

Unit Guide

Diploma of Information Technology

Monash College

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Overview

DIPLOMA PART I		
Unit Code	Unit Name	Unit EFTSL
MCD1160	Introductory Engineering Computing	0.125
MCD1170	Introductory Chemistry	0.125
MCD1180	Introductory Physics	0.125
MCD1700	Introductory Mathematics	0.125
MCD1190	Chemistry A	0.125
MCD1200	Physics A	0.125
MCD1710	Introductory Biology	0.125
MCD1750	Intermediate Mathematics	0.125
DIPLOMA PART II		
Unit Code	Unit Name	Unit EFTSL
Major in Bachelor of IT:		
MCD1470/ MCD4770	Professional Practice	0.125
MCD2130	Functions and Their Applications	0.125
MCD4600	Intermediate Physics	0.125
MCD4700	Introduction to Computer Systems, Networks and Security	0.125
MCD4720	Fundamentals of C++	0.125
MCD4710	Introduction to Algorithms and Programming	0.125
MCD4730	Foundations of 3D	0.125
	2 Electives*	0.250

Overview continued

Major in Bachelor of Computer Science:		
MCD1470 / MCD4770	Professional Practice	0.125
MCD4490	Advanced Mathematics	0.125
MCD4700	Introduction to Computer Systems, Networks and Security	0.125
MCD4720	Fundamentals of C++	0.125
MCD4710	Introduction to Algorithms and Programming	0.125
MCD4440	Discrete Mathematics for Computer Science	0.125
MCD4500	Engineering Mathematics	0.125
MCD4730	Foundations of 3D	0.125

*Electives:

- MCD4440 Discrete Mathematics for Computer Science
- MCD2040 Managing People and Organisations
- MCD2080 Business Statistics
- MCD4290 Engineering Mobile Apps
- MCD4490 Advanced Mathematics
- MCD4500 Engineering Mathematics

MCD1160 – Introductory Engineering Computing

Description

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

Prerequisites

Nil

Learning Outcomes

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

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

Assessments

- | | |
|----------------------|---------------------------|
| ● Test 1 - 10% | ● Assignment 2 - 35% |
| ● Test 2 - 10% | ● Lab Participation - 10% |
| ● Assignment 1 - 25% | ● 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 - 7%
- Test 2 - 8%
- Quizzes - 10%
- Poster / Presentation - 10%
- Laboratory work – 15%
- Final examination - 50%

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

MCD1180 – Introductory Physics

Description

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

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%
- No Examination

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. Analyse 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% or higher in order to pass this unit. Overall marks consist of internal assessments and final examination marks.

MCD1470 / 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.

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 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 in degrees and radians to solve problem in various geometric and analytical geometric contexts.
23. Apply sine and cosine rule solve to solve problem in various geometric and analytical geometric contexts.
24. Sketch the graphs of trigonometric functions of sin, cos, tan, sec, cosec and cot
25. Identify amplitude, period and mid line of $a \sin(bx + c) + d$ and $a \cos(bx + c) + d$
26. Classify vectors and scalars.

MCD1700 – Introductory Mathematics CONTINUED

27. Apply vector algebra to solve problems in geometry.
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 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

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:

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

Assessments

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

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. 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:

1. interpret business data using descriptive statistics techniques, including the use of Excel spreadsheet functions
2. apply simple concepts of probability and probability distributions to problems in business decision-making
3. describe the role of statistical inference and apply inference methods to single population means and proportions
4. interpret and evaluate the relationships between variables for business decision-making, using the concepts of correlation and multiple linear regression
5. be able to describe, explain, predict/forecasting and control strategies using time series data
6. 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.
7. 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 test 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 behaviour of functions and examining some of their applications to the real world. The way that functions will be introduced is by individually describing the characteristics of families of different function types (linear, polynomial, rational, exponential, logarithmic and trigonometric). The composition of functions through possible combinations of different types of functions will also be investigated. Other operations on functions such as transformations via shifting, scaling and reflection will be presented, along with the existence and meaning of inverse functions.

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

Prerequisites

Year 11 (or equivalent) Mathematics

Learning Outcomes

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

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

And will have developed skills in:

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

Assessments

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.

