction and interference.
13. Distinguish between energy, intensity and intensity level in a wave.

Assessments

- Test 1 - 4%
- Quizzes - 6%
- Test 2 - 8%
- Laboratory - 22%
- Final Exam - 60%

Students must achieve an overall mark of 50% or higher with a minimum mark of 40% in the final examination in order to pass this unit. Overall mark consists of internal assessments and final examination marks.

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.

This is a core unit in the Monash College Diploma of Engineering, Part 1.

Prerequisites

MCD1170 (Introductory Chemistry) or VCE Year 11 Chemistry Unit 3.

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. Relate organic chemical structures to observed chemical reactions, using examples from those involved in human nutrition and global cycling of nutrients.
3. Analyse the arrangement of elements in the periodic table (including its historical development) and relate trends in properties of elements to their atomic structure.

Assessments

- Test 1 - 7%
- Test 2 - 8%
- Quizzes - 10%
- Poster - 6%
- Laboratory – 9%
- Final Examination - 60%

Students must achieve an overall mark of 50% or higher with a minimum mark of 45% in the final examination in order to pass this unit. Overall mark consists of internal assessments and final examination marks.

MCD1200 – Physics A

Description

This unit continues on from MCD1180: Introductory Physics, and considers the basic concepts of practical investigation, rotational motion, electricity, magnetism and atomic theories. Through practical work, you will relate your theoretical knowledge to experimental processes and engage in critical observation and testing of physical phenomena.

This is a core unit in the Monash College Diploma of Engineering, Part 1.

Prerequisites

MCD1180 Introductory Physics.

Learning Outcomes

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

1. Demonstrate knowledge of the value of practical work.
2. Apply the theory of rotational motion.
3. Solve problems involving electricity and magnetism.
4. Explain a range of atomic theories.

Assessments

- Test 1 - 4%
- Quizzes (1-6) - 6%
- Test 2 - 8%
- Laboratory - 22%
- Final Exam - 60%

Students must achieve an overall mark of 50% or higher with a minimum mark of 45% in the final examination in order to pass this unit. Overall mark consists of internal assessments and final examination marks.

MCD1470 – Engineering Practices

Description

The practice of engineering involves applying scientific and technical knowledge, common sense and experience to solving problems of practical significance for people. During this unit, you will learn about engineering practices by studying important engineering skills that are not covered in traditional mathematics, chemistry and physics courses, and will apply these skills to projects. Through the study of this unit, you will improve your knowledge of the IT and engineering professions, design and analysis, communication, ethics and economics.

This is a core unit in the Monash College Diplomas of Engineering and IT, Part 1.

Prerequisites

Nil

Learning Outcomes

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

1. Gain a foundation of engineering principles and integrate these principles with chemistry, physics, mathematics, economics and design principles.
2. Develop conceptual understanding and problem-solving abilities by applying engineering principles.
3. Develop proficiency with technologies for analysis, simulation, theoretical prediction, access to information, and report preparation.
4. Describe the importance and relevance of engineering and its interdisciplinary ties to other fields and society, in order to become a scientifically literate and ethical citizen.
5. Demonstrate proper and ethical scientific and engineering practices, including safety, environment, and record keeping.
6. Interpret scientific and engineering results and draw reasonable conclusions.
7. Communicate effectively through written and oral reports.

Assessments

- Assignment 1 - 10%
- Assignment 2 (Test 1) - 10%
- Assignment 3 - 10%
- Assignment 4 (Test 2) - 10%
- Assignment 5 (Test 3) - 10%
- Final Design Project - 50%

Students must achieve an overall mark of 50% or higher in order to pass this unit.

MCD1700 – Introductory Mathematics

Description

This is a core unit in the Monash College Diploma Part 1 of Engineering, Information Technology and Science. The unit will provide students with the pre-requisite knowledge and skills to progress to the higher levels of mathematics in the Engineering IT and Science diploma; subsequently in the relevant degree programs.

