UNSW Course Outline

MATH3570 Foundations of Calculus - 2024

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General Course Information

Course Code : MATH3570
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Science
Academic Unit : School of Mathematics & Statistics
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 3

<u>Useful Links</u>

<u>Handbook</u> <u>Class Timetable</u>

Course Details & Outcomes

Course Description

What does it mean for a limit to exist? What does it mean for a function to be continuous or differentiable? There are functions which are continuous everywhere but differentiable nowhere! Are there functions whose integral does not exist? In this course, we look again at the essential

concepts of limit, continuity, differentiability and integrability and try to place them on a sure footing. The syllabus includes material on sequences and series of real numbers and also of real valued functions. Although of general interest to those studying mathematics for its own sake, this course is of special relevance to those planning a career in secondary teaching.

MATH3570 is a compulsory component of the program for mathematics teachers.

Course Aims

The aim of this course is to re-examine the key ideas behind Calculus to give a deeper understanding of the notions of real numbers, sequences, limits, continuity, differentiability and integrability. We will look at not only what is true, but also what is not true, in order to better understand why definitions are the way that they are, and why the conditions on the main theorems in the course need to be there. This will equip these future Mathematics teachers with the confidence and ability to adopt a rich, understanding-based teaching style rather than a procedural one.

Relationship to Other Courses

This course re-covers most of the calculus component of MATH1131/1141/1151 with greater rigor and with a focus on understanding calculus rather than its applications. It is excluded against the more advancd analysis courses such as MATH3611/5705 and MATH5605.

The formal re-requisites are at least 12UoC of level II maths,

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Synthesize, compare, connect and evaluate relevant fundamental mathematical concepts required to teach calculus to mathematics students.
CLO2 : Apply the definitions and theorems on the real number system, sequences, limits and continuous functions so as to justify mathematical statements and solve problems on these topics.
CLO3 : Apply the definitions and theorems on the formal structure of differential and integral calculus to justify mathematical statements and solve problems on these topics.
CLO4 : Communicate mathematical ideas in written form using rigorous and logical statements, correct terminology and using technology.

Course Learning Outcomes	Assessment Item
CLO1 : Synthesize, compare, connect and evaluate relevant fundamental mathematical concepts required to teach calculus to mathematics students.	• Assignment • Mid-Term Test • Final exam • Examples Portfolio
CLO2 : Apply the definitions and theorems on the real number system, sequences, limits and continuous functions so as to justify mathematical statements and solve problems on these topics.	• Assignment • Mid-Term Test • Final exam • Examples Portfolio
CLO3 : Apply the definitions and theorems on the formal structure of differential and integral calculus to justify mathematical statements and solve problems on these topics.	• Assignment • Final exam • Examples Portfolio
CLO4 : Communicate mathematical ideas in written form using rigorous and logical statements, correct terminology and using technology.	• Assignment • Final exam • Examples Portfolio

Learning and Teaching Technologies

Moodle - Learning Management System | Blackboard Collaborate | Echo 360

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Assignment Assessment Format: Individual	20%	Start Date: when released (before week 3) Due Date: Week 4: 04 March - 10 March Post Date: 10/03/2024 11:30 PM
Mid-Term Test Assessment Format: Individual	20%	Start Date: Week 7 - see detail below Due Date: Not Applicable
Final exam Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: Not Applicable
Examples Portfolio Assessment Format: Individual	10%	Start Date: Not Applicable Due Date: part 1: Sunday after week 1. Part 2; Friday week 9

Assessment Details
Assignment

Assessment Overview

The purpose of the assignment is to:

(a) give you an opportunity to solve longer more open-ended mathematical problems and

(b) improve your written mathematical communication.

You will be presented with questions, and you will produce typed solutions using Microsoft Word, LaTeX or another similar editor. The assignment will be released by the beginning of Week 3 and will be due at the end of Week 4. You will be provided with feedback on the clarity of your communication of mathematical ideas and the correctness of your solutions approximately two weeks after submission.

Course Learning Outcomes

- CLO1 : Synthesize, compare, connect and evaluate relevant fundamental mathematical concepts required to teach calculus to mathematics students.
- CLO2 : Apply the definitions and theorems on the real number system, sequences, limits and continuous functions so as to justify mathematical statements and solve problems on these topics.
- CLO3 : Apply the definitions and theorems on the formal structure of differential and integral calculus to justify mathematical statements and solve problems on these topics.
- CLO4 : Communicate mathematical ideas in written form using rigorous and logical statements, correct terminology and using technology.

Detailed Assessment Description

See Assignment Brief on moodle for details.

Submission notes

Must be typed: LaTeX or Word is preferred, but not compulsory

Assessment information

Late submissions will only be accepted with an approved special consideration application.

