The University of Southern Queensland

Course specification

Description: Algebra and Calculus I						
Subject	Cat-nbr	Class	Term	Mode	Units	Campus
MAT	1102	30344	1, 2004	ONC	1.00	TWMBA

Academic group: FOSCI
Academic org: FOS003
Student contribution band: 2
ASCED code: 010101

STAFFING

Examiner: Chris Harman
Moderator: Patricia Cretchley

RATIONALE

In fields ranging from engineering to economics, the techniques of differential and integral calculus provide powerful investigative tools because rates of change and summation are key elements in the description and analysis of the relationships between measurable quantities. Linear systems also arise commonly in fields of application in business, economics, engineering and science, and matrix, vector and complex number techniques are often used to model the associated problems. This course provides the opportunity to master the fundamental concepts and operations of calculus, matrix algebra, vectors and complex numbers.

SYNOPSIS

This course investigates the elementary functions of mathematics: polynomials, logarithms, trigonometric functions, their inverses, arithmetic combinations and compositions of these functions and functions implicitly defined through relationships between them. Properties of these functions and the rules for finding their derivatives and anti-derivatives are developed and used in applications and the solution of problems. Systems of linear algebraic equations are formulated and solved in a variety of settings. Vectors, matrices and complex numbers are used to formulate and solve problems from various fields of application, and to describe the geometry of two and three dimensional space.

OBJECTIVES

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

- demonstrate competence in geometric, numeric, and algebraic approaches to concept development and problem solving using the fundamental techniques of algebra and calculus;

- produce meaningful representations and solutions of practical applications of algebra and calculus;
- use computer aided methods to develop concepts in algebra and calculus;
- communicate mathematical ideas and conclusions in writing;
- evaluate approximate rates of change;
- evaluate limits to compare relative sizes of quantities in given neighbourhoods and to find instantaneous rates of change;
- find the derivatives of polynomial, algebraic, exponential and trigonometric functions, and their inverses (where they exist), as well as combinations and compositions of these functions;
- find derivatives of functions defined implicitly;
- find areas under curves;
- understand the concept of the definite integral and the fundamental theorem of calculus;
- reconstruct a function from its derivative;
- construct anti-derivatives using definite integrals;
- find integrals using tables, substitution, and integration by parts;
- apply techniques of calculus to solve problems of function behaviour, rates of change, optimisation, and summation;
- use vectors and their decompositions to solve problems involving 2 and 3 dimensions;
- find equations of lines and planes in three dimensions and use these to establish their relative positions and intersections;
- formulate systems of simple linear equations, find solutions when they exist, and interpret the results meaningfully;
- use matrices and matrix algebra to store and manipulate data;
- simplify and evaluate expressions containing vectors, matrices and complex numbers, and demonstrate understanding of their geometric and algebraic properties;
- solve simple polynomial equations for complex-valued solutions;
- recognise and manipulate elementary functions of a complex variable.

TOPICS

	Description	Weighting (%)
1.	Calculus: Limits and Derivatives, including definitions of the derivative and basic differentiation rules. Applications of differentiation including the chain rule and maxima and minima problems. Transcendental Functions, including inverse Trigonometric Functions. Techniques of Integration including Mid-point and Trapezoidal approximations. Anti-derivative techniques using tables, algebraic and trigonometric substitutions, and integration by parts. Applications of Integration, including areas, arc lengths, volumes, and other physical problems.	50.00
2.	Linear Algebra: Matrix operations; systems of linear equations, Gaussian elimination; the inverse matrix. Vectors, dot and cross products, projections, lines and planes. Determinants and adjoint matrices.	50.00

Complex numbers, de Moivre's Theorem, Euler's form, elementary functions of a complex variable.

TEXT and MATERIALS required to be PURCHASED or ACCESSED:

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at http://bookshop.usq.edu.au click 'Semester', then enter your 'Course Code' (no spaces).

These books will also be used for course MAT2100.

Hughes-Hallett, D et al 2003, *Calculus, Single and Multivariable*, 3rd edn, Wiley, New York.

Larson, R & Edwards, B 2003, *Elementary Linear Algebra*, 5th edn, Houghton Mufflin, Massachusetts.

(The 4th edition (2000) may still be used.)

Study Book 2004, *Course MAT1102 Algebra and Calculus I*, USQ Distance Education Centre, Toowoomba.

REFERENCE MATERIALS:

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

MATLAB,

(Version 6 or earlier)

Anton, H & Rorres, C 1994, *Elementary Linear Algebra - Applications Version*, 7th edn, John Wiley, New York.