Prerequisites

Nil

Learning Outcomes

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

1. Identify number sets in complex domain.
2. Use set notations to describe numbers.
3. Use interval notations to represent number sets.
4. Use real number line to express the number sets.
5. Use Venn diagram to represent number sets.
6. Solve linear and simultaneous linear equations using graphical and algebraic methods.
7. Use simultaneous linear equations to model and solve real world problems.
8. Recognise prime, rational, irrational and complex numbers.
9. Apply factor theorem to factorise polynomial functions.
10. Solve polynomial equations.
11. Solve quadratic equations using factorizing, quadratic formula or completing the square method.
12. Sketch graphs of quadratic functions.
13. Apply binomial expansion to solve problem in various algebraic contexts.
14. Simplify rational functions inequalities.
15. Plot complex numbers in the Argand diagram.
16. Find the rule for inverse function for given functions and sketch the graph of inverse functions.
17. Solve system of equations and literal equations.
18. Use exponential and logarithmic functions to model application problems.
19. Sketch graphs of exponential and logarithmic functions.
20. Solve exponential and logarithmic equations.
21. Convert radians in to degrees and vice versa.
22. Apply trigonometric ratios of $0^\circ, 30^\circ, 45^\circ, 60^\circ, 90^\circ$ to solve problem in various geometric and analytical geometric contexts.
23. Apply sine and cosine rule solve to solve problem in various geometric and analytical geometric contexts.
24. Sketch the graphs of trigonometric functions of sin, cos, tan, sec, cosec and cot.

25. Identify amplitude, period and mid line of $a \sin(bx+c)+d$ and $a \cos(bx+c)+d$.
26. Classify vectors and scalars.
27. Apply vector algebra to solve problems in geometry.
28. Express vectors using \hat{i} and \hat{j} components. In \square^2 .
29. Express Cartesian coordinates in \square^2 .
30. Calculated distance between two points in \square^2 .
31. Use the formula $\left(\frac{nx_1 + mx_2}{n+m}, \frac{ny_1 + my_2}{n+m} \right)$ to divide a line segment by given ratio.
32. solve problems related in Parallel and perpendicular lines in \square^2 .
33. Recognise angles relating in parallel lines triangles and polygons.
34. Identify congruent and similar triangles.
35. Apply properties of congruent and similar triangles to solve problems in plane geometry and analytical geometry.
36. Recognise rectangle, rhombus, parallelogram and square from complex geometrical diagrams. Apply properties of rectangle, rhombus, parallelogram and square to solve problems in plane geometry and analytical geometry.

Assessments

- Topic Quizzes - 10%
- Test - 15%
- Assignment - 10%
- Tutorial participation - 5%
- Final Examination - 60%

In order to pass this unit, students must:

- ❖ Achieve at least 65% in the tutorial participation
- ❖ Achieve at least 40% in the total internal assessments
- ❖ Achieve at least 40% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD1750 – Intermediate Mathematics

Description

This is a core unit in the Monash College Diploma Part 1 of Engineering, Information Technology and Science. The unit will provide students with the pre-requisite knowledge and skills to progress to the higher levels of mathematics in the Engineering IT and Science diploma; subsequently in the relevant degree programs.

Prerequisites

MCD1700 (Introductory Mathematics)

Learning Outcomes

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

1. Apply the concept of vectors in Cartesian form in analytical geometry.
2. Find and apply position vector, magnitude of vector, unit vector, angles between vectors and direction cosines in two and three-dimensional problems.
3. Describe linear dependency and independency in vectors.
4. Find scalar and vector resolute, scalar product of vectors, application of scalar product.
5. Use Pythagorean identities $\sin^2 \theta + \cos^2 \theta = 1$; $\tan^2 \theta + 1 = \sec^2 \theta$; $1 + \cot^2 \theta = \csc^2 \theta$ in problem solving.
6. Apply compound-angle identities in various geometric and analytical geometric applications.
7. Find general solutions of simple and complicated trigonometric equations.
8. Apply limits, continuity and differentiation to solve mathematical problems.
9. Identify and analyse the nature of critical point using derivative tests.
10. Apply the differentiation to solve the problems in various context of engineering and other disciplines.
11. Extend the concept of derivatives by inverse circular functions.
12. Perform anti-differentiation calculations using integration by substitution, integration by partial fractions.

Assessments

- Topic Quizzes - 10%
- Test - 15%
- Oral Presentation - 10%
- Tutorial participation - 5%
- Final examination - 60%

Students must achieve at least 40% in the internal assessments, 45% in the final examination and an overall mark of 50% in order to pass this unit.