Assignment submission Turnitin type

This is not a Turnitin assignment

Mid-Term Test

Assessment Overview

The midterm test is designed to assess your mastery of the topics covered in lectures in weeks 1-5 inclusive. It will be typically scheduled in Week 7 and is typically 50 minutes long.

You will be given feedback with comments and/or solutions within two weeks of the test.

Course Learning Outcomes

- CLO1 : Synthesize, compare, connect and evaluate relevant fundamental mathematical concepts required to teach calculus to mathematics students.
- CLO2 : Apply the definitions and theorems on the real number system, sequences, limits and continuous functions so as to justify mathematical statements and solve problems on these topics.

Detailed Assessment Description

See assessment brief and details on moodle. Test is to be held in person during the Thursday 10am class in week 7.

Assignment submission Turnitin type

Not Applicable

Final exam

Assessment Overview

The final exam is designed to summarize your learning and problem-solving skills on all topics delivered across the term. The examination will occur during the official university examination period and is typically 2 hours in length. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CLO1 : Synthesize, compare, connect and evaluate relevant fundamental mathematical concepts required to teach calculus to mathematics students.
- CLO2 : Apply the definitions and theorems on the real number system, sequences, limits and continuous functions so as to justify mathematical statements and solve problems on these topics.
- CLO3 : Apply the definitions and theorems on the formal structure of differential and integral calculus to justify mathematical statements and solve problems on these topics.
- CLO4 : Communicate mathematical ideas in written form using rigorous and logical statements, correct terminology and using technology.

Detailed Assessment Description

For further details see moodle

Assignment submission Turnitin type

Not Applicable

Examples Portfolio

Assessment Overview

The portfolio has two components: At the very beginning of the course, you will be provided with a set of problems which do not require knowledge beyond first-year mathematics. You will submit a draft solution that will form the "before" part of your portfolio by the end of week 1. This is worth 3% of the total course mark.

Feedback on this component will be provided 10 days after submission.

By the end of week 9, you will submit a revised version of your solution: the "after" part of your portfolio. This will build on what you have learnt during the course and give you an opportunity to demonstrate and reflect on the understanding and skills you gained from the course. This task is worth 7% of the total course mark.

Feedback on the final submission will be provided 10 days after submission.

Course Learning Outcomes

- CLO1 : Synthesize, compare, connect and evaluate relevant fundamental mathematical concepts required to teach calculus to mathematics students.
- CLO2 : Apply the definitions and theorems on the real number system, sequences, limits and continuous functions so as to justify mathematical statements and solve problems on these topics.
- CLO3 : Apply the definitions and theorems on the formal structure of differential and integral calculus to justify mathematical statements and solve problems on these topics.

- CLO4 : Communicate mathematical ideas in written form using rigorous and logical statements, correct terminology and using technology.

Detailed Assessment Description

See Portfolio Brief on moodle for details.

Submission notes

First submission can be handwritten; final submission must be typed.

Assessment information

Late submissions will only be accepted with an approved special consideration application.

Assignment submission Turnitin type

This is not a Turnitin assignment

General Assessment Information

Grading Basis

Standard

Requirements to pass course

A composite mark of at least 50 out of 100.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Wednesday 7th February. Introduction. Some history. What are the main theorems? How are they related? What is not true?
	Online Activity	Quiz 1: Closes 23:50 Wednesday 21st February
	Assessment	Portfolio part 1 (3%). Due 23:50, Sunday 18th February. Submit through moodle.
Week 2 : 19 February - 25 February	Lecture	Wednesday 21st February. Notation: writing things clearly, Quantified statements, Writing analytic proofs
	Online Activity	Quiz 2: Closes 23:50 Wednesday 28th February
	Tutorial	Tutorial 1: Thursday 22nd February 10am.
Week 3 : 26 February - 3 March	Lecture	Wednesday 28th February. Limits of sequences. What are the real numbers? Supremum and infimum. Binary expansions.
	Online Activity	Quiz 3: Closes 23:50 Wednesday 6th March
Week 4 : 4 March - 10 March	Lecture	Wednesday 6th March. Monotone Convergence Theorem. Cauchy sequences. Limits
	Online Activity	Quiz 4: Closes 23:50 Wednesday 13th March
	Tutorial	Tutorial 2: Thursday 7th March 10am.
	Assessment	Assignment (20%) due Sunday 10th March at 23:50
Week 5 : 11 March - 17 March	Lecture	Wednesday 13th March: Limits of functions at a point. Continuity. Sequential continuity. Intermediate Value Theorem.
	Online Activity	Quiz 5: Closes 23:50 Wednesday 20th March
Week 6 : 18 March - 24 March	Other	Flexibility Week: no classes.
Week 7 : 25 March - 31 March	Lecture	Wednesday 27th March : Max-Min Theorem. Differentiability.
	Assessment	Mid-Session test (20%). Thursday 28th March at 10am.
	Online Activity	Quiz 6: Closes 23:50 Wednesday 3rd April
Week 8 : 1 April - 7 April	Lecture	Wednesday 3rd April: The differentiation rules. Rolle's Theorem. Mean Value Theorem
	Tutorial	Tutorial 3: Thursday 4th April at 10am
	Online Activity	Quiz 7: Closes 23:50 Wednesday 10th April
Week 9 : 8 April - 14 April	Lecture	Wednesday 10th April: Integration.
	Online Activity	Quiz 8: Closes 23:50 Wednesday 17th April
	Assessment	Portfolio part 2 (7%): due Friday 12th April at 23:50.
Week 10 : 15 April - 21 April	Lecture	Wednesday 17th April. The Fundamental Theorems of Calculus. Revision (if time).
	Online Activity	Quiz 9: Closes 23:50 Wednesday 24th April
	Tutorial	Thursday 18th April at 10am.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

