



The University of Southern Queensland

Course specification

Description: Algebra and Calculus I

Subject	Cat-nbr	Class	Term	Mode	Units	Campus
MAT	1102	58082	3, 2006	EXT	1.00	Toowoomba

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

STAFFING

Examiner: Oleksiy Yevdokimov

Moderator: Nicolas Jourdan

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:

1. demonstrate competence in geometric, numeric, and algebraic approaches to concept development and problem solving using the fundamental techniques of algebra and calculus; (Assignments 1, 2, & 3 and Exam)
2. produce meaningful representations and solutions of practical applications of algebra and calculus; (Assignments 2, & 3 and Exam)
3. use computer aided methods to develop concepts in algebra and calculus; (Assignments 2, & 3 and Exam)

4. communicate mathematical ideas and conclusions in writing; (Assignments 2, & 3 and Exam)
5. evaluate approximate rates of change; (Assignments 2, & 3 and Exam)
6. evaluate limits to compare relative sizes of quantities in given neighbourhoods and to find instantaneous rates of change; (Assignments 2, & 3 and Exam)
7. 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; (Assignments 2, & 3 and Exam)
8. find derivatives of functions defined implicitly; (Assignments 2, & 3 and Exam)
9. find areas under curves; (Assignments 2, & 3 and Exam)
10. understand the concept of the definite integral and the fundamental theorem of calculus; (Assignments 2, & 3 and Exam)
11. reconstruct a function from its derivative; (Assignments 2, & 3 and Exam)
12. construct anti-derivatives using definite integrals; (Assignments 2, & 3 and Exam)
13. find integrals using tables, substitution, and integration by parts; (Assignments 2, & 3 and Exam)
14. apply techniques of calculus to solve problems of function behaviour, rates of change, optimisation, and summation; (Assignments 2, & 3 and Exam)
15. use vectors and their decompositions to solve problems involving 2 and 3 dimensions; (Assignments 2, & 3 and Exam)
16. find equations of lines and planes in three dimensions and use these to establish their relative positions and intersections; (Assignments 2, & 3 and Exam)
17. formulate systems of simple linear equations, find solutions when they exist, and interpret the results meaningfully; (Assignments 2, & 3 and Exam)
18. use matrices and matrix algebra to store and manipulate data; (Assignments 2, & 3 and Exam)
19. simplify and evaluate expressions containing vectors, matrices and complex numbers, and demonstrate understanding of their geometric and algebraic properties; (Assignments 2, & 3 and Exam)
20. solve simple polynomial equations for complex-valued solutions; (Assignment 3 and Exam)
21. recognise and manipulate elementary functions of a complex variable. (Assignment 3 and Exam)

TOPICS

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

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.

Larson, R, Edwards, B & Falvo, D 2004, *Elementary linear algebra*, 5th edn, Houghton Muffin, Boston, Massachusetts.

Stewart, J 2005, *Calculus: concepts & contexts*, 3rd edn, Thomson/Brooks/Cole, Australia.

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,

(Any version)

Cole, J 2005, *Student solutions manual for Stewart's single variable calculus: concepts & contexts 3*, Brooks/Cole, Belmont, California.

(To accompany *Calculus: Concepts & Contexts* by James Stewart Brooks/Cole USA.)

Larson, R & Edwards, B 2004, *Student solutions guide - elementary linear algebra*, 5th edn, Houghton Muffin, Boston, Massachusetts.

Larson, R & Edwards, B 2000, *Technology keystroke guide: elementary linear algebra*, 4th edn, Houghton Muffin, Boston, Massachusetts.

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessment	16.00
Directed Study	84.00
Examinations	3.00
Private Study	65.00

ASSESSMENT DETAILS

Description	Marks out of	Wtg(%)	Due date
ASSIGNMENT 1	100.00	4.00	24 Nov 2006
ASSIGNMENT 2	100.00	13.00	18 Dec 2006
ASSIGNMENT 3	100.00	13.00	15 Jan 2007
3 HOUR OPEN EXAMINATION	180.00	70.00	END S3 (see note 1)

NOTES

1. Examination dates will be available during the semester. Please refer to the examination timetable when published.

IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:
There are no attendance requirements for this course. However, it is the students' responsibility 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. Students should keep in contact with the course examiner and teaching team via Outreach, use the course Webpage to keep themselves well informed, and read emails regularly at their nominated email address given to USQ.
- 2 Requirements for students to complete each assessment item satisfactorily:
To complete the assignments 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 aggregate of the weighted marks obtained for each of the summative assessment items in the course.
- 6 Examination information:
In the 3 hour end of semester 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.
- 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. If requested, students will be required to provide a copy of assignments submitted for assessment purposes. Such copies should be despatched to USQ within 24 hours of receipt of a request being made. The examiner 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. Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination); IDM (Incomplete Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).