MCD2040 – Managing People and Organisations

Description

This unit offers a critical introduction to fundamental questions in the discipline of management. What is management? What do managers do and how do I become a good manager? What are the effects of management practice on employees and their experience of being managed? Key contemporary issues of globalization and cultural diversity, different types of organisations and social responsibility affect the answers to these questions and are therefore woven throughout the curriculum. The unit draws upon a range of sources – academic, practical, popular cultural – to engage students in multiple ways of understanding management.

This is a core unit in the Monash College Diploma of Business, part 2A. This course is divided into three themes to help students have a better grasp of managing people and organisations. These are management, managing and being managed.

Prerequisites

Nil

Learning outcomes

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

1. Demonstrate a contextual appreciation of management as an evolving set of contested ideas for how managers may influence people, organisations, and their environments to achieve organizational goals.
2. Identify what managers do in practice, and analyse how the various activities that comprise managing both shape and are shaped by individual and group behavior and diversity in organizational settings.
3. Critically evaluate the impact of contemporary management practices on employee experiences of being managed.
4. Explain the concepts of stakeholder interests and socially responsible management, assessing their implications for individuals and organisations in a global context.
5. Apply research, analytical and communication skills required of the management discipline to address business challenges.

Assessments

- Pre-tutorial assessments - 10%
- Tutorial test - 10%
- Reciprocal Teaching Practices (RTP) - 10%
- Management Consulting Project (MCP) Report - 10%
- Management Consulting Project (MCP) Group Presentation – 10%
- Final Examination - 50%

Students must achieve at least 50% in the final examination and an overall mark of 50% or higher in order to pass this unit.

MCD2080 – Business Statistics

Description

What is statistics and why is the study of statistics required in a business degree? Experts in statistics play an important role in modern business. In addition, everyone in a business-related job needs to be able to understand statistical discussion of issues and most need to be able to use descriptive in reports and presentations.

MCD2080 is equivalent to Monash university's EFT1100. It is also a prerequisite for a number of second and third level units in data analysis that are available in the degree program.

Prerequisites

MCD1110 Data Analysis and MCD1550 Introduction Mathematics for Business or equivalent (For Business stream only. For Part 2 students, Part 1 pre-requisites are not applicable).

MCD1110 Data Analysis and MCD1230 Applied Mathematics or equivalent (For Commerce stream only. For Part 2 students, Part 1 pre-requisites are not applicable).

Learning outcomes

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

1. Interpret business data using descriptive statistics techniques, including the use of Excel spreadsheet functions.
2. Apply simple concepts of probability and probability distributions to problems in business decision-making.
3. Describe the role of statistical inference and apply inference methods to single population means and proportions.
4. Interpret and evaluate relationships between variables for business decision-making using the concepts of correlation and simple linear regression.
5. Apply the chi-square test of independence to test whether there is relationship between two categorical variables.
6. Interpret time series components and apply suitable time series techniques of forecasting to business and financial series and interpreting the results.

Assessments

- Mid-trimester test - 10%
- Lecture activities - 10%
- Tutorial Engagement and participation - 30%
- Final Examination - 50%

Students must achieve at least 25/50 marks in the final examination (exam hurdle) and an overall mark of 50% or higher in order to pass this unit.

MCD2130 – Functions and Their Applications

Description

This unit is undertaken by students who have not met the mathematics entry requirement for their destination degree. This unit is designed as an equivalent to VCE Mathematical Methods 3/4, excluding statistics. It is primarily for those students who have not completed VCE Mathematical Methods 3/4, or completed VCE Mathematical Methods 3/4 with a low grade, or who have not completed an equivalent to VCE Mathematical Methods 3/4 as recognised by Monash College.

Areas of study include functions, domain and range, function representation; function algebra; composition of functions; inverse of functions; transformations of functions; different types of functions including linear, polynomial, rational, exponential, logarithmic and circular functions; modelling with functions; rates of change; introduction to differentiation and integration.

Prerequisites

Year 11 (or equivalent) Mathematics

Learning Outcomes

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

1. The notions of function and their representation as tables, graphs or mathematical expressions.
2. Basic characteristics of linear, polynomial, rational, exponential, logarithmic and trigonometric functions.
3. The algebra of functions.
4. Methods of transformations of a function and finding inverse functions.
5. The notion of rate of change of a function and finding derivatives of functions.
6. Finding the anti-derivative of a function and using its main application: The Fundamental Theorem of Calculus.

