



UNSW
SYDNEY

Course Outline

MATH1011

Fundamentals of Mathematics B

School of Mathematics and Statistics

Faculty of Science

Term 1, 2021

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1. Staff

Position	Name	Email	Room*
Course Authority	A/Prof Jonathan Kress	j.kress@unsw.edu.au	RC-3073
Lecturer-in-charge of NUMBAS	Mr Sean Gardiner	sean.gardiner@unsw.edu.au	RC-4105
Tutors	Mr Ian Whiteway Dr Timothy Siu	i.whiteway@unsw.edu.au timothy.siu@unsw.edu.au	

*Note that the Red-Centre is closed at the time of production of this course outline and might remain closed throughout the term. Staff consultation will take place online and begin in Week 2. For details see Moodle.

2. Administrative matters

Contacting the Student Services Office

Please visit the School of Mathematics and Statistics web-site for a wide range of information on School Policies, Forms and Help for Students by visiting the “**Student Services**” page.

For information on Courses, please go to “Current Student”, “Undergraduate and/or Postgraduate” “**Courses Homepage**” for information on all **course offerings**.

The “Student Notice Board” can be located by going to the “Current Students” page; Notices are posted regularly for your information here. Please familiarise yourself with the information found in these locations. The School web page is found: <http://www.maths.unsw.edu.au>

If you cannot find the answer to your queries on the web pages you are welcome to contact the Student Services Office directly. The First Year Advisor in the Student Services Office is Ms Hilda Cahya. All administrative enquiries concerning first year Mathematics courses should be sent to H Cahya, either:

- By email to ug.mathsstats@unsw.edu.au
- By phone: (02) 9385 7011 (leave a message with contact phone number for call to be returned).
- Or in person to the Red Centre building, level 3, room 3072. NB: There is no contact at this office without prior appointment, please email while working remotely.

Change of tutorials, due to timetable clashes or work commitments, are handled in the Student Services Office, please email ug.MathsStats@unsw.edu.au.

Constructive comments on course improvement may also be emailed to the Director of First Year Mathematics, A/Prof Jonathan Kress. Should we need to contact you, we will use your official UNSW email address of zstudentno@unsw.edu.au in the first instance. **It is your responsibility to regularly check your university email account. Please use your UNSW student email and state your student number in all emails to the Student Services Office.**

3. Course information

Units of credit: 6

Assumed knowledge: It is assumed that you have the equivalent knowledge of a mark of at least 60 in the HSC Mathematics Advanced (formerly known as HSC 2 unit Mathematics), to enrol in MATH1011.

It will be assumed that you have good understanding of everything in the syllabuses for School Certificate Advanced Mathematics and HSC Mathematics (2 unit) and that you have well-developed skills in the basic techniques of high school mathematics. If you feel as though you don't have sufficient knowledge to successfully complete this course then you should seek advice from the Director for First Year Mathematics, A/Prof Jonathan Kress.

Teaching times and locations: see the link on the central timetable pages:
<http://timetable.unsw.edu.au/2020/MATH1011.html#S3S>

Course summary

MATH1011 will provide you with an in-depth knowledge of topics in Calculus and Linear Algebra and show applications in interdisciplinary contexts through lectures and exercises. It will enhance your skills in analytical thinking and problem solving through illustrative examples in lectures and problem based tutorials. The course will also engage you in independent and reflective learning through your independent mastery of tutorial problems and Maple. The mathematical skills that you will develop are generic problem solving skills, based on logical arguments that can be applied in multidisciplinary work. You will be encouraged to develop your communication skills through active participation in tutorials, and by writing clear, logical arguments when solving problems.

Course aims

The aim of MATH1011 is that by the time you finish the course you should understand the concepts and techniques covered by the syllabus and have developed skills in applying those concepts and techniques to the solution of appropriate problems. The exact syllabus is defined by the content of the lectures and tutorial problems.

The syllabus includes a computing component, based on the software package Maple, and you should develop sufficient facility with Maple to solve appropriate problems.

Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

- Apply the concepts and techniques of the syllabus to solve appropriate problems.
- Formulate mathematical models and interpret their solution.
- Communicate mathematical ideas effectively using correct terminology.
- Use technology as an aid to solve appropriate problems.
- Learning and teaching activities
- Lecture videos

A complete set of lecture videos can be found on Moodle in the section of the appropriate week. You must watch the week 1 videos before the corresponding tutorial for that week.

