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## Overview

<b>DIPLOMA PART I FOR BOTH ENGINEERING AND IT</b>		
<b>Unit Code</b>	<b>Unit Name</b>	<b>Unit EFTSL</b>
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
MCD1700	Introductory Mathematics	0.125
MCD1750	Intermediate Mathematics	0.125
MCD1470	Engineering Practice	0.125
<b>DIPLOMA PART II - ENGINEERING</b>		
<b>Unit Code</b>	<b>Unit Name</b>	<b>Unit EFTSL</b>
MCD4140	Computing for Engineers	0.125
MCD4390	Chemistry I	0.125
MCD4160	Physics for Engineering	0.125
MCD4490	Advanced Mathematics	0.125
MCD4500	Engineering Mathematics	0.125
MCD4270	Engineering design: lighter, faster, stronger	0.125
MCD4280	Engineering design: cleaner, safer, smarter	0.125
MCD4290	Engineering mobile apps	0.125
MCD4700	Introduction to Computer systems, networks and security	0.125
<b>DIPLOMA PART II – INFORMATION TECHNOLOGY</b>		
<b>Unit Code</b>	<b>Unit Name</b>	<b>Unit EFTSL</b>
MCD4700	Introduction to Computer systems, networks and security	0.125
MCD2130	Functions and their Applications	0.125
MCD1470	Engineering Practice	0.125
MCD4140	Computing for Engineering	0.125
MCD4710	Introduction to Algorithms and Programming	0.125

# MCD1160 - INTRODUCTORY ENGINEERING COMPUTING

## Purpose

The practice of engineering involves applying scientific and technical knowledge, common sense, and experience to solving problems of practical significance for people. Engineers today depend heavily on the use of computers. This course will provide grounding in the basic functioning of a computer system and how it is used within the engineering environment.

Students will be required to apply these important skills to specific engineering projects and cases in lectures and tutorials. Students are expected to participate actively in group work designed to enhance their professional skills.

This unit is designed to extend the students' base knowledge into the following areas:

- Word advanced features
- Excel
- Access
- PowerPoint
- Project

It is expected students will investigate, explore and discuss engineering concepts and issues and solve problems in class using computers.

## 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 Power point Slides, incorporating text, graphics and sound, and presentation of information, including the use of bullet points.
- 8) Designing slide shows, 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 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 Exam

# MCD1170 - INTRODUCTORY CHEMISTRY

## Purpose

This unit introduces and reinforces the fundamentals of chemistry by exploring physical and organic chemistry using a variety of theoretical and practical techniques.

## Prerequisites

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

## Learning Outcomes

On completion of this unit, students are expected to 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 8%
- Test 2 10%
- Quizzes 1 - 6 12%
- Poster 10%
- Final examination 60%

# MCD1180 - INTRODUCTORY PHYSICS

## Purpose

Physics seeks to describe the fundamental nature of the universe and 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 the life and physical sciences, as well as Engineering and Technology. So this module considers the basic concepts of mechanics, energy, waves and optics. However, physics is not just theories. It relies heavily on mathematics and numerical measurements to test the theories – an aspect you will meet through your practical work.

## Prerequisites

Nil

## Learning Outcomes

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

1. Demonstrate knowledge of the value of practical work
2. Apply the ideas of kinematics to the motion of objects
3. Explain the concepts of force and energy as developed in the theory of dynamics
4. Explain the types and properties of waves and apply these ideas to optics

## Assessments

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

# MCD1190 - CHEMISTRY A

## Purpose

Chemistry is the study of matter, its transformations, and the energy changes that accompany those transformations.

Chemistry is an important branch of science with applications in a number of areas (Applied sciences, Biochemistry, Engineering, Environmental chemistry, Material chemistry, Earth and space sciences). 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.

This unit is designed to build on the students' base knowledge of chemistry by further exploration of:

1. Energy
2. Chemical Kinetics
3. Food Chemistry
4. Atomic Theory and the Periodic Table
5. Nuclear Chemistry

It is expected that students 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 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. Define reaction rate and find rate laws from initial rates and integrated rate laws.
3. Relate organic chemical structures to observed chemical reactions, using examples from those involved in human nutrition and global cycling of nutrients.
4. Analyse the arrangement of elements in the periodic table (including its historical development) and relate trends in properties of elements to their atomic structure.
5. Explore the nature of nuclear reactions, radioactivity, nuclear stability and rates of disintegration reactions.

## Assessments

- Test 1 8%
- Test 2 10%
- Quizzes (1-6) 12%
- Poster 10%
- Final Examination 60%

## Mode of study

This unit is taught in face-to-face mode only. Quiz component of the assessment are completed online. There are no lab or work placement components.

