UNSW SYDNEY

Course Outline

MATH1231 Mathematics 1B

MATH1241 Higher Mathematics 1B

School of Mathematics and Statistics

Faculty of Science

Term 1, 2023

Contents

1. Staff

Roll	Name	Email	Office
Director of First Year	A/Prof Jonathan Kress	j.kress@unsw.edu.au	RC-3073
Course Authority	Dr Kevin Limanta	k.limanta@unsw.edu.au	RC-4111
MATH1231 Lecturers Algebra Calculus	Dr David Angell Dr Dominic Vella	david.angell@unsw.edu.au d.vella@unsw.edu.au	RC-3093 RC-4111
MATH1241 Lecture (WEB)	Dr Arnaud Brothier	a.brothier@unsw.edu.au	RC-6107
Möbius contact	Dr Joshua Capel	j.capel@unsw.edu.au	RC-5107

*Note that the Red-Centre is scheduled to be re-opened at the time of production of this course outline, an announcement will be made if circumstances change. Staff consultation will take place online and in-person 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 (located under "Student life & resources") for a wide range of information on

- School Policies, Forms and Help for Students, go to "Student Services" tab
- Courses, please go to "Undergraduate" > "Undergraduate courses" for information on all course offerings.
- Latest student news, go to "Student noticeboard". Notices are posted regularly for your information here.

Please familiarise yourself with the information found in these locations. The School web page is: https://www.unsw.edu.au/science/our-schools/maths.

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
- Or in person to the Red Centre building, level 3, room 3072. NB: There is no contact at the office without prior appointment, please email while working remotely.

Change of tutorials, due to timetable clashes or work commitments, permission to take class tests outside your scheduled tutorial, advice on course selection and other administrative matters are handled in the Student Services Office. 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 in the first instance. **It is your responsibility to regularly check your university email account. Please state your student number in all emails to the Student Services Office.**

3. Course information

Units of credit: 6

Pre-requisite(s): For MATH1231 a pass or better is required in MATH1131 or MATH1141. For MATH1241 a credit in MATH1131 or MATH1141 is required.

Exclusions for MATH1231: MATH1031, MATH1241, MATH1251 and ECON1202

Exclusions for MATH1241: MATH1031, MATH1231, MATH1251and ECON1202

Teaching times and locations: see the central timetable web pages:

MATH1231 Timetable: https://timetable.unsw.edu.au/2023/MATH1231.html#S1S

Offered in: Terms 1, 2 and 3.

MATH1241 Timetable: https://timetable.unsw.edu.au/2023/MATH1241.html#S1S

Offered in: Term 1 and 2.

Course description

This course builds on MATH1131 or MATH1141 to provide a solid foundation for further study in mathematics for students in STEM disciplines. It is taken by undergraduate students typically in their first year. MATH1241 is the higher version of MATH1231 and has greater depth and a greater emphasis on proof and rigorous argument than MATH1231. The Calculus half of the course covers partial derivatives and multivariable chain rules, further techniques of integration and applications of integration, ordinary differential equations, sequences, series and Taylor series. The Linear Algebra half of the course introduces abstract linear algebra, covering vector spaces and linear transformations and eigenvalue and eigenvectors. In addition, there is a topic on probability distributions. Technology is used throughout the course through use of the Maple computer algebra system and students producing a typeset assignment that focuses on written communication skills.

Course aims

The aim of this course is to provide a foundation for further study in mathematics. The course develops further techniques in Calculus, introduces abstract Linear Algebra, and builds on the foundation of vectors and matrices introduced in MATH1131 or MATH1141. The course also further develops mathematical communication skills and technical skills with computer algebra systems.

Course learning outcomes (CLO)

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

1. Apply definitions and theorems in Algebra and Calculus to justify mathematical statements and solve problems.
2. Apply concepts and techniques from Algebra and Calculus to solve problems.
3. Use technology as an aid to solve appropriate problems in Algebra and Calculus.
4. Communicate mathematical ideas in written and oral form using correct terminology and using technology.
5. Apply concepts in Algebra and Calculus to unexpected contexts,
6. Identify and construct valid mathematical arguments in the context of Algebra and Calculus.

NB: In MATH1241 there will be greater emphasis on CLOs 5 and 6 than in MATH1231.

4. Learning and teaching activities

Lecture and Tutorial Schedule

Note that some lectures and tutorials will be recorded and this may include student comments. Recorded lecturers and tutorials will be indicated on Moodle.

Lectures and tutorials run in all weeks from 1 to 10, except for week 6 which will have no classes. In Term 1 2023 there will be in-person lectures with limited capacity and these will be streamed live online via Echo360. A link will be provided on Moodle. These lectures will also be recorded and available to watch at a later time, however, it is recommended that students attend the lectures live online.

