Unit Guide

Diploma of Science

Monash College

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Overview

The Diploma of Science provides a pathway into the second year of a Monash University Science degree. Core subjects introduce students to the fundamentals of the scientific method in both theory and practice, and units are available across a range of science and related disciplines including Chemistry, Physics, Biology, Mathematics, Psychology, Computing and Engineering.

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

Diploma of Science Course Outcomes

On completion of the Diploma of Science, 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 science disciplines, underpinned by scientific and mathematical theory.

2. Identify and communicate advice in a variety of science disciplines to address technical problems in accord with management requirements

3. Utilise technical skills to demonstrate understanding and problem solving in relation to science 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 science disciplines

5. Manage work priorities and coordinate the work of others in accord with parameters set by management in a number of science 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.

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DIPLOMA PART I			
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
MCD1700	Introductory Mathematics	0.125	6
MCD1190	Chemistry A	0.125	6
MCD1200	Physics A	0.125	6
MCD1710	Introductory Biology	0.125	6
MCD1750	Intermediate Mathematics	0.125	6
DIPLOMA PART 2			
Unit Code	**Unit Name**	**Unit EFTSL[1]**	**Credit Points[2]**
MCD2080	Business Statistics	0.125	6
MCD4390	Chemistry 1	0.125	6
MCD4410	Blueprints for Life	0.125	6
	1 elective*	0.125	6
MCD4400	Chemistry 2	0.125	6
MCD4420	Life on Earth	0.125	6
	2 electives*	0.125 x 2	6 x 2
	*At least 1 elective must be a **Science elective** from: MCD2130 Functions and Their Applications MCD4160 Physics for Engineering MCD6080 Psychology 1A MCD6110 Psychology 1B (MCD6080 is a pre-requisite) MCD4490 Advanced Mathematics (cannot pick up MCD4490 if you have completed MCD2130) MCD4500 Engineering Mathematics (MCD4490 is a pre-requisite) MCD4440 Discrete Mathematics for Computer Science (you can only pick up this unit in your 2nd Trimester) **Other electives:** MCD4770 Professional Practice MCD2040 Managing People and Organisations	0.125 0.125 0.125 0.125 0.125 0.125 0.125 0.125	6 6 6 6 6 6 6 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. Credit points in Part 2 units count towards the first year of your Monash University degree.

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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 and programming languages.

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 professional presentation slides, incorporating text, graphics and sound, and presentation of information, including the use of bullet points

8. Designing slideshows, animation of a slide, slide transitions, use of templates & the auto content wizard.

9. Communicate technical content in effective oral presentations.

10. Implement problem-solving strategies.

11. Decompose problems into simpler problems.

12. Construct and test simple computer programs.

13. Analyse and debug existing programs.

14. Recognise the importance of good practices in programming.

15. Understand how real-world problems can be addressed in the digital age.

Assessments

- Test 1 - 10%
- Test 2 - 10%
- Assignment 1 - 25%
- Assignment 2 - 35%
- Lab Participation - 10%
- Weekly Quizzes - 10%

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.

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

- Test 1 - 10%
- Test 2 - 20%
- In-class Activities and Quizzes - 20%
- Group Presentation - 15%
- Laboratory work – 20%
- Scientific Communication - 15%

Students must achieve an overall mark of 50% or higher 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.

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

- Laboratory - 20%
- Test 1 - 15%
- Test 2 - 25% (Moderated)
- Weekly In-class Activities - 20%
- Projects - 20%

Students must achieve an overall mark of 50% or higher in order to pass this unit. Overall mark consists of all the internal assessment 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.

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

- Test 1 - 7%
- Test 2 - 8%
- Quizzes and In-class Activities - 20%
- Presentation - 10%
- Laboratory – 20%
- Final Examination - 35%

Students must achieve an overall mark of 50% or higher 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.

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. Analysis and evaluate the construction materials, and evaluate the effect of forces and loads on structures and materials.

