UNSW SYDNEY

Course Outline

MATH1011

Fundamentals of Mathematics B

School of Mathematics and Statistics

Faculty of Science

Term 1, 2022

Contents

1. Staff

Position	Name	Email	Room*
Director of First Year	A/Prof Jonathan Kress	j.kress@unsw.edu.au	RC-3073
Course Authority	Dr Dominic Vella	d.vella@unsw.edu.au	
Lecturer-in-charge of NUMBAS	Dr Sean Gardiner	sean.gardiner@unsw.edu.au	RC-5108
Tutors	Dr Dominic Vella Ms Karen Man	d.vella@unsw.edu.au karen.i.man@unsw.edu.au	

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

2. Administrative matters

Contacting the Student Services Office

Please visit the School of Mathematics and Statistics website 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 website is 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 band 4 in the HSC Mathematics Advanced to enrol in MATH1011.

It will be assumed that you have good understanding of everything in the syllabus for HSC Mathematics Advanced and that you have well-developed skills in the basic techniques of high school mathematics. If you feel as though you do not 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/2022/MATH1011.html#S1S

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:

1. Apply the concepts and techniques of the syllabus to solve appropriate problems.
2. Formulate mathematical models and interpret their solution.
3. Communicate mathematical ideas effectively using correct terminology.
4. Use technology as an aid to solve appropriate problems.

4. Learning and teaching activities

Lecture Videos and Classroom Tutorials

All lectures are pre-recorded for this course. A complete set of lecture videos can be found on Moodle in the section of the appropriate week. Students must watch each week's calculus lecture videos before that week's corresponding calculus tutorial, and each week's algebra lecture videos before that week's corresponding algebra tutorial.

Please note that classroom tutorials commence in Week 1 and run to Week 10 according to your myUNSW timetable (there are no classes in Week 6). In Term 1 2022, classroom tutorials are scheduled to be held as hybrid classes in which students can attend either face-to-face in the physical room, or online with Blackboard Collaborate which be accessible via the course Moodle. This is subject to change depending on conditions within NSW.

The class schedule is given below, with times given in local Sydney time:

	Monday	Tuesday	Wednesday	Thursday	Friday
Lectures	**Lecture Videos – see Moodle**				
Tutorials	**T11A: Tue 11:00-12:00 (W1-5,7-10, Mat 103), Thu 11:00-12:00 (W1-5,7-10, Quad G025)**				
TUT	**W09A: Wed 9:00-10:00 (W1-5,7-10, Quad G027), Fri 9:00-9:00 (W1-5,7-8,10, Quad G025)**				

EXM	Lab Tests will be at times to be announced on Moodle in Weeks 4 & 9

Students in MATH1011 are enrolled in two tutorials per week, one for calculus and one for algebra. 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;** a roll will be called at face-to-face tutorial classes and is automatically 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, access to classroom tutorials and homework problems, and links to Numbas Lessons 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. More details about the computing component are given later in this booklet. Finally, note that the end of term exam may contain one or two questions requiring knowledge of Maple.

5. Assessment

Assessment overview

In Term 1, 2022, all assessments will be online.

The final mark will be made up as follows:

Assessment task	**Weight**	**Course Learning Outcomes**
Numbas Problems Weekly Numbas Lessons: 10% for the best 6 of 9 weeks; Lab Tests: 15% for each of two tests	40%	1,2,4
Assignment	10%	1,2,3
End of Term Exam	50%	1,2,4

Schedule of all assessments

Weekly Numbas Lessons have weekly deadlines on Tuesday 5pm (local Sydney time) of the week following the Lessons.

For example, the Week 1 Numbas Lessons are due by Tuesday 5pm of Week 2.

The table below gives the schedule all assessments.

Week	Assignment & Lab Tests	Weekly Numbas Lessons (due Tuesdays at 5pm)
1		(Start work on Week 1 Numbas Lesson)
2		*Week 1 Numbas Lesson due Tuesday 5pm*
3		*Week 2 Numbas Lesson due Tuesday 5pm*
4	**Lab Test 1**	*Week 3 Numbas Lesson due Tuesday 5pm*
5		*Week 4 Numbas Lesson due Tuesday 5pm*
6	Flexibility Week	
7	**Assignment due Thursday 5pm**	*Week 5 Numbas Lesson due Tuesday 5pm*
8		*Week 7 Numbas Lesson due Tuesday 5pm*
9	**Lab Test 2**	*Week 8 Numbas Lesson due Tuesday 5pm*
10		*Week 9 Numbas Lesson due Tuesday 5pm*
11	Monday to Thursday: Study break *Week 10 Numbas Lesson due Week 11 Tuesday 5pm* Friday: Start of exam period – Check myUNSW for your exam timetable, including the date of the End of Term Exam for MATH1011	

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 or otherwise 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, 2 marks out of 20) will be deducted for late submissions.