There are two classes timetabled for this course.

The Wednesday 12noon-2pm class will be the lecture.

The Thursday 10am class is the tutorial time, but (despite what the official timetable may say) is

only held in "even" weeks: weeks 2, 4 , 8 and 10, with week 7 being used for the mid session test. See the full schedule below. I intend to be available at 10am on Thursday for consultation in the "off weeks" of the tutorial.

Course Resources

Prescribed Resources

There are no set text books for this course, but any edition of the standard first year maths text "Calculus, One and Several Variables" by Salas, Hille and Etgen (published by John Wiley) may be useful.

You will need access to a computer with word processing software to type up assignment and the portfolio. See moodle for further guidance.

Recommended Resources

Michael Spivak's "Calculus" is internationally renowned as a text on the foundations of calculus (or introductory analysis) and covers the material of the course, and a bit more.

Additional Costs

None

Course Evaluation and Development

Feedback will be requested in some of the formative weekly revision quizzes as well as myExperience survey at the end of the course.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	John Steele		Anita B Lawrence East 5103	+61 2 9385 7060	see Moodle announcements	Yes	Yes

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe,

harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the UNSW Student Code of Conduct Website.

Academic Honesty and Plagarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.
Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

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. 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, plagiarism and the use of AI in assessments can be located at:

- The Current Students site,
- The ELISE training site, and
- The Use of AI for assessments site.

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

Submission of Assessment Tasks

Penalty for Late Submissions
UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: https://student.unsw.edu.au/special-consideration

Important note: UNSW has a "fit to sit/submit" rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- The Current Students Gateway
- Student Support
- Academic Skills and Support
- Student Wellbeing, Health and Safety
- Equitable Learning Services
- UNSW IT Service Centre

- Science EDI Student [Initiatives](#), [Offerings](#) and [Guidelines](#)

School-specific Information

School of Mathematics and Statistics 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 web site starting at: [The School of Mathematics and Statistics 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.

Special Consideration - Short Extension Policy

The School of Mathematics and Statistics has carefully reviewed its range of assignments and projects to determine their suitability for automatic short extensions as set out by the UNSW Short Extension Policy. Upon comprehensive examination of our course offerings that incorporate these types of assessments, we have concluded that our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School of Mathematics and Statistics has decided to universally opt out of the Short Extension provision for all its courses, having pre-emptively integrated flexibility into our assessment deadlines. The decision is subject to revision in response to the introduction of new course offerings. Students may still apply for Special Consideration via the usual procedures.

Computing Lab

The main computing laboratory is room G012 of the Anita B.Lawrence Centre (formerly 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, located on the mezzanine level through the glass door (and along the corridor) opposite the School's entrance.

For more information, including opening hours, see the [computing facilities webpage](#). 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 assessments on time.

School Contact Information

School Contact Information

Please visit the [School of Mathematics and Statistics website](#) for a range of information.

For information on Courses, please go to "Student life & resources" and either Undergraduate and/or Postgraduate and respective "Undergraduate courses" and "Postgraduate courses" for information on all course offerings.

All school policies, forms and help for students can be located by going to the "Student Services" within "Student life & resources" page. We also post notices in "Student noticeboard" for your information. Please familiarise yourself with the information found in these locations. If you cannot find the answer to your queries on the web you are welcome to contact the Student Services Office directly.

Undergraduate

E: ug.mathsstats@unsw.edu.au

P: 9385 7011 or 9385 7053

Postgraduate

E: pg.mathsstats@unsw.edu.au

P: 9385 7053

Should we need to contact you, we will use your official UNSW email address of 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 us.**