# MCD1200 - PHYSICS A

## Purpose

Physics seeks to describe the fundamental nature of the universe and strives to reveal nature's underlying simplicity. This module continues on from Introductory Physics, and considers the basic concepts of practical investigation, rotational motion, electricity and magnetism, and atomic theories.

It must be remembered that physics is not just theories. It relies heavily on mathematics and numerical measurements to test certain theories – an aspect you will meet through the practical work.

## Prerequisites

MCD1180 Introductory Physics

## Learning Outcomes

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%
- On-line Quizzes 6%
- Test 2 8%
- Laboratory 22%
- Final Exam 60%



# MCD1700 - INTRODUCTORY MATHEMATICS

## Purpose

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  $\sin, \cos, \tan, \sec, \operatorname{cosec}$  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

28. Express vectors using  $\underline{i}$  and  $\underline{j}$  components. In  $\mathbb{R}^2$
29. Express Cartesian coordinates in  $\mathbb{R}^2$
30. Calculated distance between two points in  $\mathbb{R}^2$
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  $\mathbb{R}^2$
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 Quiz 10%
- Test 20%
- Assignment 5%
- Tutorial participation 5%
- Final Examination 60%

# MCD1750 - INTERMEDIATE MATHEMATICS

## Purpose

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

## 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 Quiz 10%
- Test 20%
- Assignment 5%
- Tutorial participation 5%
- Final Examination 60%

# MCD1470 - ENGINEERING PRACTICE

## Purpose

This unit is designed to extend the students' base knowledge into the following areas:

- Professions
- Design and Analysis
- Communication
- Ethics
- Economics

It is expected students will investigate, explore and discuss engineering concepts and issues, and solve quantitative and qualitative problems in class.

## Prerequisites

Nil.

## Learning Outcomes

On completion of this unit, students will 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 15%
- Assignment 2 10%
- Assignment 3 10%
- Assignment 4 10%
- Assignment 5 10%
- Project 45%

# MCD4140 - COMPUTING FOR ENGINEERING

## Purpose

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 are expected to be able to:

1. Have working knowledge of MATLAB and commonly used commands in the MATLAB programming language
2. Write MATLAB programs that apply commonly used mathematical methods to solve engineering problems
3. Understand the limitations of MATLAB programs and commonly used mathematical methods

## Assessments

- Laboratories 30%
- Assignment 10%
- Final examination 60%

# MCD4390 - CHEMISTRY I

## Purpose

A fundamental understanding of chemistry is relevant to many of the tasks encountered by professional engineers. The unit covers: atomic theory of matter; chemical periodicity; ionic, covalent and metallic bonding; role of intermolecular forces in the behaviour of liquids and solids in relation the structure and properties of materials like liquid crystals, amorphous solids and polymers; Equilibria involving precipitation, acid-base, redox and electrochemical reactions and their role in acid rain and corrosion; Coordination chemistry and the nature and properties of the transition metals and their complexes. Practical exercises are illustrative of the theory component and provide experience in laboratory techniques and laboratory OHSE practices.

## Prerequisites

## Learning Outcomes

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

1. Explain the nature of matter in terms of atomic theory and to describe ionic, covalent and metallic bonding
2. Solve numerical problems involving stoichiometric relationships, and acid-base, redox, and solubility equilibria;
3. Identify different types of intermolecular forces and to describe the influence of these on the nature and behaviour of liquids and solids
4. Describe the structure and properties of materials such as liquid crystals, metals, ceramics, amorphous solids and polymers
5. Explain the process of coordination, and to predict the shapes, and name coordination complexes
6. Perform common manipulations and unit operations in the chemical laboratory
7. Identify potential risks in the laboratory environment and apply realistic measures to control these.

## Assessments

- Tutorial Test - 10%
- Laboratory - 30%
- Online Quizzes – 10%
- Final Exam - 50%

# MCD4160 – PHYSICS FOR ENGINEERING

## Purpose

This unit relates key principles of physics to engineering and technology, and shows how physics, including quantum and nano-science, creates useful new technologies. Energy, momentum and angular momentum: planetary orbits, rocket propulsion, precession, fly wheels. Oscillations and waves: resonance, transmission of energy; Doppler effect and speed measurement, polarization and stress models, diffraction and nano-structures, thin film interference and antireflecting film. Quantum Physics: Uncertainty Principle, wave functions, lasers, stimulated emission; synchrotron radiation, atomic force microscope. 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. Identify the basic principles of physics in typical simple situations relevant to engineering, and correctly apply them;
2. Apply energy and momentum methods to analyse motion of systems;
3. Explain behaviours involving oscillations and waves and do appropriate analysis and calculations;
4. Explain, and apply basic quantum principles to, situations which are relevant in engineering and technology contexts; do appropriate analysis and calculations;
5. Demonstrate an ability to describe and explain advanced techniques used in relevant engineering or physics contexts;
6. Make reliable measurements, estimate uncertainties, analyse, evaluate and interpret data in cases appropriate to engineering and related to the theory studied;
7. 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;
8. Approach new problems and find solutions on the basis of general principles, and evaluate the appropriateness of their proposed models or solutions.