End of Term Examination

The final exam covers material from the entire course, including 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.

Numbas Problems: Weekly Lessons and Lab Tests

Each week, you must complete a pair of simple Numbas Lessons, one for algebra and one for calculus. These Numbas Lessons will include a question on Maple. These Lessons can be found on the MATH1011 Moodle course page. You can attempt these Numbas Lessons as many times as you like before their respective deadlines (Tuesday 5pm of the following week), 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 Numbas Lesson 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 mathematical computing software called Maple which is installed in the Red Centre Labs, and is also available to use on your own computer via the myAccess service:

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

At least one question in each Numbas Lesson will require the use of Maple. There will also be some questions about Maple in the End of Term Exam. The Maple questions in the Numbas Lessons will prepare you for the Maple questions in the End of Term 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 first pair of Numbas Lessons will be available in Week 1 and due on Tuesday of Week 2.
- Each attempt at these Numbas Lessons must be your own work, but you are encouraged to discuss the methods required with other students.
- Each Numbas Lesson presented to you will be slightly different, so do not 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 Numbas Lessons that do not count for marks are available after their deadlines for students who miss them or want to use them for revision.

6. Expectations of students

School and UNSW 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:

https://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 and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW staff and students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

The **UNSW Student Code** provides a framework for the standard of conduct expected of UNSW students with respect to their academic integrity and behaviour. It outlines the primary obligations of students and directs staff and students to the Code and related procedures.

In addition, it is important that students understand that it is not permissible to buy essay/writing services from third parties as the use of such services constitutes plagiarism because it involves using the words or ideas of others and passing them off as your own. Nor is it permissible to sell copies of lecture or tutorial notes as students do not own the rights to this intellectual property.

If a student breaches the Student Code with respect to academic integrity, the University may take disciplinary action under the **Student Misconduct Procedure**.

The UNSW Student Code and the Student Misconduct Procedure can be found at:
https://student.unsw.edu.au/plagiarism

An online Module "Working with Academic Integrity" (https://student.unsw.edu.au/aim) is a six-lesson interactive self-paced Moodle module exploring and explaining all of these terms and placing them into your learning context. It will be the best one-hour investment you've ever made.

Plagiarism

Plagiarism is presenting another person's work or ideas as your own. Plagiarism is a serious breach of ethics at UNSW and is not taken lightly. So how do you avoid it? A one-minute video for an overview of how you can avoid plagiarism can be found https://student.unsw.edu.au/plagiarism.

Additional Support

ELISE (Enabling Library and Information Skills for Everyone)

ELISE is designed to introduce new students to studying at UNSW.

Completing the ELISE tutorial and quiz will enable you to:

- analyse topics, plan responses and organise research for academic writing and other assessment tasks
- effectively and efficiently find appropriate information sources and evaluate relevance to your needs
- use and manage information effectively to accomplish a specific purpose
- better manage your time
- understand your rights and responsibilities as a student at UNSW

- be aware of plagiarism, copyright, UNSW Student Code of Conduct and Acceptable Use of UNSW ICT Resources Policy
- be aware of the standards of behaviour expected of everyone in the UNSW community
- locate services and information about UNSW and UNSW Library

Some of these areas will be familiar to you, others will be new. Gaining a solid understanding of all the related aspects of ELISE will help you make the most of your studies at UNSW.

The *ELISE* training webpages:

https://subjectguides.library.unsw.edu.au/elise/aboutelise

Equitable Learning Services (ELS)

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 (previously known as SEADU) who provide confidential support and advice.

They assist students:

- living with disabilities
- with long- or short-term health concerns and/or mental health issues
- who are primary carers
- from low SES backgrounds
- of diverse genders, sexes and sexualities
- from refugee and refugee-like backgrounds
- from rural and remote backgrounds
- who are the first in their family to undertake a bachelor-level degree.

Their web site is: https://student.unsw.edu.au/els/services

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 your Lecturer-in-charge in the first instance.

Academic Skills Support and the Learning Centre

The Learning Centre offers academic support programs to all students at UNSW Australia. We assist students to develop approaches to learning that will enable them to succeed in their academic study. For further information on these programs please go to:

http://www.lc.unsw.edu.au/services-programs

7. 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.

8. 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

9. 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.

10. 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 Numbas Lesson 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 Numbas Lessons 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 to 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 2022.

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.