Unit Guide

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ACN: 064 031 714

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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. Identify the features of a relational database
8. Create and modify database tables and their relationships
9. Create database queries, form and reports
10. Design Power point Slides, incorporating text, graphics and sound, and presentation of information, including the use of bullet points
11. Design slide shows, animation of a slide, slide transitions, use of templates & the auto content wizard
12. Start Project and work with its key screen features
13. Create a new project and understanding elements of project management theory
14. Create tasks, task durations, create relationships between tasks in a project

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15. Enter the various cost types into a project and an overview of constraints and deadlines
16. Adjust the schedule to meet constraints and gain an overview of project monitoring

Assessments

- Word assignment based on lab report 15%
- Excel assignment based on lab report 20%
- Access assignment 20%
- PowerPoint assignment based on chemistry presentation 20%
- Project assignment based on engineering case 25%
- 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%

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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%

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MCD1230 - APPLIED MATHEMATICS

Purpose

This unit is designed to provide students with the knowledge and skills to solve problems involved in linear, polynomial, quadratic, exponential, logarithmic and circular functions and differential and integral calculus of those functions.

Prerequisites

Nil

Learning Outcomes

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

1. Solve linear and simultaneous linear equations using graphical, algebraic and matrix methods.
2. Use simultaneous linear equations to model and solve real world problems.
3. Apply transformations to sketch graphs.
4. Describe transformations as a matrix equation.
5. Sketch graphs of inverse functions.
6. Express quadratic equations in different forms.
7. Solve quadratic equations using factorizing, quadratic formula or completing the square method.
8. Sketch graphs of quadratic functions.
9. Solve polynomial equations.
10. Solve system of equations and literal equations.
11. Use exponential and logarithmic functions to model application problems.
12. Sketch graphs of exponential and logarithmic functions.
13. Solve exponential and logarithmic equations.
14. Demonstrate understanding of trigonometric functions, sketch the graphs and solve trigonometric function problems.
15. Demonstrate understanding of differential calculus and the use of various differential calculus techniques to solve mathematical problems.
16. Use first principles to find differentiation of various functions.
17. Differentiate various functions including polynomials, circular, exponential and logarithmic functions.
18. Apply the product, quotient and chain rules to find the derivative of functions.
19. Apply the techniques of differential calculus for graph sketching and finding the equations of tangents and normals.
20. Apply the techniques of differential calculus to solve the problems in rates of change and optimisation.
21. Demonstrate understanding of anti-differentiation and apply the techniques of anti-differentiation to graphs, rates and straight-line motion.
22. Demonstrate understanding of integral calculus to the integral and the use of integration techniques to solve area and rate problems.

Assessments

- Test 1 20%
- Test 2 20%
- Final Examination 60%

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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.

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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%

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MCD1220 - ENGINEERING MATHEMATICS A

Purpose

This unit is designed to provide students with a foundation of essential mathematical skills to prepare students for engineering studies. The aim of this unit is to develop knowledge in complex numbers and vectors. This unit provides an extension into circular functions and differential calculus including anti-derivatives and differential equations. It investigates applications particularly for use in other engineering subjects, such as kinematics.

Prerequisites

MCD1230 - Applied Mathematics or Mathematical Methods unit 3 & 4 equivalent.

Learning Outcomes

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

1. Explore and use Triangular identities of circular functions.
2. Perform calculations utilizing the complementary and supplementary angle identities, compound-angle identities, sum-and-product identities.
3. Explain the meaning of inverse and reciprocal trigonometric functions.
4. Apply the combinations of sine and cosine functions, converting $a\cos x + b\sin x$ to a single sine $Asin(x+\alpha)$
5. Understand the concept of complex numbers and construct the Argand diagram.
6. Perform operations with complex numbers in Cartesian, polar and exponential form. Understand the Euler's formula.
7. Apply De Moivre's theorem for computation powers and roots of complex numbers.
8. Find loci and subsets of the complex plane.
9. Understand the concept of vectors in Cartesian form, position vector, vector algebra, magnitude of vector, unit vector, angles between vectors and direction cosines.
10. Find scalar and vector resolute, scalar product of vectors, application of scalar product.
11. Use one-side and two-side limits to discuss left and right continuity.
12. Apply limits, continuity and differentiation to solve mathematical problems.
13. Identify and analyse the nature of critical point using derivative tests.
14. Apply the differentiation and anti-differentiation to solve the problems in Kinematics.
15. Extend the concept of derivatives for inverse circular functions.
16. Apply the method of logarithmic differentiation and implicit differentiation.
17. Perform anti-differentiation calculations using inverse trigonometric functions, integration by substitution, integration by parts and integration by partial fractions.
18. Use definite integration to find volumes of revolution, centre of mass, mean value and root mean square.
19. Perform computation with vector calculus, such as displacement, velocity and acceleration.
20. Understand the concept of exponential growth, differential equation and initial value problems.
21. Solve differential equations with separable variable and explore various differential equations in engineering applications.

Assessments

- Assignment 1 5%
- Test 10%
- Assignment 2 5%
- Tutorial participation 10%
- Final Examination 70%

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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%

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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

MCD4170 Mathematics for Engineering

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 18%
- Library test 2%
- Assignment 10%
- Final examination 70%

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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%

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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

MCD1220 Engineering Mathematics A (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

- Test 1 - 6%
- Assignment 1 - 6%
- Test 2 - 6%
- Assignment 2 - 6%
- Test 3 - 6%
- Final Examination 70%

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MCD4410 – BIOLOGY I

Purpose

A study of animal and plant biology and diversity from genes to whole organisms. The structure and function of plant and animal cells is examined with an emphasis on energy fixation, storage and usage. Principles of genetics, including advances in molecular biology, and current views of evolutionary processes and ecology are integrated into a structured course that offers considerable feedback on progress and opportunities for self-paced learning.