Hughes-Hallett, D et al 2003, *Student Solution Manual - Calculus, Single and Multivariable*, 3rd edn, Wiley, New York.

Larson, A, Hostetler, R & Edwards, B 1994, *Calculus*, 5th edn, DC Heath, Lexington.

(or similar calculus texts)

Larson, R & Edwards, B 2003, *Student Solutions Guide - Elementary Linear Algebra*, 5th edn, Houghton Mifflin, Boston.

Larson, R & Edwards, B 1996, *Technology Keystroke Guide: Elementary Linear Algebra*, Heath, Lexington.

STUDENT WORKLOAD REQUIREMENTS:

ACTIVITY	HOURS
Assessment	16.00
Examinations	4.00
Lectures	52.00
Private Study	65.00
Tutorial	26.00

ASSESSMENT DETAILS

Description	Marks out of	Wtg(%)	Due date
ASSIGNMENT 1	100.00	10.00	28 Mar 2004
MID SEMESTER TEST (CLOSED)	100.00	10.00	30 Apr 2004 (see note 1)
ASSIGNMENT 3	100.00	10.00	28 May 2004
2 HR RESTRICTED EXAM (PART A)	120.00	35.00	END S1 (see note 2)
2 HR OPEN EXAMINATION (PART B)	120.00	35.00	END S1 (see note 3)

NOTES:

1. The mid semester test will be held in Week 9, 26 April - 30 April 2004. You will be notified on the course website.
2. Examination date will be available during the semester. Please refer to examination timetable when published.
3. Examination date will be available during the semester. Please refer to examination timetable when published.

IMPORTANT ASSESSMENT INFORMATION

1 Attendance requirements:
It is the students' responsibility to attend and participate appropriately in all activities (such as lectures, tutorials, laboratories and practical work) scheduled for them, and to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.

2 Requirements for students to complete each assessment item satisfactorily:
To complete each of the assessment items satisfactorily, students must obtain at least 50% of the marks available for each assessment item. To complete the examination satisfactorily, students must obtain at least 50% of the marks available for the examination.

3 Penalties for late submission of required work:

If students submit assignments after the due date without prior approval then a penalty of 20% of the total marks gained by the student for the assignment will apply for each working day late.

4 Requirements for student to be awarded a passing grade in the course:
To be assured of a passing grade, students must demonstrate, via the summative assessment items, that they have achieved the required minimum standards in relation to the objectives of the course by satisfactorily completing the examination and assignments.Students who do not qualify for a Passing grade may, at the discretion of the Examiner, be awarded a Supplementary Examination and/or assigned additional work to demonstrate to the Examiner that they have achieved the required standard. It is expected that such students will have gained at least 45 % of the total marks available for all summative assessment items.

5 Method used to combine assessment results to attain final grade:
The final grades for students will be assigned on the basis of the weighted aggregate of the marks obtained for each of the summative assessment items in the course.

6 Examination information:
In an Open Examination, candidates may have access to any material, calculator and battery-operated computer during the examination except the following: internet, electronic communication devices, bulky materials, devices requiring mains power and material likely to disturb other students. In a Restricted Examination, candidates are allowed access to specific materials during the examination. The only materials that candidates may use in the restricted examination for this course are: writing materials (non-electronic and free from material which could give the student an unfair advantage in the examination); scientific or graphics calculators which are not used to store textual information. Students must indicate on their examination paper the make and model of any calculator(s) they use during the examination; and these may not be used to access or make use of stored textual information.

7 Examination period when Deferred/Supplementary examinations will be held:
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.

8 University Regulations:
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL http://www.usq.edu.au/corporateservices/calendar/part5.htm or in the current USQ Handbook.

ASSESSMENT NOTES

9 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner. Students must retain a copy of each item submitted for assessment. This must be despatched to USQ within 24 hours of receipt of a request being made. In accordance with University Policy, the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances. The Faculty will normally only accept assessments that have been written, typed or printed on paper-based media. The Faculty will NOT accept

submission of assignments by facsimile. Students who do not have regular access to postal services or who are otherwise disadvantaged by these regulations may be given special consideration. They should contact the examiner of the course to negotiate such special arrangements. In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience. Extensions of more than a week are not normally granted for assignments in this course, because solutions will be available at that stage. No marks will be granted for assignments submitted more than five working days after the due date, because solutions need to be released as a valuable resource for students in this course.