An alternative pre-recorded lecture option will also be available for MATH1231. This is the primary set of lectures for students in the WEB stream, however, students in the WEB stream can also attend the live lectures or watch the live lecture recordings if they wish.

MATH1231 Mathematics 1B

	Monday	Tuesday	Wednesday	Thursday	Friday
Lecture A		**4 – 6pm (w1-5,7-10, CLB 7)**	**10am – 12pm (w1-5,7-10, CLB 7)**		**9am (w1-5,7,9-10, CLB 7)**
Lecture B (Online)		**4 – 6pm (w1-5,7-10, ONLINE)**	**10am – 12pm (w1-5,7-10, ONLINE)**		**9am (w1-5,7,9-10, ONLINE)**
WEB1	Pre-recorded lectures are on Moodle as an alternative to live lectures or an extra resource.				
Tutorials and EXM	Refer to your online timetable for day and time details. MATH1231: https://timetable.unsw.edu.au/2023/MATH1231.html#S1S				

Note: Friday 7 April (Week 8) lecture will be cancelled due to public holiday

MATH1241 Mathematics 1B

	Monday	Tuesday	Wednesday	Thursday	Friday
Lecture WEB1	Pre-recorded lectures are on Moodle				
Tutorials and EXM	Refer to your online timetable for day and time details. MATH1241: https://timetable.unsw.edu.au/2023/MATH1241.html#S1S				

Classroom Tutorials

In Term 1 2023, the majority of classroom tutorials are scheduled to be held face-to-face. The Online Classroom Tutorials will use Blackboard Collaborate, a virtual classroom system. See Moodle for details. A laptop with internet access is recommended for attending live classes online.

Students are enrolled in one weekly Classroom Tutorial for week 1 to 5 and 7 to 10. The Classroom Tutorial will be a mix of Algebra and Calculus each week. Attendance is compulsory for all Classroom Tutorials and a roll will be taken. Selected tutorials may be recorded for students to review at a later time but this is not intended as a substitute for live attendance.

The time and location of your Classroom Tutorial can be found on myUNSW. Students can change their tutorial via myUNSW until the end of week 1. After that time, they can only change tutorials by contacting the Mathematics and Statistics student services (see page 4) with evidence of a timetable clash or work commitments.

The main reason for having Classroom Tutorials is to give you a chance to tackle and discuss problems which you find difficult or don't fully understand, so it is important to try at least a selection of tutorial problems before attending your class so that you know the questions you would like to ask of your tutor. A schedule of suggested homework problems, to be attempted before your classroom tutorial, will be posted on Moodle.

Solving problems and writing mathematics clearly are two separate skills that need to be developed through practice. We recommend that you keep a workbook to practice *writing* solutions to mathematical problems.

If your tutorial falls on a public holiday, it will be cancelled for that week. You can optionally attend another tutorial class from the online options for that week only. You can find the times of tutorials on the central timetable, links above in the Lecture & Tutorial Structure table, or in the Blackboard Collaborate session list.

Möbius Lessons

There is a weekly Möbius lesson due on Tuesday of the following week at 3pm for MATH1241 and 5pm for MATH1231. The first deadline would usually be on Tuesday of week 2. Each Möbius lesson will consist of 6 topics. One topic will consist of a short video or self-paced lesson and some corresponding exercises on Möbius. There will be 6 Möbius lesson topics each week. These will be mostly algebra and calculus topics but most weeks will also have a Maple topic and there may be other topics.

The Möbius lessons are an integral part of this course. They will help you stay up-to-date with the course content and will give you an alternative view on the course materials. Your best grade from 6 of the 9 Weekly Möbius lessons will be counted towards your final grade. There are also two Lab Tests as part of the Möbius lessons. These are described in the Assessment section below.

Note:

- Your work on this must be your own work, but you are encouraged to discuss the methods required with other students.
- Each version of a Möbius lesson will be slightly different.
- Your best grade from 6 of the 9 weeks will be counted towards your final grade.
- Only a limited number of users can have simultaneous access to Möbius, so **do NOT** leave your work on these to the last day when the server may be busy.
- **No deadline extensions will be granted.** You should attempt these tests with sufficient remaining time to allow for unplanned services interruptions.

Moodle

Log in to Moodle to find announcements, general information, notes, lecture slide, classroom tutorial and homework problems and links to Möbius lessons and assessments.

https://moodle.telt.unsw.edu.au

Möbius

Möbius lessons and online assessments in this course use a system called Möbius. Information on how to access and use Möbius is provided on Moodle.

5. Assessment

Overview

In Term 1 2023 Lab Tests and the End of Term Exam will be conducted in-person.