And will have developed skills in:

1. Identifying different types of functions behavior by means of neat sketch-graphs; determining basic properties and behavior 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 behavior; calculating simple derivatives and integrals; communicating and interpreting mathematical results.

Assessments

- Diagnostic online assessment quizzes - 10%
- Tutorial participation - 10%
- Mini test 1 - 5%
- Assignment 1 - 5%
- Mini test 2 - 5%
- Assignment 2 - 5%
- Final Examination - 60%

Students must achieve least 40% in the final examination (exam hurdle) and an overall mark of 50% or higher in order to pass this unit.

MCD4140 – Computing for Engineering

Description

This unit introduces software development and design using MATLAB, including data types and variables, structured programming, M-files and functions, numerical errors and uncertainty and the programming of numerical techniques. Numerical techniques covered include root finding, interpolation, linear and non-linear regression, numerical integration and ordinary differential equations.

Prerequisites

Nil

Co-requisites

MCD4500 Engineering Mathematics

Learning Outcomes

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

1. Develop an understanding of commonly used numerical methods for solving engineering problems; the ability to appropriately apply numerical methods to engineering problems and to know some of the limitations of such methods.
2. Develop structured problem solving techniques and to develop a knowledge of programming concepts and the ability to write simple programs.

Assessments

- Lecture Quizzes and Computer Labs - 30%
- Assignment - 10%
- Final Examination - 60%

In order to pass this unit, students must:

- ❖ Attempt all internal assessments
- ❖ Achieve at least 45% in the total internal assessments
- ❖ Achieve at least 45% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4160 – Physics for Engineering

Description

Engineers apply their technical expertise to an enormous variety of situations. In particular, an engineer will develop solutions to problems, design new technologies or utilize existing technologies that requires knowledge of both the macro world, wherein classical physics principles prevail and of the quantum underpinnings of the physical world. This unit acquaints students with physics concepts and related engineering applications that bridge all scales of inquiry.

The practical component develops measurement, analysis and communication skills.

This is an optional unit in the Monash College Diploma of Engineering Part 2.

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

- Quizzes / Assignment - 10%
- Test 1 (Mechanics) - 14%
- Test 2 (Oscillation and Waves) - 14%
- Laboratory Work - 22%
- Final Examination - 40%

In order to pass this unit, students must:

- ❖ Achieve at least 45% in the total internal assessments
- ❖ Achieve at least 45% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4290 – Engineering Mobile Apps

Description

This unit introduces students to the use of Information Technology (IT) in modern engineering practice. Students will learn an object-oriented approach to both computer systems and software engineering for solving engineering problems. Students will work in small teams to develop a mobile application that meets a contemporary need in engineering. The fundamental stages in the software development lifecycle will be introduced, including requirements analysis, design, implementing and verification. Students will use IT tools to support the engineering process.

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

Prerequisites

Nil

Learning Outcomes

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

1. Describe the capabilities and limitations of mobile computing devices, as well as the interaction between developments in IT and their use in modern Engineering practice.
2. Construct mobile applications that utilise device capabilities to solve engineering problems using a simple object-oriented software approach.
3. Employ IT tools for aspects of the software engineering process, including a code editor, debugger, shared code repository and version control system, task-tracking and team communication tools.
4. Prepare written technical documentation in a standard design formalism from a template.
5. Complete tasks as part of a team, and communicate effectively with team members.
6. Prepare and deliver oral presentations in a professional engineering format.

Assessments

- Assignment 1 - 9%
- Presentation 1 – 3%
- Assignment 2 - 18%
- Presentation 2 – 6%
- Practical Class Work – 6%
- Tutorial Class Work – 6%
- Pre-reading / Workshop Quizzes – 12%
- Examination - 40%

In order to pass this unit, students must:

- ❖ Achieve at least 45% in the total internal assessments
- ❖ Achieve at least 45% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4390 – Chemistry I

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.

This is a core unit in the Monash college Diploma of Engineering and Diploma of Science Part 2.

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 gases 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.