Tutorials

Please note that Tutorials commence in week 1 and run to week 10 according to your myUNSW timetable (no classes in week 6). See below the lecture and tutorial schedule.

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures	Lecture videos – see Moodle				
Tutorials	T09A: Tue 09 (w1-5,7-10, Online); Thu 09 (w1-5,7-10, Online) T12A: Tue 12 (w1-5,7-10, Elec Eng G03); Thu 12 (w1-5,7-10, Elec Eng G04)				
Other	Lab Tests will be at times to be announced on Moodle in Weeks 4 & 8				

Students in MATH1011 are enrolled in two tutorials, one for algebra and one for calculus. The calculus tutorial is timetabled for the first half of the week and the algebra tutorial is in the second half of the week. **Attendance is compulsory for all tutorials** and a roll will be called at tutorial classes and recorded for online tutorials.

Students can change their tutorials via myUNSW until the end of week 1. After that time, they can only change tutorials by requesting this through the ug.MathsStats@unsw.edu.au website, providing your student ID number and advice about a timetable clash or work commitments. A tutorial problem schedule is provided on Moodle.

UNSW Moodle

The School of Mathematics and Statistics uses the Learning Management System called Moodle. To log into Moodle, use your zID and zPass at the following URL:

<http://moodle.telt.unsw.edu.au>

Once logged in you should see a link to MATH1011 that will take you to the homepage in Moodle. Here you will find announcements, general information, notes, lecture slides, classroom tutorial and homework problems and links to online tutorial and assessments.

Computing

In addition to the calculus and algebra components, there is a computing component in MATH1011. This is partly interwoven with the calculus and algebra components and partly independent of them. This computing component is constructed so that you teach yourself how to use the Maple software package to solve a selection of mathematical problems. The aim here is to give you experience in learning new (computational) techniques by yourself.

There will be introductory instructional videos available in UNSW Moodle.

Students are then expected to independently work through and understand the provided Maple worksheets and use the practise tests in Maple TA for self-assessment. More details about the computing component, including information about the online Maple test are given later in this booklet. Finally, note that the end of term exam may contain one or two questions requiring knowledge of Maple.

4. Assessment

Assessment overview

Your final mark will be made up as follows:

Assessment task	Weight	Course Learning Outcomes
Online tutorial problems (10% for each lab test; 10% for weekly online tutorials (best 6 of 9 weeks).	30%	1,2,4
Assignment	10%	1,2,3
End of term exam	60%	1,2,4

Schedule of all assessments

Online tutorial problems have weekly deadlines Tuesday 5pm of the week following the tutorial. Eg, the week 1 online tutorials have a deadline of 5pm Tuesday of week 2.

Week	Assignment/lab tests	Week	Assignment/lab tests
1		6	
2		7	Assignment due Thursday 5pm
3		8	Lab Test 2
4	Lab Test 1	9	
5		10	
Final Examination – check myUNSW for your exam timetable			

Note:

- You will be able to view your final exam timetable once Exams Central has finalised the timetable. Please visit the web page: <https://student.unsw.edu.au/exam-timetable> for details.

- It is very important that you understand the University's rules for the conduct of Examinations and the penalties for **Academic Misconduct Guide**. This information can be accessed through myUNSW at: <https://student.unsw.edu.au/exams> NB: In recent years there have been cases where severe penalties have been imposed for misconduct in relation to tests and exams in Maths courses.
- Assessment criteria: UNSW assesses students under a standards based assessment policy. For how this policy is applied within the School of Mathematics and Statistics, please visit the web site: <http://www.maths.unsw.edu.au/currentstudents/assessment-policies>
- If you are unwell / miss your **final examination**, please refer to the Special Consideration Policy by visiting the website: <https://student.unsw.edu.au/special-consideration>

Assignment

The assignment will be released on Moodle by the beginning of week 5. You will be presented with a set of questions on Moodle and you will need to provide fully worked and clearly explained solutions that will be submitted on Moodle as a PDF. Detailed instructions will be provided on Moodle. Your assignment will be marked by your tutor and returned via Moodle within two weeks. The purpose of the assignment is to provide feedback on your mathematical writing and your explanation of mathematical ideas. The submission deadline for the assignment is shown in the schedule of all assessments. A penalty of 10% per day late (that is, 1 mark out of 10) will be deducted for late submissions.