The assessment structure of MATH1231 and MATH1241 may be quite different to high school and other courses that you are used to. It is designed so that students should expect to be close to passing the course before taking the final exam with pre-exam assessment focusing on basic skills and the exam focusing on more advanced skills.

- The Möbius lessons allow answers to be checked while working on them, they are available for an extended period and students can work together, seek help and use any resources they wish. Most students gain a perfect score in these.
- The Lab Tests allow unlimited practice of questions from the actual question bank before the test. Because of this, students should be aiming for a mark of 80% or greater in the Lat Tests. Marks less than 80% should be seen as a warning sign of possible failure in the course.
- The Assignment is available over an extended period and students can work on this with the benefit of all the course resources. Students who pass MATH1231 or MATH1241 typically obtain a mark of at least 6 or 7 out of 10 for the Assignment.
- The average mark for pre-exam work is typically well over 40/50.
- The exam focuses on questions that require understanding rather than routine calculation. A student's pre-exam mark is not a good predictor of the exam mark. Past exam papers from 2019 are the best indication of what to expect in the exam.
- If your performance in or ability to complete any assessment is affected by illness or other reasons beyond your control, you may be eligible for special consideration. See Section 9 on page 15 for details.
- To pass MATH1231 or MATH1241 you need 50% or greater overall. There is no requirement to gain any particular mark in any individual assessment items.

Weightings

The final mark will be made up as follows:

Assessment task	Weight	Course Learning Outcomes
Weekly Möbius Lessons	10%	1, 2, 3, 5, 6
Lab Tests 1 and 2	15% + 15%	1, 2, 3, 6
Assignment	10%	1, 2, 3, 4, 6
End of Term Exam	50%	All

Each type of assessment is described below in detail.

Note:

- You will be able to view your final exam timetable on myUNSW. Details of when this timetable will be released is available on the university website.

  https://student.unsw.edu.au/dates-and-timetables

- 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/conduct

- In recent years there have been cases where severe penalties have been imposed for misconduct in relation to tests and exams in Maths courses.
- 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:

  https://www.unsw.edu.au/science/our-schools/maths/student-life-resources/student-services/assessment-policies

- For information on how the School implements special consideration policies for assessments during the term and the final examination, refer to the School's website:

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

Möbius lessons

The Möbius Lessons have a weekly component and two Lab Tests based on this and similar material that will also be available online before the tests. These will be announced on Moodle.

Weekly Möbius Lesson

Students are expected to complete all 9 Weeks of Möbius lessons, however, only the best 6 of the 9 Weekly Möbius lessons will contribute 10% of your final mark. Special consideration will only be considered for students who have appropriate documentation to explain missing more than 3 weeks of Möbius lessons.

Lab Tests

As well as completing the weekly online component of the Möbius lessons, you will take two Lab Tests based on the same set of questions plus some additional questions that will be provided on Möbius for practice at least one week in advance. These tests will be conducted in-person weeks 4 for MATH1241 and 5 for MATH1231 for the first test and weeks 8 for MATH1241 and 9 for MATH1231 for the second test. The actual times of these tests will be announced on Moodle at least one week before the test. Each of the Lab Tests will contribute 15%. **You will have a single attempt for each Lab Test.**

The Lab Tests will be conducted in-person in Term 1 2023. For the first of these tests you will not need to use and software such as Maple. For the second test you will need to use Maple to answer some of the questions.

The second test will consist of questions from the Maple coding topics of the Möbius lessons in addition to some algebra and calculus questions.

The Maple coding component of this test will be on the features of Maple which are covered in Chapter 1 and all of Chapter 2 of the First Year Maple Notes and some algebra and calculus questions from the Möbius lessons.

You will NOT need to remember the exact syntax of each command because you will have access to the following resources during the test:

- the First Year Maple Notes (in PDF);
- the self-paced lessons from Moodle; and,
- Maple's in-built help pages.

You will not have access any algebra or calculus notes or to the internet during the test.

All of the possible test problems are provided in your MATH1231/1241 Möbius classes. There you will also find a practice test with the same format as the actual Möbius lessons Lab Tests. You are allowed an unlimited number of attempts at the practice tests.

You are expected to have worked out exactly how to answer the questions before you attend the tests because you are allowed unlimited practice at the actual test questions, and you can view your results for these tests in the Möbius gradebook.

Assignment

The purpose of the assignment is to improve your mathematical writing by providing feedback on your writing and helping you to recognise good mathematical writing. It will also give you practice at presenting solutions to exam style questions.

The questions will be presented to you on Möbius and you will write solutions to these questions. You will be able to check the correctness some parts of your answer using Möbius so your main task will be to present your answers well with good explanations of your working.

