MATH1050 Ipswich
Mathematical Foundations
Semester 1, 2006
Course Profile

Brief description of course content

Matrices, addition and multiplication, inverses and determinants, simple systems of equations. Points, lines, vectors, scalar and cross products.

Natural, rational and real numbers. Absolute values and inequalities. Arithmetic and geometric series. Complex numbers, Euler’s and DeMoivre’s formulae.

Functions, limits and continuity. Differentiation, maxima and minima, first and second derivative tests. Integration and the anti-derivative, integration by parts and substitution.

Lecturer

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Consultation hours: Tuesday 1-3 at private study room 4 of the library

Web page: The course profile and course material can be found on the web at the following address: http://www.maths.uq.edu.au/courses/MATH1050Ips. This also contains up-to-date news about the course material and announcements for students. Please check this regularly during the semester.

Class contact hours: 3L, 2T

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Mon 1.00pm</th>
<th>Mon 2.00pm</th>
<th>Tue 10.00am</th>
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<tbody>
<tr>
<td>Tutorials</td>
<td>Mon 3.00pm</td>
<td>Tue 11.00am</td>
<td>2-109</td>
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</table>

Students should attend all lectures and tutorials. Occasionally lectures may be replaced by tutorials and vice versa. If any of these times do not fit in your timetable talk to the lecturer.

A FRIENDLY NOTE: Please let your lecturer know if you have any problems with any aspect of this course. Please don’t leave difficulties until the last minute.

Assumed background
This course assumes that you have a good understanding of the course material in either secondary school Maths B or MATH1040. It is a student's responsibility to fill in any gaps in the assumed knowledge. Revision material is available on the course webpage.

**Course goals**

On completing this course, students will:
- Be able to perform basic operations with vectors and matrices;
- Be able to model physical situations using vectors;
- Be familiar with arithmetic and geometric sequences and some of their applications;
- Be familiar with the representations of complex numbers and the fundamental theorem of algebra;
- Be able to calculate the derivative of many functions, and be familiar with applications of the derivative;
- Be able to use a variety of techniques of integration.

**Syllabus**

The following list of topics for MATH1050 is intended as a rough guide.
- Matrices: addition and scalar multiplication, transpose, inverse, determinants, solving simultaneous equations;
- Vectors: representations of vectors, addition and scalar multiplication, scalar product, vector product, applications of vectors;
- Sequences and series: arithmetic and geometric progression, applications to compound interest and population growth, proof by mathematical induction;
- Complex numbers: representations, Argand diagram, de Moivre’s theorem, Euler’s identity, roots of polynomials;
- Functions: review of functions, inverse functions, composition of functions, logarithmic and exponential functions;
- Differentiation: limits, derivative from first principles, derivative rules, applications of the derivative to curve sketching and rate of change problems;
- Integration: indefinite and definite integrals, the fundamental theorem of calculus, integration by substitution.

**Teaching and learning methods**

Each week students should attend three hours of lectures, and two hours of tutorials.
- Lectures and Tutorials start in week 1.
- Tuesday 25 April and Monday 1 May are public holidays. There will be no classes on those days.
- The purposes of the various forms of class contact are as follows.
  *Lectures* define the course material. They set out the basic theory and demonstrate techniques for problem solving. They cover all the core material required for the course. They are also used to provide administrative information for the course. Students are expected to bring their course notes to each lecture. During the lectures, students are expected to annotate their course notes as the lecturer works through the notes, complete the examples in the course notes, and answer or ask questions when the opportunities arise.
  *
  *Tutorials* provide students with an opportunity for individual assistance. Students will be given a set of problems to complete during each tutorial, giving them the
opportunity to practice mathematical techniques with assistance available from a tutor and/or from their peers. Students must have their work on the tutorial questions signed by a tutor before the conclusion of the tutorial. It is expected that the tutorial problems will take approximately half an hour to complete, so there will be additional time in the tutorial in which to ask questions about other aspects of the course.

- All classes start on the hour and conclude at 50 minutes past the hour.

**Graduate Attributes**

The following graduate attributes will be developed in the course.

1. *In-depth Knowledge of the Field of Study*
   - You will gain an in-depth understanding of the fundamental mathematical techniques as described in the course content through examples presented in lectures, work on tutorial problems and assignments, and study for examinations.
   - You will achieve an understanding of the breadth of mathematics through discussion in lectures and examples from a wide range of areas.
   - You will obtain an understanding of the applications of mathematics to other fields through examples presented in lectures.