Assessments

- Tutorial participation - 3%
- Laboratory component - 30%
- Online assessments - 10%
- Lab Online Quiz – 1%
- In-Class Online Quiz – 1%
- Final examination - 55%

In order to pass this unit, students must:

- ❖ Achieve at least 15% out of 30% in the lab component
- ❖ Achieve at least 30% out of 55% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4400 – Chemistry II

Description

The aim of this course is for students to learn about the understanding of general and physical chemistry to explore the behaviour of chemicals in a number of interesting case studies, incorporating a range of significant biological and synthetic molecules such as carbohydrates, proteins, and polymers and pharmaceutically important drugs. Along the way, students will discuss the formation of inorganic coordination compounds and investigate their role in colour and magnetism, and metals in biological systems. The concepts developed within the tutorials are complemented through a laboratory program where students will have the opportunity to develop analytical techniques and design their own experiments to solve a range of chemical problems.

Prerequisites

MCD4390 (Chemistry I)

Learning Outcomes

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

1. Demonstrate a basic understanding of chemical nomenclature.
2. Describe the classification, bonding, structure, properties and reactions of a wide range of organic compounds according to the functional groups they contain.
3. Describe the nature of biological and synthetic macromolecules such as proteins, carbohydrates and polymers.
4. Discuss the properties of transition elements.
5. Describe a wide range of coordination compounds and their structures, reactions and applications in both synthetic materials and biological materials.
6. Describe how spectroscopy can be used to investigate molecular structure.
7. Foster practical skills by exploiting an inquiry-based approach to the chemistry laboratory experience.
8. Communicate chemistry, discuss the social and environmental responsibility of chemists in the global community.

Assessments

- Lab component (Pre-labs/Reports) - 30%
- Online assessment - 10%
- Tutorial attendance, participation & assessments - 5%
- Final examination - 55%

In order to pass this unit, students must:

- ❖ Achieve at least 50% in the lab practical component
- ❖ Achieve at least 30% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4410 – Blueprints for Life

Description

This unit will explore the fundamental processes and patterns common to all life on Earth. It will examine how living organisms grow, develop diverse and complex structures, harness and utilize energy and transmit their life blueprints to the next generation. In this unit, students will progress through fundamental themes in cellular biology, biochemistry, genetics, genomics and microbiology. They will examine contemporary issues in biological sciences and the societal impact that biology has by learning from world-class researchers and industry experts.

Prerequisites

Nil

Learning Outcomes

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

1. Identify and describe the concepts, processes and practical applications of cell biology, biochemistry, genetics, molecular biology and microbiology in society and everyday human life
2. Demonstrate proficiency in communicating scientific results through a range of formats (written and oral)
3. Formulate hypotheses, collect experimental data and demonstrate proficient in interpreting their results
4. Demonstrate competence and precision in the use of common life sciences equipment and techniques
5. Utilize research skills including database searches to synthesise and interpret information related to scientific research, using appropriate conventions for scientific attribution
6. Work effectively, responsibly, safely and ethically, both individually and in peer or team contexts

Assessments

- A1: Weekly Assessment Quiz – 10%
- A2: Practical Assessments & Tutorial Participation – 40%
- A3: Final Examination – 50%

Students must achieve an overall mark of 50% or higher in order to pass this unit.

MCD4420 – Life on Earth

Description

This unit views the extraordinary diversity of life on Earth through the prism of evolutionary theory and in the context of human and environmental health. Students will examine how animals and plants, through the agents of gene mutation and natural selection, are able to adapt to new and changing environments. Diverse physiological, reproductive and behavioural solutions to life's challenges will be used to illustrate how evolutionary forces and constraints shape us and the world around us. We will then examine how interactions within and between species and with the non-living environment generate the immense ecological variety seen on Earth. Contemporary issues and the societal impact of biology will be explored by learning from world-class researchers and industry experts.

Students will undertake self-directed learning through the online environment. These online activities, readings and instructional videos will be complemented by face-to-face workshops where they will collaborate with peers and teaching staff to deepen their understanding of the biological concepts introduced each week. Students will gain hands-on experience and develop experimental and analytical skills in the laboratory environment. Optional drop-in tutorials are available for additional learning support. This unit is ideally paired with MCD4410.