## Assessments

- Practical 22%
- Assignments 18%
- Examination 60%

# MCD4490 – ADVANCED MATHEMATICS

## Purpose

This is a core unit for students progressing from Monash College Diploma of Engineering, Part 1 to Diploma of Engineering, Part 2. It is the prerequisite to the compulsory unit MCD4500 Mathematics for Engineering. Students who have not completed, or performed well in, VCE Specialist Mathematics (or equivalent) should complete MCD4490 prior to MCD4500

The unit builds upon knowledge acquired in VCE Mathematical Methods units 3 & 4 (or equivalent) and for Bachelor of Engineering students.

This unit develops knowledge and skills in Mathematical logic, circular function, complex numbers and vectors. It provides an extension into circular functions and differential calculus including anti-derivatives and differential equations, and investigates applications particularly for use in other engineering areas, such as kinematics.

## Prerequisites

MCD1750 Intermediate Mathematics (For Part 2 entry students, Part 1 pre-requisites not applicable).

## Learning Outcomes

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

1. Sketch and transform circular functions and their inverse functions.
2. Simplify circular function expression and solve trigonometric equations.
3. Use mathematical proof techniques in algebra geometry and calculus.
4. Use hyperbolic functions.
5. Apply the combinations of sine and cosine functions, converting  $a \cos x + b \sin x$  to a single sine  $A \sin(x + \alpha)$ .
6. Understand the concept of complex numbers and construct the Argand Diagram.
7. Perform operations with complex numbers in Cartesian, polar and exponential form. Understand the Euler's formula.
8. Apply De Moivre's theorem for computation powers and roots of complex numbers.
9. Find loci and subsets of the complex plane.
10. Perform antidifferentiation calculations using inverse trigonometric functions, integration by substitution, integration by parts and integration by partial fractions.
11. Use definite integration to find volumes of revolution, centre of mass, mean value and root mean square.
12. Perform computation with vector calculus, such as displacement, velocity and acceleration.
13. Understand the concept of exponential growth, differential equation and initial value problem.
14. Solve differential equations with separable variable and explore various differential equations in engineering applications.
15. Use vector calculus in dynamics.

## Assessments

- Lecture quiz and attendance 5%
- Test 10%
- Project 5%
- Assignment 5%
- Tutorial participation 5%
- Final Examination 70%



# MCD4500 - ENGINEERING MATHEMATICS

## Purpose

This unit is designed to provide students to explore the fundamental concepts and techniques required for first year engineering courses in the areas of: vector algebra and geometry, linear algebra and matrix operations, Eigen-values and Eigen-vectors, differential and integral calculus, sequences and series, ordinary differential equations and boundary value problems, multivariable calculus and partial derivatives.

## Prerequisites

MCD4490 Advanced Mathematics (For Part 2 entry students, Part 1 pre-requisites not applicable).

## Learning Outcomes

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

1. Calculate cross products of vectors, and use vectors to represent lines and planes.
2. Perform matrix algebra to solve systems of linear equations and find Eigen-values and Eigen-vectors in simple cases.
3. Use hyperbolic functions, perform logarithmic and implicit differentiation.
4. Establish the convergence of improper integrals and use further techniques of integration including integration by parts.
5. Establish the convergence of numeric and power series, construct Taylor series and use Taylor polynomials to approximate functions.
6. Solve first order ordinary differential equations including the techniques of exact integration, separable variables and integrating factor.
7. Solve second order linear homogenous and non-homogeneous differential equations with constant coefficients.
8. Set up differential equations with initial or boundary conditions to model simple engineering problems.
9. Calculate partial derivatives, use the grad vector to find directional derivatives, use chain rule, calculate small error using the total differential and find maximum and minimum values of two-variable functions.

## Assessments

- Assignment 1 - 5%
- Test - 10%
- Assignment 2 - 5%
- Lecture quiz and attendance – 5%
- Tutorial Participation – 5%
- Final Examination 70%

# MCD4700 – INTRODUCTION TO COMPUTERSYSTEMS, NETWORKS AND SECURITY

## Purpose

This unit will provide an introduction to the concepts of database design and usage and the related issues of data management. Students will develop skills in planning, designing, and implementing a data model using an enterprise-scale relational database system (Oracle). Methods and techniques will also be presented to populate, retrieve, update and implement integrity features on data in the implemented database system.