5. Explain a range of atomic theories.

Assessments

- Test 1 - 5%

- Quizzes - 10%

- Test 2 - 10%

- Laboratory work - 20%

- Project Work- 15%

- Final Exam - 40%

Students must achieve an overall mark of 50% in order to pass this unit. Overall marks consist of internal assessments and final examination marks.

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MCD1470 – Engineering Practice

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.

Prerequisites

Nil

Learning Outcomes

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

1. Undertake a simple design and build project in a competitive team-based environment.

2. Develop conceptual understanding and problem-solving abilities by applying engineering principles.

3. Develop proficiency with technologies for information gathering 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. Identify professional issues relevant to a contemporary engineering challenge and appropriate responses.

6. To present and discuss engineering issues and concepts in a range of writing formats, including essay and technical report.

7. Demonstrate proper and ethical scientific and engineering practices, including safety, environment, and record keeping.

8. Interpret scientific and engineering results and draw reasonable conclusions.

9. Work with a small team to plan and manage an engineering project and report on team performance.

10. Communicate effectively through written and oral reports.

Assessments

- Assessment 1: LR - 10%

- Assessment 2: Test 1 - 10%

- Assessment 3: OP1 - 10%

- Assessment 4: Test 2 - 10%

- Assessment 5: Test 3 - 10%

- Assessment 6: Project - 50%

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

MCD1700 – Introductory Mathematics

Description

The 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. 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 problems 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 in degrees and radians to solve problems in various geometric and analytical geometric contexts.
23. Apply sine and cosine rule solve to solve problems 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.

MCD1700 – Introductory Mathematics CONTINUED

28. Express vectors using i and j components.

29. Express coordinates in Cartesian coordinates

30. Calculated distance between two points

31. Use the formula +to divide a line segment by a given ratio.

32. Solve problems related in Parallel and perpendicular lines

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.

37. 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

MCD1710 – Introductory Biology

Description

This unit will explore the fundamental processes and patterns common to life on Earth. It will examine how living organisms grow, develop diverse and complex structures and pass on their genetic material to the next generation. The students will progress through principal themes in biochemistry, cellular structure and systems, cell division and reproduction, genetics and evolution, biodiversity and ecosystems. 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. We will then examine how interactions within and between species and with the non-living environment generate the enormous variety of life on Earth.

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 processes of evolution 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

- A1: Formative Test Assessment with student-led annotated feedback (weekly) - 20%

- A2: Completed Lab Practicals (6 practicals for submissions) - 30%

- A3: Self Access Quizzes (weekly) - 10%

- A4: In class open book summative Test - 40%

In order to pass this unit, students must achieve an overall mark of 50% or higher.

MCD1750 – Intermediate Mathematics

Description

This unit continues on from MCD1700 Introductory Mathematics. The 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

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. Determine linear dependency and independency in vectors.

4. Find scalar and vector resolute, scalar product of vectors and solve application questions relating to the concepts.

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 points using derivative tests.

10. Apply differentiation concepts in curve sketching.

11. Understand and represent implicit equations as parametric equations.

12. Apply differentiation to both explicit and parametric equations to solve problems in various contexts of engineering and other disciplines.

13. Perform basic anti-differentiation calculations and the technique of integration by substitution.

14. Apply integration techniques to find areas under curves.

Assessments

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

In order to pass this unit, students must:

❖ Achieve at least 40% in the total internal assessments

❖ Achieve at least 45% in the final examination

❖ Achieve an overall mark of 50% or higher

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MCD2040 – Management 1: Managing People and Organisations

Description

This unit is designed to develop an understanding of how organisations are managed and to enable the application of analytical skills to a range of managerial and organisational issues.

Prerequisites

Nil

Learning Outcomes

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

- 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 organisational goals

- identify what managers do in practice, and analyse how the various activities that comprise managing both shape and are shaped by individual and group behaviour and diversity in organisational settings

- critically evaluate the impact of contemporary management practices on employee experiences of being managed

- explain the concepts of stakeholder interests and socially responsible management, assessing their implications for individuals and organisations in a global context

- apply research, analytical and communication skills required of the management discipline to address business challenges.