2. *Effective Communication*
   - You will gain the ability to present a logical sequence of reasoning using appropriate mathematical notation and language through completion of tutorial problems and assignments.
   - You will gain the ability to select and use an appropriate level, style and means of written communication, using the symbolic, graphical, and diagrammatic forms relevant to the context, through examples presented in lectures and completion of tutorial problems and assignments.
   - You will enhance your ability to interact effectively with others through interaction with your peers and your tutor in tutorials.

3. *Independence and Creativity*
   - You will improve your ability to work and learn independently through completion of your assignments and study for examinations.
   - You will gain the ability to generate and synthesise ideas through solving tutorial problems and assignment questions.
   - You will obtain the ability to formulate problems mathematically through tutorial problems, assignments and examinations.

4. *Critical Judgement*
   - You will improve your ability to identify and define problems through work on tutorial problems and assignments.
   - You will gain the ability to evaluate methodologies and models, to make decisions and to reflect critically on the mathematical bases for these decisions, through discussion in lectures and work on tutorial problems and assignments.
   - You will improve your ability to apply critical reasoning to analyse and evaluate a piece of mathematics, through discussion in lectures and work in tutorials.

5. *Ethical and Social Understanding*
   - You will obtain knowledge and respect of ethical standards in relation to working in the area of mathematics through discussion in lectures.
• You will gain an appreciation of the history of mathematics as an ongoing human endeavour through discussion in lectures.

Assessment

The assessment will consist of tutorial participation, five assignments, a mid-semester test, and a final examination.

• Tutorial participation (worth 10% of your final grade)
  Each week, at the beginning of your tutorial, you will be given a set of tutorial questions. You are expected to work on these questions during the tutorial. You are encouraged to discuss the questions with your peers and ask for assistance from your tutor. Before the end of the tutorial you must show your work to your tutor, who will sign it. Provided that you have put a genuine effort into solving the tutorial problems, the tutor will record your name as having done the tutorial problems for that week. Your work will be checked for effort rather than for correctness. Solutions to the tutorial problems will be handed out the following week. Each week’s tutorial participation is worth 1%, to a maximum of 10%.

• Five assignments (worth 20% of your final grade)
  There will be five assignments, and each will contribute 4% towards your final grade. The assignments will be due on the Mondays of weeks 4, 7, 9, 11 and 13. Handing in procedures will be discussed in lectures.

• Mid-semester test (worth 10% of your final grade)
  There will be a take-home mid-semester test given during week 6 of lectures. More information will be given in lectures.

• Final examination (worth 60% of your final grade)
  There will be a two hour end-of-semester examination. The end-of-semester examination will be timetabled by the University administration and more details will be provided in lectures near the end of semester.

You are strongly encouraged to complete all items of assessment.

Assessment Criteria

Solutions will be marked for accuracy, appropriateness of mathematical techniques and clarity of presentation, as demonstrated by examples presented in lectures.

To earn a Grade of 7, a student must demonstrate an excellent understanding of MATH1050. This includes clear expression of nearly all their deductions and explanations, the use of appropriate and efficient mathematical techniques and accurate answers to nearly all questions and tasks with appropriate justification. They will be able to apply techniques to completely solve both theoretical and practical problems. Students earning a grade of 7 will have achieved a final mark between 85% and 100%.

To earn a Grade of 6, a student must demonstrate a comprehensive understanding of MATH1050. This includes clear expression of most of their deductions and explanations, the general use of appropriate and efficient mathematical techniques and accurate answers to most questions and tasks with appropriate justification. They will be able to apply techniques to partially solve both theoretical and practical problems. Students earning a grade of 6 will have achieved a final mark between 75% and 84%.

To earn a Grade of 5, a student must demonstrate an adequate understanding of MATH1050. This includes clear expression of some of their deductions and explanations, the use of appropriate and efficient mathematical techniques in some situations and accurate answers to some questions and tasks with appropriate justification. They will be able to apply techniques to solve fundamental problems. Students earning a grade of 5 will have achieved a final mark between 65% and 74%.
To earn a Grade of 4, a student must demonstrate an understanding of the basic concepts of MATH1050. This includes occasionally expressing their deductions and explanations clearly, the occasional use of appropriate and efficient mathematical techniques and accurate answers to a few questions and tasks with appropriate justification. They will have demonstrated knowledge of techniques used to solve problems and applied this knowledge in some cases. Students earning a grade of 4 will have achieved a final mark between 50% and 64%.