Manipulation of a database necessarily raises issues of data collection/creation and management, data rights (ownership, copyright, access, privacy etc) and data curation, which this unit will also address.

## Prerequisites

Nil

## Learning Outcomes

At the completion of this unit, students should be able to:

1. Explain the motivations behind the development of database management systems;
2. Describe the underlying theoretical basis of the relational database model and apply the theories into practice;
3. Develop a sound database design;
4. Develop a database based on a sound database design;
5. Construct queries that meet user requirements;
6. Use data modelling and database development tools effectively.

## Assessments

- Pre-lecture online quizzes – 5%
- Participation in lectures, tutorials or forums – 5%
- Assignment 1 – 20%
- Assignment 2 – 20%
- Final Exam – 50%

# MCD4710 – INTRODUCTION TO ALGORITHMS AND PROGRAMMING

## Purpose

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.

## Learning Outcomes

At the 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.

**Prerequisites** MCD4700

## Assessment

Examination (3 hours): 70%; In-semester assessment: 30% (Semester 1)

Examination (3 hours): 60%; In-semester assessment: 40% (Semester 2)

## Workload requirements

Minimum total expected workload equals 12 hours per week comprising:

- a. Contact hours for on-campus students:
  - Two hours lectures
  - Two hours laboratories
  - Two hours tutorials
- b. Additional requirements (all students):
  - A minimum of 2-3 hours of personal study per one hour of lecture time in order to satisfy the reading, tute, prac and assignment expectations.

# MCD4270 - ENGINEERING DESIGN: LIGHTER, FASTER, STRONGER

## Purpose

This unit develops a process for the analysis and design of static and dynamic structures and mechanisms using engineered materials. Through a multidisciplinary approach, the fundamentals of mechanical, civil and material engineering will be explained and the basic concepts of loads and motions are introduced.

Team based projects will highlight the multidisciplinary nature of modern engineering. These concepts will be practiced through hands-on projects carried out by teams. Communication and teamwork skills will be developed through teamwork tasks.

## Prerequisites

Nil

## Learning Outcomes

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

1. Describe, with examples, the multi-disciplinary nature of modern engineering problems
2. Describe, with examples, the role of engineers in the design of structures and mechanisms in modern society
3. Identify different structural forms (including beams and trusses) and translate physical structures into appropriate models for analysis and design
4. Apply fundamental concepts of kinematics and kinetics to analyse motion of particles and rigid bodies
5. Apply energy methods to analyse the motion of particles and rigid bodies
6. Describe the key properties of structural materials for specific applications
7. Define, measure and summarize the importance of the microstructure of materials and analyse the microstructure-property relationship
8. Explain how different material processing routes directly influence material structural properties
9. Develop and apply problem-solving techniques that demonstrate knowledge and application of the technical content considered in the unit
10. Recognize and apply systematic principles of engineering design
11. Complete tasks as part of a team and communicate effectively with team members
12. Prepare and present oral and written reports in a professional engineering format

## Assessments

- Continuous assessment: 60%
- Examination (3 hours): 40%

Students are required to achieve at least 45% in the total continuous assessment component and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

# MCD4280 - ENGINEERING DESIGN: CLEANER, SAFER, SMARTER

## Purpose

Fundamentals of electrical, chemical and materials engineering will be introduced and applied to provide technological solutions for real-world problems. Theory underpinning analogue and digital circuit design; energy and mass balance; materials processing and the role of functional materials will be presented. The contribution of each topic to a contemporary engineering application will be demonstrated.

Team based projects will highlight the multidisciplinary nature of modern engineering. These concepts will be practiced through hands-on projects carried out by teams. Communication and teamwork skills will be developed through teamwork tasks.

## Prerequisites

Nil

## Learning Outcomes

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

1. Describe, with examples, the multi-disciplinary nature of modern engineering problems
2. Employ standard electrical laboratory equipment to measure electrical quantities used to debug circuits
3. Apply fundamental concepts of resistance, current, voltage and Kirchhoff's Laws to analyze simple circuits
4. Employ fundamental theories of electrical engineering to build analogue and digital circuits
5. Analyse steady state systems with and without chemical reaction through the application of mass balance concepts
6. Analyse thermodynamic processes through the application of energy balance concepts
7. Describe the key properties of functional materials for specified applications
8. Define, measure and summarize the importance of key properties of functional materials on their intended application and explain the structure-property relationship
9. Explain how different material processing routes directly influence material structural properties
10. Develop and apply problem-solving techniques that demonstrate knowledge and application of the technical content considered in the unit
11. Recognize and apply systematic principles of engineering design
12. Complete tasks as part of a team and communicate effectively with team members
13. Prepare and present oral and written reports in a professional engineering format.