Assessments

Task		Weight
Pre-Tutorial Assessments	Week 1 – week 10	10%*
RRD (Best 6 out of 8)	Week 2 – week 9	10%*
Class Engagement Activities (Best 8 out of 10)	Week 2 – week 11	10%
In Class Tests (x2)	Wk 3 (5%), Wk 4 (10%)	15%*
Part 1 - Management Consulting Project - Report	Week 7	15%
Part 2 - Management Consulting Project - Presentation	Week 10	25%
Management Consulting Project – Presentation	Week 12	15%

*Combined total for the Trimester

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MCD2040 – Management 1: Managing People and Organisations *CONTINUED*

Requirements to Pass the Unit

- In order to achieve a pass in this unit, students must achieve 50% or higher for their overall internal mark.

Mode of study

MCD2040 uses a flipped classroom approach which requires students to be independent learners. This unit is taught face-to-face. The lecture materials are available online for self-access by students. Students are required to review lecture materials and readings at home prior to coming to the tutorials.

MCD2080 – Business Statistics

Description

This unit is designed to provide skills in data analysis and statistical processes as applied to business and basic business computations and techniques.

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

In this unit you will learn to use basic statistical techniques and apply them to problems across a range of areas in business.

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

- interpret business data using descriptive statistics techniques, including the use of Excel spreadsheet functions

- apply simple concepts of probability and probability distributions to problems in business decision-making

- describe the role of statistical inference and apply inference methods to single population means and proportions

- interpret and evaluate the relationships between variables for business decision-making, using the concepts of correlation and multiple linear regression

- be able to describe. explain, predict/forecasting and control strategies using time series data

- to be able to identify components of time series, model and interpret coefficients, and predict equipping you with techniques of forecasting time series data in real life.

- Develop skills in spreadsheet modelling and understand how simulation is used to address business problems.

These outcomes are important to a successful career in Business.

MCD2080 – Business Statistics *CONTINUED*

Assessments

Task	Weight
Lecture Practice and Quizzes	15%
Assignment	10% (Week 6)
Tutorial Workshops	15%
Mini Tests	10% (FAT 1: 5%, FAT 2: 5%)
Final Examination	50% (40% hurdle)

* Approved calculator will be allowed for tests and exam. Assignment should be done using Excel.

Requirements to Pass the Unit

- In order to achieve a pass in this unit, you must achieve at least 40% (exam hurdle) on the final exam and your overall result must be 50% or higher.
- Your overall result combines your internal assessment and your exam results.
- 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 are no work placement components.

MCD2130 – Functions and Their Applications

Description

The focus of this unit will be on the behavior 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 recommended that students have studied Year 11 (or equivalent) Mathematics.

Learning Outcomes

On completion of this subject, 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:

● 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;

● Using function algebra;

● Calculating composition functions and inverse functions; using functions as models of real-life behaviour; calculating simple derivatives and integrals; communicating and interpreting mathematical results;

● and will have developed and/or strengthened the ability to present mathematical arguments in writing.

Assessments

Task	Weight
Two Assignments	10% (each worth 5% respectively)
Two Mini Tests	10% (each worth 5% respectively)
Participation	10%
Diagnostic Online Quizzes	10%
Final Examination	60% (40% exam hurdle)

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

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 require 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.

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

MCD4390 – Chemistry 1

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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 glasses.

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

- Tutorial participation (3x tutorial tests) - 10%

- Laboratory component (Online Reports) - 30%

- Online assessments (12 x pre-workshop quizzes) - 10%

- Final examination - 50%

In order to pass this unit, students must:

- ❖ Achieve a minimum mark of 45% in the lab component.

- ❖ Achieve an overall mark of 50% or higher.

