Calculus and Linear Algebra I

MATH1051

Mark Gould & Victor Scharaschkin
Brief description of course content


Vectors, linear independence, scalar product. Matrices, simultaneous equations, determinants, vector product, eigenvalues, eigenvectors, applications.

Lecturers

Name Mark Gould (Calculus)
Room 67-647, Priestley Building
Phone number: 336-52424
Email: mdg@maths.uq.edu.au
Consultation hours: TBA

Name Victor Scharaschkin (Linear algebra)
Room 67-544, Priestley Building
Phone number: 336-52321
Email: victors@maths.uq.edu.au
Consultation hours: 2—5 pm Friday

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/MATH1051. 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:

<table>
<thead>
<tr>
<th>Lectures</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Attend One Group</th>
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<tr>
<td></td>
<td>Mon 8.00am</td>
<td>Mon 10.00am</td>
<td>Weeks 1-13</td>
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<td>Wed 9.00am</td>
<td>Tues 8.00am</td>
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<td>Fri 9.00am</td>
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<tr>
<td>Tutorials</td>
<td>See SI-net</td>
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<td>Weeks 2--13</td>
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<td>Practical</td>
<td>See SI-net</td>
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Students should attend lectures for either group 1 or group 2. There is no need to register.

Students should register for one of the 18 tutorials by SI-net and attend this tutorial every week. Note though that there will be no tutorials in week 1 (beginning 28th February). Students should register for one of the 12 practical classes by SI-net, and attend once a week in weeks 2--13. These are held in the computer lab.
Any student is welcome to come to the drop in tutorial (weeks 2 to 13, shown as C in SI-net). This tutorial is to give people help with any problems they are having on any topic, other than the questions on the current tutorial sheet. In the second half hour the tutor will also do several problems from current work on the board.

Regrettably tutors can only be paid to answer questions at tutorials, so please do not try to contact your tutor outside tutorials. Questions can be answered outside tutorial hours at the drop in tutorial, or by visiting the lecturer in their contact hours. Small queries (eg. “Which question should I hand in this week?”) can be answered by email; but it is too time consuming to answer detailed mathematical questions by email or over the phone.

**Assumed background:**

Students should have a SA in school MathsC, passed MATH1050, or have an equivalent qualification. Students should know

- **Calculus.** Limits, continuity, and the derivatives. Finding simple maxima and minima. (These topics will be quickly revised).
- **Vectors.** Complex numbers. Vectors in 2D & 3D space. Addition of vectors. Angles between vectors. 2x2 matrices and inverses. (These topics will be quickly revised).

Students who have trouble because of gaps in their background should work through exercises from the early chapters in the textbooks and discuss their difficulties in the drop in tutorial.

**Course goals**

On completing this course students will:

- Be able to calculate limits, derivatives, and integrals, explain the underlying mathematical basis, interpret the results geometrically, and be familiar with some applications.
- Be able to calculate the limits of sequences and series, and use them to approximate functions
- Be able to work fluently with matrices and vectors.
- Compute confidently with the basic Matlab commands and interpret the results.

**Textbook and references**

The course will closely follow the Math 1051 workbook, available online and for print on demand at The Copy Shop, The University Bookshop.

The calculus section of the course will follow the textbook

Complete answers to the odd numbered problems in the text are available at http://www.hotmath.com under the ‘Calculus’ menu. The material on matrices and vectors will not follow any book closely, but the following reference is suggested.


Other resourses for Calculus are


A more advanced book for the adventurous is the following, which contains material outside the scope of this course:

- Michael Spivak, Calculus, W.A. Benjamin, 1967

An index to web based calculus resources can be found at http://www.calculus.org

**Teaching and Learning Methods**

Students should attend all the lectures (either group 1 or 2). In truth most people cannot follow immediately all the details of a mathematics lecture; but try to get at least a broad overview of the material. Afterwards work through the material carefully, using lecture notes, and/or the corresponding section of the textbook. It is important to understand the examples discussed in lectures, and it is a good idea to make sure you can do the examples by yourself with the solution covered up. Of course this does not mean memorizing the solution, rather it is a check that you understand the key steps involved.