Prerequisites

Nil

Learning Outcomes

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

1. Identify and describe the role of biological concepts and processes of evolution, plant and animal physiology, reproduction and life history strategies and core ecological concepts in society and everyday human life.
2. Demonstrate proficiency in communicating scientific results through a range of formats (written and oral).
3. Formulate hypotheses, collect experimental data and demonstrate proficiency in interpreting their results.
4. Demonstrate understanding of the use of common life sciences equipment and techniques.
5. Utilise research skills including database searches to synthesise and interpret information related to scientific research, using appropriate conventions for scientific attribution.
6. Work effectively, responsibly, safely and ethically, both individually and in peer or team contexts.

Assessments

- Weekly Assessment Quiz and Active Participation - 18%
- Practical Assessment - 32%
- Examination - 50%

Students must achieve an overall mark of 50% or higher and at least 50% in the 'Weekly Assessment Quiz and Active Participation' task in order to pass this unit.

MCD4490 – Advanced Mathematics

Description

Functions and coordinate geometry: types of functions, composite functions, inverse functions, modelling 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

MCD1750 (Intermediate Mathematics) 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 behaviour.
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. Demonstrate understanding of the concepts of limit, continuity, differentiable and integrable functions.
5. Evaluate limits of piecewise functions and of rational functions at infinity.
6. Apply differentiation techniques to related rates of change problems and optimization problems.
7. Use differentiation rules to find derivatives of implicit and explicit functions.
8. Use simple integration techniques to find definite and indefinite integrals, including by substitution and partial fractions.
9. Apply integration techniques to calculate areas, average values, volumes and centres of mass or moment.
10. Solve kinematics problems and set up and solve problems involving Newton's laws of motion.
11. Express and explain mathematical techniques and arguments clearly in words.

Assessments

- Assignment 1 - 5%
- Test - 10%
- Oral Presentation - 5%
- Lecture quiz and attendance - 10%
- Tutorial participation - 10%
- Final Examination - 60%

In order to pass this unit, students must:

- ❖ Attempt all internal assessments and achieve at least 45% in the total internal assessments
- ❖ Achieve at least 45% in the final examination
- ❖ Achieve an overall mark of 50% or higher

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, use in error analysis. Ordinary differential equations: first order, second order with constant coefficients, repeated roots, simple non-homogeneous cases. Laplace transforms: elementary functions, inversion by tables; shifting; derivatives, applications to ODEs. 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. Evaluate cross products of vectors and use vectors to represent lines and planes.
2. Perform matrix algebra.
3. Solve up to 3x3 systems of linear equations and find eigenvalues and eigenvectors.
4. Use hyperbolic functions.
5. Evaluate improper integrals of elementary functions and use integration by parts.
6. Solve first order ordinary differential equations, including by separable variables and integrating factors.
7. Solve second order linear differential equations with constant coefficients.
8. Use differential equations to model simple engineering problems.
9. Evaluate and invert Laplace transforms and use them to solve ordinary differential equations.
10. Express and explain mathematical techniques and arguments clearly in words.

Assessments

- Assignment 1 - 5%
- Test - 10%
- Assignment 2 - 5%
- Lecture quiz and attendance - 10%
- Tutorial participation - 10%
- Examination - 60%

In order to pass this unit, students must:

- ❖ Attempt all internal assessments and achieve at least 45% in the total internal assessments
- ❖ Achieve at least 45% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4700 – Introduction to Computer Systems, Networks and Security

Description

The unit introduces students to fundamentals of computer systems, networks and security. It provides basic knowledge of computer organisation and architecture, operating systems, networking architecture, technology and operation. It introduces the concepts of security goals for protecting common modern computer systems and communication networks from adversaries and the deployment of suitable countermeasures to achieve these goals.

Prerequisites

Nil

Learning Outcomes

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

1. Analyse simple logic circuits.
2. Explain and analyse key computer structure and its operations.
3. Analyse and evaluate various strategies used by an operating system in managing the system resources and running applications efficiently.
4. Describe the operation of communication and networking models and develop simple solutions to network problems.
5. Critically assess the security threats and risks to an organisation's information assets and propose suitable security control technologies that can be applied to reduce the security risks or in making procurement decisions.