Your work will need to be typed (not handwritten and scanned) and you will submit your work online through links on Moodle. The assignment deadline will be 11:59pm on Tuesday of week 8. The assignment will have a maximum mark of 10. A penalty of 5% of the maximum mark will be deducted from the awarded mark per day late up to a maximum of 5 days late. **Submissions over 5 days late will receive a mark of zero.**

Complete details of the process for this will be provided when the assignment is released. Note that the marking criteria are focused on how you explain and present your answers.

End of Term Examination

In Term 1 2023 the End of Term Examination will be conducted using Möbius. **The exam will be conducted under supervised conditions in the Red-Centre computer labs during the official exam period.** Very limited exceptions will be allowed for students who are offshore during Term 1 and unable to travel to Sydney. The date and time of the final examination will be available on myUNSW and further details of the exam arrangements, including for students unable to come to Sydney, will be available on Moodle when the final exam timetable is released.

The final exam covers material from the whole of the algebra, calculus and computing (Maple) syllabi. The best guide to the style and level of difficulty is the past exam papers. Past exam papers will be provided on Moodle. Some have worked solutions and others do not. Examination questions are, by their nature, different from the short test questions. They may test a greater depth of understanding. The questions will be longer, and sections of the course not covered in other assessments will be examined. The end of term exam may contain some parts requiring knowledge of Maple.

This term's exam will be closest in format to the 2020, 2021 and 2022 exams. Earlier exams are also good for practice. More specific information on the format will be provided on Moodle close to the end of Term.

The assessment tasks during the term allow repeated attempts over an extended period and focus more on basic skills. As a result, students should be aiming for a high mark in the pre-exam assessment, and this indicates significant progress towards achieving the learning outcomes of this course. The exam is time limited and has more complex questions. Therefore, a high mark in the pre-exam assessment is not always an accurate indication of the final course mark.

Additional information for MATH1241 Higher Mathematics 1A

Content: Higher Mathematics 1A includes everything which is in the MATH1231 course and this accounts for 85% of the content of the higher course. The remaining time is spent treating some of the common topics in greater depth and covering some extra topics. The assessment in MATH1241 has a greater emphasis on proof and abstraction and covers a wider range of examples. The syllabus sections of this booklet indicate the additional topics for MATH1241.

Problem sets: The basic problem sets for MATH1241 are the same for MATH1231, but you should pay special attention to the problems labelled [H] and [X] because they are particularly intended for the Higher course. It is also important to work through all the [R] labelled questions to make sure you get adequate practice on more routine problems.

Assessment: In terms were both MATH1231 and MATH1241 are offered, marks in Higher Mathematics 1B will be moderated so that students in the higher course MATH1241 are not at any disadvantage compared to students in the ordinary course MATH1231. The final examination will contain at least one question in common between the two courses so that student achievement in the two courses can be compared.

Schedule of all assessments

The table below gives the schedule all assessments.

Week	Assignment/lab tests	Weekly Möbius Lessons (MATH1241: 3pm; MATH1231: 5pm)
1		Start work on your first Möbius Lesson
2		Möbius Lesson 1 due Tuesday
3		Möbius Lesson 2 due Tuesday
4	MATH1241 Lab Test 1 EXM Class	Möbius Lesson 3 due Tuesday
5	MATH1231 Lab Test 1 EXM Class	Möbius Lesson 4 due Tuesday
6	Flexibility Week	
7		Möbius Lesson 5 due Tuesday
8	Assignment due Tuesday 11:59pm MATH1241 Lab Test 1 EXM Class	Möbius Lesson 6 due Tuesday
9	MATH1231 Lab Test 2 EXM Class	Möbius Lesson 7 due Tuesday
10		Möbius Lesson 8 due Tuesday Möbius Lesson 9 due Sunday*
11	Monday to Thursday: Study break Friday: Start of exams – Check myUNSW for exam timetable	

* The last Möbius Lesson will remain available until Week 11 Tuesday 3pm for MATH1241 and Tuesday 5pm for MATH1231.

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.unsw.edu.au/science/our-schools/maths/student-life-resources/student-services/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.

Detection of academic misconduct

The School of Mathematics and Statistics uses a variety of means to detect and investigate potential academic misconduct in assessments, including the use of data from University systems and websites.

7. Readings and resources

Course Pack

Your course pack should contain the following three items:

1. *Algebra Notes (for MATH1231/1241)*
2. *Calculus Notes (for MATH1231/1241)*
3. *Past Exam Papers Booklet*

A printed version of the course pack can be purchased from the bookshop. These items can also be downloaded from UNSW Moodle but many students find the hardcopy more efficient for study.

NB: The Course Outline can be downloaded from Moodle or the School website only.

Information on administrative matters, lectures, tutorials, assessment, syllabuses, class tests, computing, special consideration and additional assessment.

Textbook

S.L. Salas, E. Hille and G.J. Etgen, *Calculus – One and Several Variables,* any recent edition, Wiley.