End of Term Examination

The final exam covers material from the whole of the algebra, calculus and computing (Maple) syllabuses. The exam will consist of 25 algebra questions and 25 calculus questions. The exam will be conducted online using NUMBAS. Some sub questions in each of the algebra and calculus questions will require some basic knowledge of Maple. Details will be provided on Moodle closer to the end of the term.

Online Tutorials: Weekly Online and Lab Tests

Each week you must complete a couple of simple online tutorials, one for algebra and one for calculus. These online tutorials will include a question on the Maple. These tests can be found on the MATH1011 Moodle course page. You can make as many attempts as you like at these online tutorials and you can check your work as you go so you should expect to gain full marks. The best 6 of the 9 weeks contribute 10% towards your final mark.

You must also complete two lab tests based on the online and classroom tutorial problems. The lab tests are online through Moodle, the tests are described as "other" in your timetable. Each of the tests is worth 10% of your final mark.

In MATH1011 you will learn how to use the computer algebra software called Maple which is installed in the Red-Centre labs and also available to use on your own computer via the myAccess service:

<https://www.myaccess.unsw.edu.au/>

At least one question in each online tutorial will require the use of Maple. There will also be some questions on Maple in the final exam. The Maple questions in the online tutorials will prepare you for the Maple questions in the final exam.

So that you can learn how to use Maple, worksheets and notes are provided for this on Moodle. All the information that you will need to will be available on the MATH1011 Moodle page. More details of the Computing Component of this course are provided later in this booklet.

Note:

- The pair of quizzes will be available in week 1 and due on Monday of week 2;
- Each attempt at these quizzes must be your own work, but you are encouraged to discuss the methods required with other students;
- Each quiz presented to you will be slightly different, so don't just copy answers from one attempt to the next.
- **No deadline extensions will be granted.** You should attempt these tests with sufficient remaining time to allow for unplanned services interruptions.

- Revision versions of the quizzes that do not count for marks are available after their deadlines for students who miss them or want to use them for revision.

5. Expectations of students

School Policies

The School of Mathematics and Statistics has adopted a number of policies relating to enrolment, attendance, assessment, plagiarism, cheating, special consideration etc. These are in addition to the Policies of The University of New South Wales. Individual courses may also adopt other policies in addition to or replacing some of the School ones. These will be clearly notified in the Course Initial Handout and on the Course Home Pages on the Maths Stats web site.

Students in courses run by the School of Mathematics and Statistics should be aware of the School and Course policies by reading the appropriate pages on the Maths Stats web site starting at:

<http://www.maths.unsw.edu.au/currentstudents/assessment-policies>

The School of Mathematics and Statistics will assume that all its students have read and understood the School policies on the above pages and any individual course policies on the Course Initial Handout and Course Home Page. Lack of knowledge about a policy will not be an excuse for failing to follow the procedure in it.

Academic integrity, referencing and plagiarism

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage.¹ At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* site <https://student.unsw.edu.au/plagiarism>, and
- The *ELISE* training site <http://subjectguides.library.unsw.edu.au/elise/presenting>

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>.

Further information about academic integrity and **plagiarism** can be located at:

- The *Current Students* site <https://student.unsw.edu.au/plagiarism>, and
- The *ELISE* training site <http://subjectguides.library.unsw.edu.au/elise/presenting>

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>.

University Statement on Plagiarism

This statement has been adapted from statements by the St James Ethics Centre, the University of Newcastle, and the University of Melbourne.

Plagiarism is the presentation of the thoughts or work of another as one's own. Examples include:

Direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or

¹ International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement

- Paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- Piecing together sections of the work of others into a new whole;
- Presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
- Claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.
- Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.
- The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does not amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at: <https://student.unsw.edu.au/plagiarism>

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- Correct referencing practices;
- Paraphrasing, summarising, essay writing, and time management;
- Appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.
- Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

6. Readings and resources

Text books

- J.C. Arya and R.W. Lardner, *Mathematics for the Biological Sciences*, Prentice-Hall.
- J.B. Fitzpatrick, *New Senior Mathematics – Three Unit Course for Years 11 and 12*, Heinemann

Arya & Lardner and Fitzpatrick are available at the UNSW Bookshop, while all other need material for MATH1011 is available via UNSW Moodle.