MCD4290 – Engineering Mobile Apps

Description

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

Prerequisites

Nil

Learning Outcomes

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

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

Assessments

- Class Test - 4%
- Assignment 1 - 8%
- Assignment 2 – 22%
- Presentation - 4%
- Practical Class Work – 5.5%
- Tutorial Class Work – 5.5%
- Weekly Quizzes – 11%
- Examination - 40%

In order to pass this unit, students must:

- ❖ Achieve an overall mark of 50% or higher

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

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 Mathematic) or Mathematical Methods Units 3 & 4 equivalent.

Learning Outcomes

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

1. Demonstrate understanding of the properties of common functions and their graphs, use composition of functions, and inverse functions; use trigonometric functions to model periodic behaviour.
2. Represent complex numbers in Cartesian, polar and exponential forms, and on the complex plane.
3. Perform arithmetic and algebra on complex numbers, including finding powers and complex roots of polynomials.
4. 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%

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

MCD4500 – Engineering Mathematics CONTINUED

- ❖ Achieve an overall mark of 50% or higher

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:

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% or higher in order to pass this unit. Overall marks consist of internal assessments and final examination marks.

MCD4700 – Introduction to Computer Systems, Networks and Security

Description

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

Prerequisites

Nil

Learning Outcomes

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

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

Assessments

- Practical Class Work - 15%
- Assignment 1 - 15%
- Assignment 2 - 20%
- Assignment 3 - 30%
- Quiz 1 – 10%
- Quiz 2 – 10%

In order to pass this unit, students must:

- ❖ Achieve an overall mark of 50% or higher

MCD4710 – Introduction to Programming

Description

This unit introduces programming fundamentals using the Python language. It will present fundamental programming control structures, built-in and complex datatypes, mechanisms for modularity, and the use of basic libraries. Students will also be introduced to good programming practices and programming in teams.

Prerequisites

Nil

Learning Outcomes

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

1. Effectively use variables, conditionals and loops in computer programs.
2. Design, construct and test simple programs that include user-defined functions and data structures.
3. Write programs efficiently by discovering and leveraging libraries.
4. Implement good programming practices in a team, including unit testing, basic documentation and readability.

Assessments

- Practical work - 6%
- Test 1 - 4%
- Assignment 1 - 20%
- Test 2 - 15%
- Assignment 2 - 25%
- Test 3 - 15%
- Code Demonstration - 15%

In order to pass this unit, students must:

- ❖ Achieve an overall mark of 50% or higher

MCD4720 – Fundamentals of C++

Description

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

Prerequisites

Nil

Learning Outcomes

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

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

Assessments

- Assignment 1 – 10%
- Assignment 2 – 10%
- Assignment 3 – 30%
- Practical Class Work – 10%
- Quiz - 10%
- Examination – 30%

In order to pass this unit, students must:

- ❖ Achieve an overall mark of 50% or higher

MCD4730 – Foundations of 3D

Description

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

Prerequisites

Nil

Learning Outcomes

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

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

Assessments

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

In order to pass this unit, students must:

- ❖ Achieve an overall mark of 50% or higher

MCD4740 – Web Fundamentals

Description

This unit aims to give students a sound basic knowledge of the web and a range of issues which may be involved in the design and development of web sites and applications. It will take a strongly practical focus in examining the technology, design and implementation problems a designer or developer needs to address in real-world systems. The diversity of web applications means that there are a wide range of issues which may be relevant to the development of any given project. The unit will aim to give breadth of coverage of these issues, rather than focusing in depth on any particular development task or any specific type of web technology.

Prerequisites

Nil

Learning Outcomes

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

1. Critically analyse how fundamental web technologies work from a technical perspective and their impact on society.
2. Create media assets to integrate into a website, with a focus on optimisation, compatibility and accessibility.
3. Apply design principles as part of pre-production processes to create website designs.
4. Develop and test websites using front-end technologies including HTML, CSS and JavaScript.
5. Apply collaborative design techniques for planning the design of web content and web sites.

Assessments

- Weekly Tasks - 20%
- Assignment 1 - 10%
- Assignment 2 - 30%
- Assignment 3 - 30%
- Assignment 4 - 10%

In order to pass this unit, students must:

- ❖ Achieve an overall mark of 50% or higher