Note, the 10h Edition of the textbook above comes with access to the electronic resources known as WileyPlus. This electronic version provides internet access to the textbook, problems, worked solutions, test (for self-assessment) and other electronic resources related to the text material. If purchased from the UNSW Bookshop, you will have access to the WileyPlus server for one year; it is possible to renew the web access on a yearly basis or for one year, at a fee determined by the publisher. Note that these WileyPlus electronic resources are provided by the publisher John Wiley, and **not** by the School of Mathematics and Statistics. Any difficulty that you might experience with WileyPlus must be resolved with the publisher.

8. Getting help outside tutorials

Staff Consultations

From week 2 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 will be announced on the Moodle course page and linked to the folder in Moodle called “Help is available!” It is also provided in the link below.

https://www.unsw.edu.au/science/our-schools/maths/student-life-resources/student-services/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. In Term 1 2023 the Drop-in Centre will be available both in-person in the Red-Centre lab RC_G012B and online. See Moodle for details.

The Maths drop-in Centre schedule will be available on Moodle 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. The Maths drop-in Centre is accessible through the web link below.

https://www.unsw.edu.au/science/our-schools/maths/student-life-resources/student-services/mathematics-drop-in-centre

Lab Consultants

For help with the Maple computing component of the first year courses, consultants will be available via the Drop-in Centre. For more details, visit website:

https://www.unsw.edu.au/science/our-schools/maths/student-life-resources/student-services/computing-information/maple-lab-consultants

Additional support for students

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

Other Supports

- 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
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html

9. Applications for Special Consideration

If you are unable to complete an assessment on time or during the proscribed period due to illness or other reason beyond your control, you can apply for special consideration.

For all information on Special Consideration, including the circumstances that are covered or excluded and how to apply, see the Special Consideration web site:

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 central team will advise you, by email to your UNSW student email, of the outcome of your application and the date of any supplementary assessment or extension as appropriate.

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 or in person for advice. The contact details are the Red Centre, level 3 room RC-3073 or by email to j.kress@unsw.edu.au

Professor A Coster

Head, School of Mathematics and Statistics

10. Algebra Syllabus and Lecture timetable (MATH1231/1241)

The algebra course for both MATH1231 and MATH1241 is based on chapters 6 to 9 of the Algebra Notes. Lecturers will not cover all of the material in these notes in their lectures as some sections of the notes are intended for reference and for background reading.

The following timetable is the basic timetable and syllabus which will be followed by MATH1231 algebra lecturers. MATH1241 lecturers will include extra material in their lectures. Lecturers will try to follow this timetable, but some variations are inevitable.

Lecture	Topics	Algebra Notes
	Chapter 6. Vector Spaces	
The aim of this section of the course is to introduce the general theory of vector spaces and to give some basic examples. The majority of examples will be for the real vector space $\mathbb{R}^n$, but occasional examples may be given for complex vector space $\mathbb{C}^n$, as well as from vector spaces of polynomials.		
1	Introduction to vector spaces and examples of vector spaces.	6.1
2	Properties of vector arithmetic.	6.2
3	Subspaces.	6.3
4	Linear combinations and spans.	6.4
5	Linear independence.	6.5
6	Basis and dimension.	6.6
7	Basis and dimension.	6.6
	Chapter 7. Linear Transformations	
The basic aims of this section are to introduce the general theory of linear transformations, to give some geometric applications of linear transformations and to establish the close relationship between linear functions and matrices.		
8	Introduction to linear maps. Linear maps and the matrix equations	7.1, 7.2
9	Geometrical examples.	7.3
10	Subspaces associated with linear maps.	7.4
11	Rank, nullity and solutions of $A\boldsymbol{x} = \boldsymbol{b}$. Further applications.	7.4.3, 7.5
	Chapter 8. Eigenvectors and Eigenvalues	
The aims of this section are to introduce the ideas of eigenvalue and eigenvector and to show some applications of these ideas to diagonalization of matrices, evaluation of powers of matrices and solution of simple systems of linear differential equations. Examples will be restricted to 2 × 2 matrices and very simple 3 × 3 matrices.		
12	Definition, examples and geometric interpretation of eigenvalues and eigenvectors.	8.1
13	Eigenvectors, bases and diagonalization of matrices.	8.2
14	Applications to powers of matrices and solutions of systems of linear equations..	8.3
	Chapter 9. Probability and Statistics	

The main objective of this section is to introduce some of the ideas in mathematical probability and apply these concepts to discrete and continuous valued random variables and their associated probability distributions. The main distributions studied are the binomial and geometric in the discrete case, and the normal distribution in the continuous case. These are applied to solving a range of problems.