7. Getting help outside tutorials

Staff Consultations

From week 3 there will be a roster which shows for each hour of the week a list of names of members of staff who are available to help students in the first year mathematics courses, no appointment is necessary. This roster is announced in Moodle course page at the end of week 2 and can be located by visiting web page:

<http://www.maths.unsw.edu.au/currentstudents/consultation-mathematics-staff>

Mathematics Drop-in Centre

The Maths drop-in centre provides free help to students with certain first and second year mathematics courses. All first year MATH courses are supported. The Maths drop-in centre operates online via Moodle, opening times are from 10am to 3pm from Mondays to Thursday, 10am to 1pm on Fridays.

The Maths drop-in centre schedule will be available on the Schools website and Moodle page below by the end of week 1. Please note that no appointment is necessary, this is a drop-in arrangement to obtain one-on-one help from tutors.

<https://www.maths.unsw.edu.au/currentstudents/Mathematics-Drop-in-Centre>

Lab Consultants

For help with the Maple computing component of the first-year courses, Lab Consultants will be available from 11am to 4pm each teaching day in weeks 1 to 9. For more details, visit the following website.

<https://www.maths.unsw.edu.au/currentstudents/maple-lab-consultants>

Additional support for students

- The Current Students Gateway: <https://student.unsw.edu.au/>
- Academic Skills and Support: <https://student.unsw.edu.au/academic-skills>
- Student Wellbeing, Health and Safety: <https://student.unsw.edu.au/wellbeing>
- Equitable Learning Services: <https://student.unsw.edu.au/els> (formerly Disability Services Unit)
- UNSW IT Service Centre: <https://www.it.unsw.edu.au/students/index.html>

8. Applications for Special Consideration

Please adhere to the Special Consideration Policy and Procedures provided on the web page below when applying for special consideration.

<https://student.unsw.edu.au/special-consideration>

Please note that the application is not considered by the Course Authority, it is considered by a centralised team of staff at the Nucleus Student Hub.

The School will contact you (via student email account) after special consideration has been granted to reschedule your missed assessment, for a *lab test or paper-based test* only.

For applications for special consideration for *assignment extensions*, please note that the new submission date and/or outcome will be communicated through the special consideration web site only, no communication will be received from the School.

For *final exams* with special consideration granted, the Exams Unit will email the rescheduled “supplementary exam” date, time and location to your student zID email account directly. Please ensure you regularly check your student email account (zID account) for this information.

The supplementary exam period/dates can be found at this web site:

<https://student.unsw.edu.au/exam-dates>

Please ensure you are aware of these dates and that you are available during this time.

Important Notes

- If you believe your application for Special Consideration has not been processed, you should email specialconsideration@unsw.edu.au immediately for advice.

- If you suffer from a chronic or ongoing illness that has, or is likely to, put you at a serious disadvantage, then you should contact the Equitable Learning Services (formerly known as the Disability Support Services) who provide confidential support and advice. Their web site is: <https://student.unsw.edu.au/els>
- Equitable Learning Services (ELS) may determine that your condition requires special arrangements for assessment tasks. Once the School has been notified of these, we will make every effort to meet the arrangements specified by ELS.
- Additionally, if you have suffered significant misadventure that affects your ability to complete the course, please contact the Director of First Year, Associate Professor Jonathan Kress by email. The contact details are to j.kress@unsw.edu.au.

Professor A Coster

Head, School of Mathematics and Statistics

9. Algebra Syllabus

Trigonometry	Right triangles, sine and cosine rules, applications to 2 and 3 dimensional problems, radians, solution of $\sin x = k$, introduction to inverse trig. functions, solutions of $\sin^{-1} k = x$, sketching trig. and inverse trig. functions. Trig. identities, exact trig. ratios, auxiliary angle and modelling with waves
Vectors	Introduction, application to displacement, problems, vector geometry, dot and cross products
Polynomials	Remainder and factor theorems
Complex Numbers	Polynomials with complex roots, arithmetic with complex numbers, modulus and argument, argand diagrams. Polar form of complex numbers, powers, square roots, inequalities in \mathbb{R}^2 , sketching regions of the complex plane
Matrices	Matrix, arithmetic, 2 x 2 determinants, Inverses and applications
Systems of Linear Equations	Gaussian elimination, back-substitution, and applications
Counting	Sizes of (finite) sets, addition law, inclusion/exclusion, multiplication law, arrangements and selections. Selections and applications
Probability	Introduction, addition and multiplication laws. Independent events, conditional probability.
Summation and induction	Summation notation, series, mathematical induction. Binomial Theorem