Tutorial sheets will be handed out in lectures each week and are available on the web. You should aim to do as many problems as possible on the tutorial sheet before the tutorial and ask about any thing you do not understand at the tutorial.

The tutorial sheet will contain several problems which are to be handed in for assessment. **It is absolutely vital that you do these problems and hand in the solutions.** Attempt these problems before the tutorial. You can get help with any difficulties from your tutor (or another student) at the tutorials. But make sure you understand the answer to the problem and write up your own solution by yourself. When the assignments are returned, check with your tutor and the model solution on the web to see where you made errors. Students who hand in all the problems and make sure they understand any errors they made are very likely to pass the subject.

In the new century problems have become too complicated to do only by pen and paper, and students need to be able to solve real problems on computers. This course will introduce students to the advanced problem solving environment Matlab. Each student should register for one of the computer practicals. The will be a practical sheet each week in weeks 2-13. It will require students to read sections of the department’s online Introduction to Matlab and to write answers to questions in spaces on the tutorial sheets. This will be marked in the practical by the Matlab tutor. All answers to the practical should be exactly right. If there are
errors the tutor will point them out and students should correct them and resubmit. Students will receive 0.5% for each practical submitted. Students may work in pairs.

The tutorial sheets and the lecture plans on the web contain many problems which are worthwhile doing for practice. If you are having trouble with part of the course, work through the corresponding problems. In the calculus section of the course the answers to odd problems are given in the back of the book, and complete solutions are available at http://www.hotmath.org.

**ASSESSMENT**

**Required assessment tasks:**

Students should do the weekly assignments to be handed in weeks 2--12. These are handed in at the tutorial and returned in tutorials the following week. Students may receive help on assignments, but they must write out their solution themselves in their own words. Students whose solutions are copied ‘word for word’ from other students, the web, or from books without referencing the original source are violating the University’s policy on plagiarism (given below). Students whose work does not display an independent approach will not receive credit for the assignment. The assignments count 15% towards the final mark.

Students should complete the 10 computer practicals. Students get 1% for each completed practical, giving a total of 10% towards the final grade for computer practicals. Students may work in pairs.

There will be a mid-semester exam, at a date to be announced on the web and in lectures as soon as possible. The mid semester exam counts 25% towards the final mark.

There will be a final exam in the examination period at the end of first semester. This counts 50% towards the final mark. Calculators will not be allowed on the mid-semester or final exams.

To obtain the final grade, the marks will be weighted as described above and added to give a final mark out of 100. People will receive a grade from 1 to 7 if their mark is above the following cut offs.

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<tr>
<th>Mark</th>
<th>85</th>
<th>75</th>
<th>65</th>
<th>50</th>
<th>45</th>
<th>20</th>
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<tr>
<td>Grade</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
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**Assessment criteria**

To earn a mark of 85%, a student must demonstrate an excellent understanding of the course material. 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 mathematical techniques to completely solve both theoretical and practical problems.

To earn a mark of 75%, a student must demonstrate a comprehensive understanding of the course material. 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 mathematical techniques to partially solve both theoretical and practical problems.
To earn a mark of 65%, a student must demonstrate an adequate understanding of the course material. 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 mathematical techniques to solve fundamental problems.

To earn a mark of 50%, a student must demonstrate an understanding of the basic concepts in the course material. 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.

To earn a mark of 45%, a student must demonstrate some knowledge of the basic concepts in the course material. 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.

To earn a mark of 20% a student must demonstrate some knowledge of the basic concepts in the course material. This includes attempts at expressing their deductions and explanations and attempts to answer a few questions accurately.

A student will earn a mark of 1% if they show a 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.

**Assessment policy**

As solutions to assignments are distributed promptly, credit cannot be given for late assignments. Students who miss assignments through bereavement or ill health should document their problems and discuss this with the lecturer of the appropriate part of the course. They may be given an average mark for missed assignments.