15	Revision of set theory and mathematical probability.	9.1, 9.2.1, 9.2.2
16	Conditional probability, Bayes' rule, statistical independence.	9.2.3, 9.2.4
17	Random variables, discrete random variables, mean of a discrete random variable.	9.3.1, 9.3.2
18	Variance of discrete random variable, special distributions, the binomial distribution.	9.3.2, 9.4.1
19	Geometric distribution, sign test.	9.4.2, 9.4.3
20	Continuous random variables.	9.5
21	The Normal distribution, approximations to the binomial distribution.	9.6
22	Review	

Extra Algebra Topics for MATH1241

The extra topics in the MATH1241 syllabus, marked [X] in the notes, will be selected from the following:

Vector spaces. Matrices, polynomials and real-valued functions as vector spaces. (6.8). Coordinate vectors (6.7). The theoretical treatment of vector spaces in MATH1241 will be at a slightly more sophisticated level than that in MATH1231.

Linear transformations. Linear maps between polynomial and real-valued function vector spaces (7.5). Matrix representations for non-standard bases in domain and codomain (7.6). Matrix arithmetic and linear maps (7.7). Injective, surjective and bijective linear maps (7.8). Proof the rank nullity theorem (7.9).

Eigenvalues and eigenvectors. Markov Chain Processes (8.3.3). Eigenvalues and eigenvectors for symmetric matrices and applications to conic sections.

Probability and statistics. The Exponential distribution. (9.6.2).

Problem Sets

At the end of each chapter there is a set of problems. Some of the problems are very easy, some are less easy but still routine and some are quite hard. To help you decide which problems to try first, each problem is marked with an **[R],** and **[H]** or an **[X].** The problems marked **[R]** form a basic set of problems which you should try first. Problems marked **[H]** are harder and can be left until you have done the problems marked **[R].** Problems marked with **[V]** have a video solution available via Moodle. You *do* need to make an attempt at the **[H]** problems because problems of this type will occur on tests and in the exam. If you have difficulty with the **[H]** problems, ask for help in your tutorial.

The problems marked **[X]** are intended for students in MATH1241 – they relate to topics which are only covered in MATH1241. Extra problem sheets for MATH1241 may be issued in lecturers.

Questions marked with a **[V]** have a video solution available from the course page for this subject on Moodle.

Theory in the Algebra Course

The theory is regarded as an essential part of this course and it will be examined both in class tests and in the end of year examination.

You should make sure that you can give **DEFINITIONS** of the following ideas:

Chapter 6. Subspace of a vector space, linear combination of a set of vectors, span of a set of vectors, linear independence of a set of vectors, spanning set for a vector space, basis for a vector space, dimension of a vector space.

Chapter 7. Linear function, kernel and nullity of a linear function, image and rank of a linear function.

Chapter 8. Eigenvalue and eigenvector, diagonalizable matrix.

Chapter 9. Probability, statistical independence, conditional probability, discrete random variable, expected value (mean) of a random variable, variance of a random variable, binomial distribution, geometric distribution.

You should be able to give **STATEMENTS** of the following theorems and propositions.

Chapter 6. Theorem 1 of §6.3, Propositions 1 and 3 and Theorem 2 of §6.4, Proposition 1 and Theorems 2, 3, 4, 5 and 6 of §6.6.

Chapter 7. Theorem 2, 3, and 4 of §7.1, Theorem 1 and 2 of §7.2, Proposition 7 and Theorems 1, 5, 8, 9 and 10 of §7.4.

Chapter 8. Theorems 1, 2 and 3 of §8.1, Theorem 1 and 2 of §8.2.

You should be able to give **PROOFS** of the following theorems and propositions.

Chapter 6. Theorem 2 of §6.4, Theorems 2 and 3 of §6.5, Theorem 2 of §6.6.

Chapter 7. Theorem 2 of §7.1, Theorem 1 of §7.2, Theorems 1, 5 and 8 of §7.4.

Chapter 8. Theorem 1 of §8.1.

11. Calculus syllabus for MATH1231 Mathematics 1B

In this syllabus, the references to the textbook are *not* intended as a definition of what you will be expected to know. They are just a guide to finding the relevant material. Some parts of the subject are not covered in the textbook and some parts of the textbook (even in the sections mentioned in the references below) are not included in the subject. The scope of the course is defined by the content of the lectures and problem sheets. The approximate lecture time for each section is given below. References to the 8th and 10th editions of Salas & Hills are shown as SH8 and SH10.