Assessments

- Practical Class Work - 15%
- Assignment 1 - 20%
- Assignment 2 - 15%
- Final Examination - 50%

In order to pass this unit, students must:

- ❖ Achieve at least 40% in the total internal assessments
- ❖ Achieve at least 40% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4710 – Introduction to Algorithms and Programming

Description

This unit introduces programming fundamentals and the Python language to students. The unit provides a foundational understanding of program design and implementation of algorithms to solve simple problems. Fundamental programming control structures, built in and complex datatypes and mechanisms for modularity will be presented in Python.

Topics covered will include basic input and output, program control structures, basic data structures and modular program structure. Problem-solving strategies and techniques for algorithm development, iteration and recursion, algorithm efficiency and the limitations of algorithms will be introduced.

Prerequisites

Completed at least one of: (MCD1220, MCD2130, MCD4170, MCD4490, OR MCD4500) and MCD4720.

Learning Outcomes

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

1. Recognise the relationship between a problem description and program design.
2. Implement problem solving strategies.
3. Demonstrate how basic data structures (list, graphs, trees, sets, tables) function.
4. Investigate different strategies for algorithm development and evaluate these to select an appropriate solution to a given problem.
5. Decompose problems into simpler problems.
6. Determine the complexity of simple algorithms.
7. Recognise the limitations of algorithms.

Assessments

- Mid-trimester Test 1 – 8%
- Assignment 1 – 8%
- Mid-trimester Test 2 – 12%
- Assignment 2 – 10%
- In-lecture Quizzes – 10%
- Practical Class Work – 12%
- Final Examination – 40%

In order to pass this unit, students must:

- ❖ Achieve at least 40% in the total internal assessments
- ❖ Achieve at least 40% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4720 – Fundamentals of C++

Description

This unit introduces programming fundamentals and the C++ language to students. The unit provides a foundational understanding of program design and implementation of algorithms to solve simple problems. Fundamental programming control structures, built in and complex datatypes and mechanisms for modularity will be presented in C++. This unit also places a focus on object-oriented design principles, using object-oriented design as a process for program design and problem solving. More advanced object-oriented programming topics such as inheritance and polymorphism will also be covered. Other C++ fundamentals such as pointers and the STL will be presented, as will implementations of algorithms and data structures used in problem solving.

Prerequisites

Nil

Learning Outcomes

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

1. Design, implement, compile, execute and debug programs using fundamental C++ constructs.
2. Apply fundamental programming control structures, including conditional statements, iteration and recursion to solve programming problems.
3. Apply object-oriented design principles, including inheritance and polymorphism, to solve programming problems.
4. Create C++ programs using pointers to demonstrate an understanding of efficient memory use and management.
5. Troubleshoot C++ program code using an Integrated Development Environment and its tools.

Assessments

- Assignment 1 – 10%
- Assignment 2 – 10%
- Assignment 3 – 20%
- Practical Class Work – 10%
- Examination – 50%

In order to pass this unit, students must:

- ❖ Achieve at least 40% in the total internal assessments
- ❖ Achieve at least 40% in the final examination
- ❖ Achieve an overall mark of 50% or higher

MCD4730 – Foundations of 3D

Description

This unit is an introduction to the techniques, frameworks and processes comprising 3D modelling and 3D imaging. Foundations of 3D aims to give students an understanding of 3D modelling by developing skills in 3D model creation for a variety of contexts, including 3D prototyping, 3D visualisation and 3D modelling for games and animation. Students will communicate their knowledge of 3D theory through the production of designs that demonstrate geometrical modelling, texture mapping, virtual lighting techniques, camera positioning and rendering procedures.

Prerequisites

Nil

Learning Outcomes

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

1. Evaluate and assess techniques used in the 3D creation process.
2. Research, evaluate and implement 3D geometry, 3D texturing and 3D rendering techniques.
3. Develop and modify 3D models and 3D environments.
4. Design, create and detail 3D models and 3D scenes for diverse media.

Assessments

- Assignment 1 - 20%
- Assignment 2 - 20%
- Assignment 3 - 30%
- Tutorial Test 1 - 10%
- Tutorial Test 2 - 10%
- Tutorial Test 3 - 10%

In order to pass this unit, students must:

- ❖ Achieve at least 40% in the total internal assessments
- ❖ Achieve at least 40% in the final examination
- ❖ Achieve an overall mark of 50% or higher