MCD4400 – Chemistry 2

Description

You will explore the behaviour and characteristics of chemicals through a number of interesting case studies incorporating a range of significant biological and synthetic molecules. Along the way, students will discuss the formation of inorganic coordination complexes and investigate their role in colour and magnetism, and metals in biological systems. The concepts developed within the workshops and tutorials are complemented through a laboratory program where you will have the opportunity to use a variety of analytical techniques 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, structure and properties of a wide range of organic compounds according to the functional groups they contain.

3. Discuss the properties of transition elements.

4. Describe a wide range of coordination compounds and their structures, reactions and applications in both synthetic materials and biological materials.

5. Employ spectroscopy analysis to investigate molecular structure.

6. Foster practical skills by exploiting an inquiry-based approach to the chemistry laboratory experience.

7. Communicate chemistry, discuss the social and environmental responsibility of chemists in the global community.

Assessments

●   Lab component (Prelabs / Reports) - 30%

●   Online assessment - 10%

●   Tutorial attendance, participation & assessments - 10%

●   Final exam - 50%

In order to pass this unit, students must:

❖   Achieve at least 45% in the lab practical component

❖   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 information through a range of formats (written and oral)

3. Formulate hypotheses, collect experimental data and demonstrate proficiency 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: Fortnightly Assessment Quizzes - 25%
- A2: Practical Assessments - 30%
- A3: Major Assessments - 45%

In order to pass this unit, students must:

- ❖ Achieve an overall mark of 50% or higher

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.

Prerequisites

MCD4410 Blueprints for Life

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 - 20%

- Practical Assessment - 30%

- Examination - 50%

In order to pass this unit, students must:

❖ Achieve a minimum mark of 45% in the Weekly Assessment Quizzes and Active Participation

❖ Achieve an overall mark of 50% or higher

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MCD4440 – Discrete Mathematics for Computer Science

Description

This unit introduces fundamental discrete mathematics topics including combinatorics, sets, relations and functions; methods of logic and proof, especially proof by induction; probability theory, Bayes' theorem; recursion; recurrence relations; trees and other graphs. It establishes the mathematical basis required for studies in Computer Science and Software Engineering.

Prerequisites

Nil

Learning Outcomes

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

1. Solve Diophantine equations by using extended Euclidean algorithm, apply modulo arithmetic to solve problems in mathematics

2. Identify basic methods of proof, particularly induction, and apply them to solve problems in mathematics and computer science

3. Apply propositional and predicate logic in mathematics and computer science

4. Manipulate sets, relations, functions and their associated concepts, and apply these to solve problems in mathematics and computer science

5. Apply counting principles in combinatorics

6. Describe the principles of elementary probability theory, evaluate conditional probabilities and use Bayes' Theorem

7. Use and analyse simple first and second order recurrence relations

8. Use trees and graphs to solve problems in computer science

Assessments

- ALP Quizzes - 5%
- Topic quizzes - 10%
- Participation - 10%
- Oral Presentation - 5%
- Mid-trimester Test - 15%
- Assignment - 5%
- Final Exam - 50%

In order to pass this unit, students must:

- ❖ Achieve 45% or more in the unit's examination, and
- ❖ Attempt all internal assessments and achieve 45% or more
- ❖ Achieve an overall unit mark of 50% or more.

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

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 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

- Assignment - 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.

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. Appreciate convergence of numeric and power series, construct Taylor series and estimate errors in numerical approximations.

7. Solve first order ordinary differential equations, including by separable variables and integrating factors.

8. Solve second order linear differential equations with constant coefficients.

9. Use differential equations to model simple engineering problems.

10. Evaluate and invert Laplace transforms and use them to solve ordinary differential equations.

11. Calculate partial derivatives, use the gradient vector to find directional derivatives and find extreme values of two-variable functions.

12. 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%

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MCD4500 – Engineering Mathematics CONTINUED

In order to pass this unit, students must:

- ❖ Attempt all internal assessments and 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

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MCD4600 - Intermediate Physics

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.