To earn a Grade of 3, a student must demonstrate some knowledge of the basic concepts of MATH1050. This includes occasional expression of their deductions and explanations, the use of a few appropriate and efficient mathematical techniques and attempts to answer a few questions and tasks accurately and with appropriate justification. They will have demonstrated knowledge of techniques used to solve problems. Students earning a grade of 3 will have achieved a final mark between 45% and 49%. Students should be aware that a Grade of 3 is now a FAIL.

To earn a Grade of 2, a student must demonstrate some knowledge of the basic concepts of MATH1050. This includes attempts at expressing their deductions and explanations and attempts to answer a few questions accurately. Students earning a grade of 2 will have achieved a final mark between 20% and 44%.

A student will receive a Grade of 1 if they demonstrate extremely poor knowledge of the basic concepts in the course material. This includes attempts at answering some questions but showing an extremely poor understanding of the key concepts. Students receiving a grade of 1 will have achieved a final mark between 0% and 19%.

Assessment policy
Students should be familiar with the rules which relate to assessment in their degrees as well as general university policy such as found in the General Award Rules. These are all set out on the myAdvisor page on the UQ website: http://www.uq.edu.au/myadvisor/index.html?page=12450

Calculator policy
Students may use a calculator of their choice for their work and in exams. However, the contents of the calculator memory must be erased before each exam.

Missed or late assessment
Since there are 12 tutorial weeks, you can miss two tutorial weeks and still achieve full marks for tutorial participation. If you miss more than two tutorials, exemption from losing your weekly tutorial participation mark will be granted only if you provide medical certification or other compelling reasons. Please see the lecturer for advice if you miss more than two tutorial weeks.

Late assignments will be accepted within a week of the due date only on the basis of medical certificates or other compelling reasons. If you do not hand in a particular assignment, you will be awarded a mark of zero for that assignment.

If you have a compelling reason why you cannot sit the mid-semester test at the scheduled time, you should contact the lecturer as soon as possible. In such a case, the lecturer will try to make arrangements for you to sit the test at a suitable time within the week after the scheduled mid-semester test.

Plagiarism:

The University has adopted the following definition of plagiarism: “Plagiarism is the action or practice of taking and using as one’s own the thoughts or writings of another, without acknowledgment.” The following practices constitute acts of plagiarism and are a major infringement of the University's academic values:

- Where paragraphs, sentences, a single sentence or significant parts of a sentence are copied directly, and are not enclosed in quotation marks and appropriately footnoted;
• Where direct quotations are not used, but are paraphrased or summarised, and the source of the material is not acknowledged either by footnoting or other simple reference within the text of the paper; and

• Where an idea which appears elsewhere in printed, electronic or audio-visual material is used or developed without reference being made to the author or the source of that material.”

When a student knowingly plagiarises someone’s work, there is intent to gain an advantage and this may constitute misconduct.

Students are encouraged to study together and to discuss ideas, but this should not result in students handing in the same or similar assessment work. Do not allow another student to copy your work. While students may discuss approaches to tackling a tutorial problem, care must be taken to submit individual and different answers to the problem. Submitting the same or largely similar answers to an assignment problem may constitute misconduct, and may result in both students being granted a mark of zero for that assignment.

For more information on the University policy on plagiarism, please refer to http://www.uq.edu.au/hupp/index.html?page=25128&pid=25075

**Supplementary examinations:**

A supplementary examination may be awarded in one course to students who obtain a grade of 2 or 3 in the final semester of their program and require this course to finish their degree. You should check the rules for your degree program for information on the possible award of supplementary examinations. Applications for supplementary examinations must be made to the Director of Studies in the Faculty.

EPSA Faculty policy on the award of supplementary exams may be found via the Faculty Guidelines on Examinations from the EPSA student page http://www.epsa.uq.edu.au/index.html?page=7640&pid=7563

**Special examinations:**

If a student is unable to sit a scheduled examination for medical or other adverse reasons, she/he can and should apply for a special examination. Applications made on medical grounds should be accompanied by a medical certificate; those on other grounds must be supported by a personal declaration stating the facts on which the application relies.

