



The University of Southern Queensland

Course specification

The current and official versions of the course specifications are available on the web at <http://www.usq.edu.au/coursespecification/current>.
Please consult the web for updates that may occur during the year.

Description: Algebra and Calculus I

Subject	Cat-nbr	Class	Term	Mode	Units	Campus
MAT	1102	84059	3, 2008	EXT	1.00	Toowoomba

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

STAFFING

Examiner: Oleksiy Yevdokimov

Moderator: Harry Butler

RATIONALE

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

SYNOPSIS

Assuming current knowledge and competencies equivalent to Qld Year 11 and 12 school Maths B with Calculus, this course investigates the elementary functions of mathematics: polynomials, logarithms, trigonometric functions, and their inverses, arithmetic combinations and compositions. Derivatives and anti-derivatives of such functions are developed and used in applications and problem-solving. Two and three-dimensional vectors and their algebra are used to describe motion, find projections, and lines and planes and their geometry in three dimensional space. Systems of linear algebraic equations are also formulated and solved in a range of settings. Matrices and their algebra are used to formulate and solve problems. Complex numbers are developed and their properties used for solving polynomial equations and representing geometric models.

OBJECTIVES

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

1. demonstrate competence in graphical, geometric, numeric, and algebraic approaches to concept development and problem solving using the fundamental techniques of algebra and calculus (Assignments 1 to 3 and Exam);
2. produce representations, models, and solutions of applications of algebra and calculus (Assignments 1 to 3 and Exam);

3. use computing aids for computation, graphing, matrix manipulation, concept development and problem solving in algebra and calculus (Assignments 2 and 3);
4. communicate mathematical reasoning and mastery of mathematical symbols and notation in writing (Assignments 1 to 3 and Exam);
5. apply and demonstrate understanding of the concept of a limit (Assignment 2 and Exam);
6. evaluate approximate and instantaneous rates of change (Assignments 2 to 3 and Exam);
7. find derivatives of polynomials, algebraic, exponential and trigonometric functions, their inverses (where they exist), and combinations and compositions of these functions (Assignments 2, 3 and Exam);
8. find derivatives of functions defined implicitly (Assignment 3 and Exam);
9. find areas under curves (Assignment 3 and Exam);
10. understand the concept of the definite integral and the fundamental theorem of calculus (Assignment 3 and Exam);
11. reconstruct a function from its derivative (Assignment 3 and Exam);
12. construct anti-derivatives using definite integrals (Assignment 3 and Exam);
13. find integrals using tables, substitution, and integration by parts (Assignment 3 and Exam);
14. apply derivatives to analyse function behaviour, find rates of change and optimise functions of one variable;
15. use integrals to do summation in a range of applications (Assignments 2, 3 and Exam);
16. use vectors, their decompositions, and vector algebra to describe motion and geometric shapes in 2 and 3 dimensions (Assignments 2, 3 and Exam);
17. find equations of lines and planes in three dimensional space, establish their relative positions and intersections (Assignments 2, 3 and Exam);
18. formulate systems of simple linear equations, find solutions when they exist, and interpret the results (Assignments 2, 3 and Exam);
19. use matrices to store and manipulate data; use row reduction to reduce matrices and solve systems of equations; apply matrix algebra to expressions containing matrices (Assignment 3 and Exam);
20. apply matrices to a range of applications; find determinants in preparation for later applications (Assignment 3 and Exam);
21. manipulate complex numbers, and demonstrate understanding of their geometric and algebraic properties (Assignment 3 and Exam);
22. solve simple polynomial equations for complex-valued solutions and find n th roots (Assignment 3 and Exam);
23. recognise elementary functions of a complex variable (Assignment 3 and Exam).

TOPICS

	Description	Weighting (%)
1.	Calculus: Limits and Derivatives, including definitions of the derivative and rules for differentiation. Applications of differentiation including chain rule, related rates, maxima and minima problems and optimisation. 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. 50.00
 Linear Algebra: Matrix operations; solving systems of linear equations, Gaussian elimination; the inverse matrix, determinants.
 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).

Two books are needed. Note that these books are also used for 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,

(MATLAB (any recent version) or Scilab (a MATLAB clone freely available on the web.)

Cole, J 2005, *Student solutions manual for Stewart's Single Variable Calculus: Concepts & Contexts* 3, Brooks/Cole, Belmont, Calif.

(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 Mifflin, Boston.

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

STUDENT WORKLOAD REQUIREMENTS

ACTIVITY	HOURS
Assessments	17.00
Directed Study	84.00
Examinations	2.00
Private Study	65.00

ASSESSMENT DETAILS

Description	Marks out of	Wtg (%)	Due date
ASSIGNMENT 1	100.00	4.00	28 Nov 2008
ASSIGNMENT 2	100.00	18.00	15 Dec 2008
ASSIGNMENT 3	100.00	18.00	12 Jan 2009
2 HR OPEN EXAMINATION	120.00	60.00	END S3 (see note 1)

NOTES

1. USQ will make the examination dates available during the semester. Students must refer to the official USQ examination timetable when it is 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 each of the assessment items satisfactorily, students must obtain at least 50% of the marks available for each assessment item.
- 3 Penalties for late submission of required work:
If students submit assignments after the due date without (prior) approval of the examiner then a penalty of 5% of the total marks gained by the student for the assignment may apply for each working day late up to ten working days at which time a mark of zero may be recorded.
- 4 Requirements for student to be awarded a passing grade in the course:
To be assured of receiving a passing grade a student must achieve at least 50% of the total weighted marks available for the course.
- 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:
Candidates may have access to any material during the Open examination except the following: electronic communication devices, computers, 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 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 Keeping informed of course-related activities and notices: All students must regularly check the course website and discussion group, and read emails sent to the address they gave USQ.
- 10 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.
- 11 Due dates: The due date for an assignment is the date by which a student must despatch the assignment to USQ.
- 12 Evidence of submission and work done: Students should request a dated receipt when posting an assignment. The onus is on the student to provide proof of the despatch date, if requested.
- 13 Students must keep a copy of all assessment work submitted, and despatch to USQ within 24 hours of receiving a request to do so.
- 14 In accordance with University Policy, the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances. Such approval should be sought in advance of the due date, unless that is impossible. Extensions of more than a week are not normally granted in this course, because solutions need to be made available for feedback and to advance learning. Assignments submitted after solutions are released will generally not earn marks.
- 15 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 should note the date of the public holiday on the assignment cover, for the Examiner's information.
- 16 Special circumstances: Students who do not have regular access to postal services or who are otherwise disadvantaged by these regulations must contact the Examiner in good time, requesting special consideration.
- 17 The Faculty will NOT normally accept submission of assignments by facsimile.