## Assessments

- Continuous assessment: 60%
- Examination (3 hours): 40%

Students are required to achieve at least 45% in the total continuous assessment component and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

# MCD4290 - ENGINEERING MOBILE APPS

## Purpose

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 testing. Students will use IT tools to support the engineering process.

## Prerequisites

Nil

## Learning Outcomes

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

1. describe, with examples, the multidisciplinary nature of modern engineering problems
2. describe the interaction between developments in IT and their use in modern engineering practice
3. create and evaluate a simple multi-platform object-oriented architecture design
4. design and implement a mobile application that utilises the device capabilities to solve an engineering problem
5. design and perform simple black box acceptance testing
6. use IT tools, including an Integrated Development Environment (IDE), shared code repository and version control, bug-tracking and design drawing tools, for aspects of the software development process
7. interpret and produce written technical documentation in standard design formalism
8. complete tasks as part of a team, and communicate effectively with team members
9. communicate effectively with clients as part of the software development process

## Assessments

- Continuous assessment: 60%
- Examination (3 hours): 40%

Students are required to achieve at least 45% in the total continuous assessment component and at least 45% in the final examination component and an overall mark of 50% to achieve a pass grade in the unit. Students failing to achieve this requirement will be given a maximum of 45% in the unit.

# MCD2080 - BUSINESS STATISTICS

## Purpose

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

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

1. Use tables, graphs and charts to present data in meaningful forms.
2. Calculate measures of central tendency and dispersion for raw data and estimate measures of central tendency and dispersion from grouped data.
3. Apply elementary probability concepts such as experiments, complementary events, conditional probabilities, and independence.
4. Identify the main features of the binomial and general discrete probability distributions, and apply these to business problems.
5. Recognise and utilise normal distribution probability curves, and perform associated business calculations involving the use of standard normal tables and statistical functions in Excel.
6. Select a simple random sample and identify possible sources of bias in sample surveys.
7. Use the normal distribution and t-distribution to calculate confidence intervals for population parameters.
8. Use the normal distribution and t-distribution to test statistical hypotheses.
9. Utilise statistical concepts and methods, including correlation and linear regression, to explore and explain the relationship between two variables.
10. Identify and interpret the four basic components of a time series and apply elementary forecasting techniques to time series data and
11. Use the chi square distribution for testing of independence between two categorical variables.
12. Perform simple statistical analysis, calculation and report writing using Excel.

## Assessment

- Assignments, tests and tutorial work: 30%
- Examination 70%
- A scientific or graphics calculator will be allowed for some tests and exam. Assignments and some tests should be done using Excel.

## Mode of study

This unit is taught in face-to-face mode only. There are no online or work placement components.

# MCD2040 - MANAGING PEOPLE AND ORGANISATIONS

## Purpose

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:

1. Define management and summarise the evolution of management ideas on how managers may influence, people, organisations and their contexts to achieve organisational goals. This includes an awareness of the cultural contexts of the original source and the development and contemporary application of management theory and practice.
2. Identify and discuss contextual factors in the organisation's environment that impact on how people, managers and organisations interact
3. Describe how decision-making, planning, leading, organising and controlling can be managed in organisations
4. Examine the impact on individuals and organisations of contemporary issues in management, including stakeholder interests, ethics and social responsibility
5. Apply the skills of academic writing, research, questioning and analysis required of the management discipline.

## Assessment

- Tutorial participation and assignments: 50%
- Examination: 50%

## Mode of study

This unit is taught in face-to-face mode only. There are no online or work placement components.



# MCD2130 - FUNCTIONS AND THEIR APPLICATIONS

## Purpose

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 combination of different types of component 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 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 and mathematically analysing their behaviour;
2. Creating graphs illustrating important characteristics of a function;
3. Being able to interpret transformations of a function and to be able to find the inverse of a function (with the notable exception of inverse trigonometric functions as they are not currently on the syllabus);
4. Basic techniques of The Calculus;
5. Forming a **LOGICAL** progression of thought.

## Assessment

Assessment will consist of:

- Three assignments: 20% (each worth 7%, 7% and 6% respectively)
- Tutorial work: 10%
- Diagnostic online quizzes: 10%
- Final exam: 60%

## Mode of study

This unit is taught in face-to-face mode only. There are no online or work placement components.