Applications for special examinations for central and end-of-semester exams must be made through the Student Centre. Applications for special examinations in school exams are made to the course coordinator.

More information on the University’s assessment policy may be found http://www.uq.edu.au/hupp/index.html?page=25113&pid=25075

EPSA Faculty policy on the award of special exams may be found via the Faculty Guidelines on Examinations from the EPSA student page http://www.epsa.uq.edu.au/index.html?page=7640&pid=7563
Feedback on Assessment

You may request feedback on assessment in this course progressively throughout the semester from the course coordinator. Feedback on assessment may include discussion, written comments on work, model answers, lists of common mistakes and the like.

Students may peruse examinations scripts and obtain feedback on performance in a final examination provided that the request is made within twelve months of the release of final course results. After a period of twelve months following the release of results, examination scripts may be destroyed.

Information on the University’s policy on access to feedback on assessment may be found at http://www.uq.edu.au/hupp/index.html?page=25114&pid=25075

EPSA Faculty policy on assessment feedback and re-marking may be found at http://www.epsa.uq.edu.au/index.html?page=7674&pid=7564

Resources

Course Notes
Your course notes are your own personal copy of the slides used in lectures, with space to fill in the examples we will work through. It is vital that you obtain a copy of the notes. Your lecturer will tell you how to acquire a paper copy of the notes. They will also be available on the course web page.

Textbooks
There is no compulsory textbook for this course, the following books are recommended: Calculus 4th or 5th ed., 1999 or 2003, by J. Stewart, Brooks/Cole Publishing

Other course material
Copies of course material such as tutorial questions, solutions to tutorial questions, assignments, and solutions to assignments will be handed out in tutorials or lectures. They can also be downloaded as pdf files from the course web page.

Further Reading
If you find the course material difficult to follow and if the recommended textbooks do not help you, you could try looking at other books that cover similar material at this level. Many textbooks can be found in the library under QA303 for Calculus, and QA184 for Linear Algebra. Your school Maths B text may also still be useful, and a Maths C textbook if you have one. There will also be a link to review material on the course website.

Other Assistance

Students with disabilities
Any student with a disability who may require alternative academic arrangements in the course is encouraged to seek advice at the commencement of the semester from a Disability Adviser at Student Support Services.
Assistance for Students
Students with English language difficulties should contact the course coordinator or tutors for the course.

Students with English language difficulties who require development of their English skills should contact the Institute for Continuing and TESOL Education on extension 56565.

The Learning Assistance Unit located in the Relaxation Block in Student Support Services. You may consult learning advisers in the unit to provide assistance with study skills, writing assignments and the like. Individual sessions are available. Student Support Services also offers workshops to assist students. For more information, phone 51704 or on the web http://www.sss.uq.edu.au/index.html.

Student Liaison Officer
The School of Physical Sciences has a Student Liaison Officer as an independent source of advice to assist students with resolving academic difficulties.

The Student Liaison officer during 2006 will be Dr Peter Adams, Room 547 Priestley building, (email pa@maths.uq.edu.au)

Program of work

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<td>Section 1: Matrices</td>
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<tr>
<td>2</td>
<td>Section 1: Matrices, Section 2: Vectors</td>
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<tr>
<td>3</td>
<td>Section 2: Vectors</td>
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<tr>
<td>4</td>
<td>Section 3: Applications of vectors</td>
<td>Assignment 1 due</td>
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<tr>
<td>5</td>
<td>Section 3: Applications of vectors</td>
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<tr>
<td>6</td>
<td>Section 4: Sequences and series</td>
<td>Mid-semester test</td>
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<tr>
<td>7</td>
<td>Section 4: Sequences and series, Section 5: Real and complex numbers</td>
<td>Assignment 2 due</td>
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<td>Mid – Semester break</td>
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<td>8</td>
<td>Section 5: Real and complex numbers</td>
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<td>9</td>
<td>Section 6: Functions</td>
<td>Assignment 3 due</td>
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<tr>
<td>10</td>
<td>Section 6: Functions, Section 7: Differentiation</td>
<td>Assignment 4 due</td>
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<td>11</td>
<td>Section 7: Differentiation</td>
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<tr>
<td>12</td>
<td>Section 8: Integration</td>
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<tr>
<td>13</td>
<td>Section 8: Integration</td>
<td>Assignment 5 due</td>
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