	SH8	**SH10**
1. **Functions of several variables**. (3 hours)	14.1-14.4	15.1-15.4
Contours and level curves, partial derivatives.	14.6	15.6
Mixed derivative theorem, increment estimation.		
Chain rules, tangent planes.		
2. **Integration techniques**. (4 hours)		
Trigonometric integrals and reduction formulae.	8.3	8.3
Trigonometric and hyperbolic substitutions.	8.4	8.4
Rational functions and partial fractions.	8.5	8.5
Further substitutions.	8.6	8.6
3. **Ordinary differential equations**. (6 hours)		
Particular, general, explicit and implicit solutions.	18.1	
First order equations; separable, linear, exact.	8.9, 18.2, 15.9	9.1, 9.2, 19.1, 19.2,
Modelling with odes		9.1, 9.2
Second order linear equations with constant coeffts:		
Homogeneous, non-homogeneous (undetermined coeffts).	18.3, 18.4	9.3, 19.4

4. **Taylor series**. (7 hours)		
Taylor polynomials, Taylor's theorem.	11.5	12.6, 12.7
Application to stationary points.		
Sequences: convergence and divergence;	10.2, 10.3	11.2-11.4
combination of sequences.		
Series: partial sums; convergence;	11.1, 11.2	12.1, 12.2
*k*th term test for divergence;		
integral, comparison and ratio tests;	11.1-11.3	12.3, 12.4
alternating series (Leibniz' test);		
absolute and conditional convergence;	11.4	12.5
rearrangement of series.		
Taylor and Maclaurin series.	11.6	12.7
Power series: radius and interval	11.7, 11.8	12.8, 12.9
of convergence; operations on power series.		
5. **Application of integration**. (3 hours)		
Average value of a function.	5.8	5.9
Arc length.	9.8	10.7
Arc length in polar coordinates.	9.5, 9.8	10.7
Area of surfaces of revolution.	9.9	10.8

12. Calculus syllabus for MATH1241 Higher Mathematics 1B

In this syllabus, the references to the textbook are *not* intended as a definition of what you will be expected to know. They are just a guide to finding the relevant material. Some parts of the subject are not covered in the textbook and some parts of the textbook (even in the sections mentioned in the references below) are not included in the subject. The scope of the course is defined by the content of the lectures and problem sheets. The approximate lecture time for each section is given below. References to the 8th and 10th editions of Salas & Hills are shown as SH8 and SH10 and references to *Calculus* by M. Spivak under Sp.

	SH8	**SH10**	**Sp**
1. **Functions of several variables**. (3 hours)			
Contours and level curves, partial derivatives.	14.1-14.4	15.1-15.4	
Mixed derivative theorem, increment estimation.	14.6	15.6	
Chain rules, tangent planes.			
2. **Integration techniques**. (4 hours)			
Trigonometric integrals and reduction formulae.	8.3	8.3	18
Trigonometric and hyperbolic substitutions.	8.4	8.4	18
Rational functions and partial fractions.	8.5	8.5	18
Further substitutions.	8.6	8.6	18
3. **Ordinary differential equations**. (6 hours)			
Particular, general, explicit and implicit solutions.	18.1		
1st order equations: separable, linear, exact.	8.9, 18.2	9.1, 9.2,	

	15.9	19.1, 19.2	
Modelling with odes		9.1, 9.2	
2nd order linear equations with constant coeffts:			
Homogeneous, non-homogeneous (undetermined coeffts).	18.3, 18.4	9.3, 19.4	
4. **Taylor series**. (7 hours)			
Taylor polynomials, Taylor's theorem.	11.5	12.6, 12.7	
Application to stationary points.			
Sequences: convergence and divergence;	10.2, 10.3	11.2-11.4	21
combination of sequences.			
Upper, lower bounds, sup and inf,	10.1-10.3	11.1	8, 21
bounded monotonic sequences.	10.2	11.1	
Recursively defined sequences.			
Series: partial sums; convergence;	11.1, 11.2	12.1, 12.2	22
*k*th term test for divergence;			
comparison, integral, ratio and root tests;	11.1-11.3	12.3, 12.4	22
alternating series (Leibniz' test);			
absolute and conditional convergence;	11.4	12.5	22
rearrangement of series.			
Taylor and Maclaurin series.	11.6	12.7	19
Power series: radius and interval	11.7, 11.8	12.8, 12.9	23
of convergence; operations on power series.			
5. **Applications of integration**. (3 hours)			
Average value of a function.	5.8	5.9	
Arc length in Cartesian and polar coordinates.	9.5, 9.8	10.7	
Area of surfaces of revolution.	9.9	10.8	

Problem Sets

The Calculus problems are located at the end of each chapter in the Calculus Notes Booklet. To help you decide which problems to try first, each problem is marked with an **[R],** and **[H]** or a **[HH].** A few problems are marked with an **[X]** for MATH1241 students.

All students should make sure that they attempt the questions marked **[R].** The problems marked **[H]** or **[HH]** are intended as a challenge for students in MATH1231 as well as MATH1241. Some harder parts of **[R]** problems are marked with a star. Any problems which depend on work covered only in MATH1241 are marked **[X].** Problems marked with **[V]** have a video solution available on Moodle.