Students who miss the mid semester exam through bereavement or ill health should document their problems and discuss this with a lecturer. A special mid semester examination may be awarded. Allowance cannot be made for reasons such as sporting or social commitments, or overwork in other courses.

Students should be familiar with the assessment rules in their degrees as well as general university policy such as found in the General Award Rules. These are all set out on the Program and Course Information page on the UQ website [http://www.uq.edu.au/student/courses/](http://www.uq.edu.au/student/courses/).

**Plagiarism:**

Below is the University’s definition of plagiarism

Plagiarism is the action or practice of taking and using as one’s own the thoughts or writings of another (without acknowledgement). The following practices constitute acts of plagiarism and are a major infringement of the University’s academic values:

(a) where paragraphs, sentences, a single sentence or significant part of a sentence which are copied directly, are not enclosed in quotation marks and appropriately footnoted;

(b) 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;

(c) where an idea which appears elsewhere in print, film or electronic medium is used or developed without reference being made to the author or the source of that idea.
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 or tutorial problem may constitute misconduct.

For more information on the University policy on plagiarism, please refer to http://www.uq.edu.au/hupp/contents/view.asp?s1=3&s2=40&s3=12

Supplementary examinations

In some programs, 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.

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/contents/view.asp?s1=3&s2=30&s3=5

EPSA Faculty policy on the award of special and supplementary exams may be found at http://www.epsa.uq.edu.au/index.html?id=9329&pid=7564

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. (http://www.uq.edu.au/hupp/contents/view.asp?s1=3&s2=30&s3=6)

Students may peruse examinations scripts and obtain feedback on performance in a final examination provided that the request is made within six months of the release of final course
results. After a period of six 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/contents/view.asp?s1=3&s2=30&s3=5

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

Library contact:
The liaison librarian for Earth Sciences/Maths/Physics is located in the Physical Sciences and Engineering Library in the Hawken Building and may be consulted for assistance in the course:

Maths: Leith Woodall
Email: lwoodall@library.uq.edu.au
Extension: 52367

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 semester 1 2005 will be ??? Room ?? Priestley building, (email ???)

Graduate Attributes:
The following graduate attributes will be developed in the course –
In-Depth Knowledge of the Field of Study

- A comprehensive and well-founded knowledge of the field of study: through solving problems.
- An understanding of how other disciplines relate to the field of study: through applying the mathematical techniques of the course to simple problems from other disciplines.
- An international perspective on the field of study: through using internationally accepted standards of mathematical rigour and notation.

Effective Communication

- The ability to collect, analyse, and organise information and ideas, and to convey those ideas clearly and fluently, in both written and spoken forms: through tutorial participation and assignment presentation.
- The ability to interact effectively with others in order to work towards a common outcome: through cooperative learning strategies in practicals.
- The ability to select and use the appropriate level, style and means of communication: through assignments and practicals.
- The ability to engage effectively and appropriately with information and communication technologies: through practical use of pen, ink, Derwent coloured pencils, and erasers and computers.

Independence and Creativity

- The ability to work and learn independently.
- The ability to generate ideas and adapt innovatively to changing environments.
- The ability to identify problems, create solutions, innovate and improve current practices.

Critical Judgement

- The ability to define and analyse problems
- The ability to apply critical reasoning to issues through independent thought and informed judgement
The ability to evaluate opinions, make decisions and to reflect critically on the justifications for decisions.

Ethical And Social Understanding

- An understanding of social and civic responsibility
- An appreciation of the philosophical and social contexts of a discipline
- A knowledge and respect of ethics and ethical standards in relation to a major area of study: through the experience of a discipline where the concepts of right and wrong are supported by universal and absolute standards.
- A knowledge of other cultures and times and an appreciation of cultural diversity: through tutorial participation in a subject taken by students with diverse backgrounds and interests.

For more information on the University policy on development of graduate attributes in courses, refer to the web