Prerequisites

MCD1180 Introductory Physics.

Learning Outcomes

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

6.   Demonstrate knowledge of the value of practical work.

7.   Apply the theory of rotational motion.

8.   Solve problems involving electricity and magnetism.

9.   Analysis and evaluate the construction materials, and evaluate the effect of forces and loads on structures and materials.

10.   Explain a range of atomic theories.

Assessments

- Test 1 - 5%
- Quizzes - 10%
- Test 2 - 10%
- Laboratory work - 20%
- Project Work- 15%
- Final Exam - 40%

Students must achieve an overall mark of 50% in order to pass this unit. Overall marks consist of internal assessments and final examination marks.

MCD4770 – Professional Practice

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.

Prerequisites

Nil

Learning Outcomes

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

1. Undertake a simple design and build project in a competitive team-based environment.
2. Develop conceptual understanding and problem-solving abilities by applying engineering principles.
3. Develop proficiency with technologies for information gathering 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. Identify professional issues relevant to a contemporary engineering challenge and appropriate responses.
6. To present and discuss engineering issues and concepts in a range of writing formats, including essay and technical report.
7. Demonstrate proper and ethical scientific and engineering practices, including safety, environment, and record keeping.
8. Interpret scientific and engineering results and draw reasonable conclusions.
9. Work with a small team to plan and manage an engineering project and report on team performance.
10. Communicate effectively through written and oral reports.

Assessments

- Assessment 1: LR - 10%
- Assessment 2: Test 1 - 10%
- Assessment 3: OP1 - 10%
- Assessment 4: Test 2 - 10%
- Assessment 5: Test 3 - 10%
- Assessment 6: Project - 50%

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

MCD6080 – Psychology 1A

Description

This unit provides students with an introduction to the broad foundations of psychology as a scientific discipline. It begins with an exploration of psychology's historical origins. Then, a series of core psychological topics will be introduced: concepts of health, stress and coping will be considered along with the distinguishing features of abnormal psychology and the biological basis of behaviour.

The unit also introduces theories of learning, memory and development and familiarizes students with key aspects of Indigenous and cross-cultural psychology. Students will also be introduced to academic writing by reporting findings through reading journal articles.

Prerequisites

Nil

Objectives

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

1. Identify key historical and philosophical developments which have resulted in the modern discipline of psychology;

2. Identify and describe key concepts underlying biological, learning, developmental and cross-cultural psychology, stress and coping and abnormal psychology;

3. Apply the knowledge and concepts of biological, learning, developmental and cross-cultural psychology, stress and coping and abnormal psychology to assessable quizzes and critical thinking assignment;

4. Outline the need for an objective understanding of human behaviour;

5.   Prepare written technical and scientific documentations and present key findings.

Assessment

- **A1:** Oral Video presentation – 30%
- **A2:** Argumentative essay – 40%
- **A3:** Weekly online tests – 30%

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

MCD6110 – Psychology 1B

Description

This unit will introduce students to the scientific discipline of psychology and provide a foundation of understanding in several key topic areas.

Specifically, we will cover topics such as personality, motivation, emotion, sensation and perception and social psychology. Students will also examine how psychologists acquire further knowledge and test their understanding of the way in which individuals think, feel and behave. This will involve an introduction to research methodology (e.g: research design, descriptive statistics and inferential statistics).

Prerequisites

MCD6080 – Psychology 1A

Learning Outcomes

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

1.   Describe the key concepts underlying core psychology topics including personality, motivation, emotion, sensation, perception and social psychology.

2.   Describe the key concepts underlying the research process, research methods and design.

3.   Apply psychological research methods and the principles required to evaluate data.

4.   Summarise key aspects of scientific journal articles on a chosen topic and prepare a written document on reported findings.

Assessments

Task	Weight
A1: Research Proposal Poster and Video Presentation	20%
A2: Research Proposal	40%
A3: Mid Trimester Test	20%
A4: Final Test	20%

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