Prerequisites

Nil

Learning Outcomes

On completion of this unit students will be able to:

1. Recognise and understand biological concepts and processes including cell biology and biochemistry, genetics, diversity, evolution and ecology;
2. Display competence and precision in the use of laboratory equipment including pipettes, spectrophotometers and microscopes;
3. Formulate hypotheses, make predictions and carry out scientific experiments to test such;
4. Collect experimental data, evaluate it and present it in meaningful ways using appropriate software;
5. Communicate scientific principles and information underlying biology-related topics in written formats and using appropriate conventions for scientific attribution;
6. Perform library catalogue and database searches to locate and synthesize appropriate information for practical reports.

Assessments

- Examination 45%
- Practical, online activities and assessments: 55%

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MCD4420 - BIOLOGY II

Purpose

A study of the biology of whole organisms, organ systems and cells, including molecular genetics, and the effect of environmental parameters on biological functions. The biology of microbes and animals is emphasised. Ecological factors that are biologically important at the level of integrated whole organisms and at cellular, subcellular, and biochemical levels are considered for each organism under study. As for MCD42420 the unit is structured to encourage self-paced learning with considerable feedback on individual performance.

Prerequisites

MCD4410

Learning Outcomes

On completion of this unit students will be able to:

1. Demonstrate a coherent understanding of biology by articulating the methods of biology and explaining why current biological knowledge is both contestable and testable through further inquiry;
2. Demonstrate an understanding of concepts and processes related to molecular genetics, genetic engineering, and the physiology of organ systems, including homeostasis, nervous and muscular-skeletal systems, animal reproduction and development and nutrition;
3. Demonstrate an understanding of microbial diversity, in particular how it relates to human health and disease;
4. Gather, synthesise and critically evaluate information relevant to biology by applying practical techniques (including Gram staining, gel electrophoresis, and spectrophotometry) and tools to conduct investigation within the laboratory;
5. Demonstrate competency in designing experiments, gathering data and analysing and presenting summative data in meaningful and accurate ways;
6. Communicate scientific principles and information underlying biology-related topics in written or oral formats and using appropriate conventions for scientific attribution;
7. Work and learn independently and collaboratively while exercising personal, professional and and social responsibility that recognises the importance of practicing science sustainably, ethically and safely.

Assessments

- Examination 45%
- Practical, online activities and assessments: 55%

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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

- Online Test 10%
- Laboratory 20%
- Final Exam 70%

MCD4400 - CHEMISTRY II

Purpose

Within MCD4400, students will exploit their understanding of general and physical chemistry discussed in MCD4150 to explore the behavior of chemicals in a number of interesting case studies incorporating a range of significant biological and synthetic molecules such as carbohydrates, proteins and polymers and pharmaceutically important drugs. Along the way, students will discuss the formation of inorganic coordination compounds and investigate their role in colour and magnetism, and metals in biological systems. The concepts developed within the workshops and tutorials are complemented through a laboratory program where students will have the opportunity to develop analytical techniques and design their own experiments to solve a range of chemical problems.

Prerequisites

MCD4150

Learning Outcomes

On completion of this unit students will be able to:

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

Assessments

- Final examinations (3 hours): 50%
- Laboratory work: 30%. Students must achieve a pass mark in their laboratory work to achieve an overall pass grade.
- Online assessment: 10%
- Tutorials: 10%

MCD6080 - PSYCHOLOGY IA

Purpose

MCD6080 Psychology 1A is the first unit in the psychology stream. The aim of MCD6080 is to provide an introduction to the scientific discipline of psychology. In the unit there is a strong emphasis on practical work and understanding research methods in psychology. The assignments are linked to these goals.

Prerequisites

Nil

Learning outcomes

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 key concepts in the following topics: biological psychology, sensation and perception, developmental psychology, personality, learning;
3. Demonstrate an understanding of points one and two in various assessments;
4. Appreciate the need for an objective understanding of human behaviour;
5. Develop skills in technical writing; and
6. Develop skills in critical thinking and experimentation

Assessment

- Lecture topic quiz: 10%
- Literature review: 30%
- Laboratory journals (online): 10%
- Examination: 50%

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MCD6110 - PSYCHOLOGY IB

Purpose

MCD6110 Psychology 1B is the second unit in the psychology stream. The aim of MCD6110: Psychology 1B is to give students a comprehensive understanding of key aspects of cognition, social psychology, abnormal psychology and research design and analysis. In the unit there is a strong emphasis on practical work and understanding research methods in psychology. The assignments are linked to these goals.

Prerequisites

MCD6080

Learning outcomes

On completion of this unit students should be able to:

1. Describe major theories and empirical findings in four core psychology disciplines, including a) social psychology, b) cognition, c) abnormal psychology, and d) research design and analysis.
2. Apply knowledge of research design and analysis to experimental situations.
3. Investigate and critically evaluate a range of issues related to psychological inquiry in the core discipline areas studied.
4. Use information pertaining to the science and practice of psychology in an ethical manner.
5. Demonstrate skills in report writing as a means of communicating experimental findings according to the professional requirements of the psychology discipline.
6. Illustrate how psychological knowledge can be used to formulate practical solutions to real world challenges.

Assessment

- Lecture topic quizzes: 10%
- Laboratory report: 30%
- Laboratory journals (online): 10%
- Examination: 50%

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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.

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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.

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MCD4700 – INTRODUCTION TO COMPUTER SYSTEMS, 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%

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