13. Computing Information

Aims

The aim of the Computing component is twofold.

- Firstly, you will use the Symbolic Computing Package called Maple to do some mathematics on the computer. This use of Maple is integrated with the Algebra and Calculus and is designed to enhance your understanding of the mathematics involved, as well as letting you use Maple as a tool to do the mathematics. You will find the skills you acquire and things you learn useful in many other subjects you study, both within and outside the School of Mathematics. Maple enables you to tackle larger, harder and more realistic mathematical problems as it can handle all the difficult algebra and calculus for you.

Furthermore, learning some Maple introduces you to some of the basic ideas in computer programming.

- Secondly, you will gain some experience in teaching yourself how to use a complicated computing package. This is a skill that will be needed in other courses at UNSW and in the workforce.

Computing lab

The main computing laboratory is Room G012 of the Red Centre. You can get to this lab by entering the building through the main entrance to the School of Mathematics (on the Mezzanine Level) and then going down the stairs to the Ground Level. A second smaller lab is Room M020, on the mezzanine level of the Red Centre.

For the computers in the school laboratories, your login ID is "z" followed immediately by your seven digit student number and your password is your zPass, issued to you at enrolment. If you have difficulties logging in, the computers will allow a five minute login with ID "new user" and password "new user" where you can access https://idm.unsw.edu.au and reset or unlock your zPass. Be aware that two consecutive failed login attempts will lock you out of the computing system for 30 minutes, or until you reset or unlock your zPass.

For more information on the Red-Centre labs, including opening hours, see https://www.unsw.edu.au/science/our-schools/maths/student-life-resources/student-services/computing-information/computing-facilities

Remember that there will always be unscheduled periods when the computers are not working because of equipment problems and that this is not a valid excuse for not completing tests on time.

Remote access to Maple

Maple is available for Windows, Mac and Linux however, these are not free. UNSW provides a cloud based virtual version of Maple that students in first year mathematics courses can access on their laptop. For details see the myAccess website:

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

How to start

The computing (Maple) component of MATH1231/1241 follows on from the computing component in MATH1131/1141. The introductory materials from MATH1131/1141 will be provided on Moodle for revision if you need them.

From week 1 onwards, you are expected to master Chapter 1 and all of the remaining sections of Chapter 2 in the First Year Maple Notes by completing the self-contained Maple learning modules and by obtaining help, if necessary, from the Consultants who will be available in Room G012 from 11am to 4pm each weekday of weeks 1 to 9.

Computing syllabus

The Maple computing component is taught via a series of self-paced modules located in UNSW Moodle You are expected to work steadily through these modules as part of the Weekly Möbius lessons which are described on page 9.

The online teaching package consists of the following modules:

Module 8: Functions of Two or More Variables

Module 9: Further Calculus

Module 10: Further Linear Algebra

Module 11: 3D Geometry

Module 12: Programming in Maple

Assessment

During the term, the assessment for the Computing Component (Maple Coding) of the course is embedded in the Möbius lessons. See that section for more information.

The assessment in the Computing Component is linked to topics in algebra and calculus so knowledge of other parts of the course is required.

Finally, the end of term exam may contain one or two sub-questions requiring knowledge of Maple.

Student-owned computers for Mathematics courses

The School of Mathematics and Statistics is committed to providing, through its own laboratories, all the computing facilities which students need for courses taught by the School. No student should feel the need to buy their own computer in order to undertake any Mathematics course. Nevertheless, the following information is provided for the benefit of those who may wish to use their own computer for work associated with Mathematics courses.

All of our courses have a UNSW Moodle presence, and it is there you should look for course materials or links unless your lecturer tells you otherwise. UNSW Moodle may be accessed from any computer with internet access; see their help files and pages for technical requirements and how to check whether your web browser is supported.

The School of Mathematics and Statistics provides assistance to students using teaching software in its laboratories. It does not have the resources to advise or assist students in the use of home computers or in communication between home computers and university facilities.

SOME GREEK CHARACTERS

Listed below are the Greek characters most commonly used in Mathematics.

Name	Lower case	Upper case	Name	Lower case	Upper case
Alpha	α		Nu	ν	
Beta	β		Xi	ξ	
Gamma	γ	Γ	Pi	π	Π
Delta	δ	Δ	Rho	ρ	
Epsilon	ϵ or ε		Sigma	σ	Σ
Zeta	ζ		Tau	τ	
Eta	η		Phi	ϕ or φ	Φ
Theta	θ	Θ	Chi	χ	
Kappa	κ		Psi	ψ	Ψ
Lambda	λ	Λ	Omega	ω	Ω
Mu	μ				