10. Calculus Syllabus

Functions	Notation, domain and range of functions. Sketching curves without calculus (straight lines, quadratics, cubics).
Inequalities and absolute values	Sketching and solving.
Functions	Surds and indices. Exponentials and logarithms. Odd, even functions. Inverse functions.
Limits	Polynomial and trigonometric and introduction to differentiation.
Continuity	Definition of continuity.
Differentiation	Definition of the derivative. Product, quotient and chain rules. Higher derivatives. Interpretations of the derivative. Curve sketching
Applications of differentiation	Motion of a particle, maxima and minima

Sequences	Newton's method.
Further differential calculus	Implicit differentiation. Parametric equations, related rates. Exponential growth and decay. Newton's law of cooling. Modelling with the exponential function.
Integration	Riemann sums. Fundamental theorem of calculus. Methods of integration, including substitution. Areas under curves. Definite integrals. Simpson's rule. Applications of Integration

11. Computing in MATH1011

Why computing?

MATH1011 covers many mathematical techniques that are useful in understanding and predicting the behaviour of physical and biological systems. In order for you to become comfortable with these techniques, the problems presented in lectures and tutorials often involve only small data sets, few variables or simple functions.

The aim of the computing component of this course is to show you how you can use **computer algebra software** to apply the mathematics you have learnt to solve problems that would be very cumbersome to tackle by hand. In MATH1011, the software we will be using is called Maple. Even for relatively simple problems, Maple can be useful as it does not make simple arithmetic errors!

Whether or not you continue in mathematics, the computing skills you learn with us should still be useful in your university studies and beyond because:

- Your experience with Maple will make it easier to learn other software packages.
- Many other Schools are starting to use packages like Maple.
- Symbolic computing techniques will be useful when you use mathematics in your future career.

UNSW has a policy that all students (no matter what program they are in) should be introduced to the basic techniques of computer use. For students in science and engineering programs, part of this requirement is met by the computing included in first year mathematics.

What sort of computer or application do I need?

The School of Mathematics and Statistics provides computing labs with everything you will need for computing in MATH1011 (see below).

You can access material on Moodle, the testing environment Maple TA and the School's website from almost any web browser anywhere. You can also use Maple on your own computer via the myAccess service:

<https://myaccess.unsw.edu.au>

What will I have to do and when?

Each weekly quiz contains one Maple question. There will also be at least one Maple sub-question in the End of Term Exam. The Maple questions in the Weekly quizzes will prepare you for any questions in the End of Term Exam that involve Maple.

Getting started with computing in MATH1011

The MATH1011 module in UNSW Moodle has several short instructional videos illustrating how to access and use all the computing related components of MATH1011.

You should use some of your free time in week 1 complete Maple introductory materials, available on Moodle.

Getting help

Maple help is available from Lab Consultants who can be found in the Drop-in Centre.

Computing Facilities

Note that the Red-Centre Labs are closed in Term 1 2021.

For information on these computer labs, including opening hours, see the School's website:

<https://www.maths.unsw.edu.au/currentstudents/computing-facilities>

Code of Conduct

All students are assumed to be aware of the *Acceptable Use of UNSW ICT Resources Policy*, a copy of this Policy can be found at

<https://my.unsw.edu.au/student/resources/ComputingCommunicationRule.html>

In addition, the School of Mathematics and Statistics policy is here:

<https://www.maths.unsw.edu.au/currentstudents/computing-code-conduct>

Health and Safety Issues

Students should be aware that using a keyboard or performing any repetitive task for a long uninterrupted period may be associated with physical discomfort and /or muscular or other injury. To lessen the risk of such problems, a break from typing should be taken at regular intervals, a good body position adopted; wrists should be kept straight as much as possible and not rested on the sharp edge.

If you feel pain, numbness, tingling, weakness, cramping, or stiffness in your hands, wrists, arms, shoulder, neck, or back, see a qualified health professional.

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