MATH3701 Higher Topology and Differential Geometry - 2024

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General Course Information

Course Code : MATH3701
Year : 2024
Term : Term 3
Teaching Period : T3
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 : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Topology and differential geometry both deal with the study of shape: topology from a continuous and differential geometry from a differentiable viewpoint.

This course begins with a study of curves in the plane and in space focusing on how they bend.

Surfaces are also introduced, studying the first and second fundamental forms introduced by Gauss, the various measures of curvature and what they mean for the external and internal appearance and properties of surfaces. The course also provides an opportunity to prove the important Gauss-Bonnet theorem and use it to examine topological properties of surfaces, such as the Euler Characteristic.

This course is part of the core Higher Pure Mathematics sequence MATH3711/MATH3611/MATH3701 which is designed to be taken in that order. In particular, it is strongly recommended that students have taken MATH3611 beforehand so they can get the most of it.

Course Aims

This course gives an introduction to differential geometry and topology, with the main focus to study with differential methods curves, surfaces and manifolds embedded in the real space with n dimensions.

Relationship to Other Courses

Prerequisite: 12 UOC of Level 2 Mathematics with an average mark of at least 70, including MATH2111 or MATH2011 (CR) or MATH2510 (CR) and MATH2601 or MATH2501 (CR), or permission from Head of Department.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Solve problems of the differential geometry and topology of curves, including calculating their invariants and using them in applications.
CLO2 : Apply intrinsic and extrinsic theorems of differential geometry of manifolds to calculate the curvature of a surface and the properties of special curves on surfaces.
CLO3 : Provide a complete topological classification of a particular surface.
CLO4 : Compare and contrast the differences and connections between topology and differential geometry for surfaces.

Course Learning Outcomes	Assessment Item
CLO1 : Solve problems of the differential geometry and topology of curves, including calculating their invariants and using them in applications.	• Final Exam • Assignment • Class Test
CLO2 : Apply intrinsic and extrinsic theorems of differential geometry of manifolds to calculate the curvature of a surface and the properties of special curves on surfaces.	• Final Exam • Assignment • Class Test
CLO3 : Provide a complete topological classification of a particular surface.	• Final Exam
CLO4 : Compare and contrast the differences and connections between topology and differential geometry for surfaces.	• Assignment • Class Test • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Final Exam Assessment Format: Individual	60%	Due Date: Exam period
Assignment Assessment Format: Individual	15%	Start Date: 21/10/2024 12:00 PM Due Date: 04/11/2024 12:00 PM
Class Test Assessment Format: Individual	25%	Start Date: 11/10/2024 01:00 PM Due Date: Not Applicable

Assessment Details
Final Exam

Assessment Overview

The final exam is designed to summarize your learning and problem-solving skills on all topics delivered across the term, including material from lectures and tutorials. There will be an emphasis on the latter half of the material.

The examination is 2 hours in duration and will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

Hurdle requirement: must achieve 50% in the exam to receive a passing grade in the course.

Course Learning Outcomes

- CLO1 : Solve problems of the differential geometry and topology of curves, including calculating their invariants and using them in applications.
- CLO2 : Apply intrinsic and extrinsic theorems of differential geometry of manifolds to calculate the curvature of a surface and the properties of special curves on surfaces.
- CLO3 : Provide a complete topological classification of a particular surface.
- CLO4 : Compare and contrast the differences and connections between topology and differential geometry for surfaces.

Assessment Length

2 hours

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see here.

Assignment

Assessment Overview

You will complete a written assignment which covers the first five weeks of lectures. The task will be provided to you in Week 7 and is typically due in Week 9.

Feedback will be provided within two weeks of submission through written comments on the submitted assignment.

Course Learning Outcomes

- CLO1 : Solve problems of the differential geometry and topology of curves, including calculating their invariants and using them in applications.
- CLO2 : Apply intrinsic and extrinsic theorems of differential geometry of manifolds to calculate the curvature of a surface and the properties of special curves on surfaces.
- CLO4 : Compare and contrast the differences and connections between topology and differential geometry for surfaces.

Detailed Assessment Description

The assignment will be provided on Monday week 7 and it is due on Monday week 9.

Assessment Length

2 weeks

Assessment information

The standard late submission rule applies to the assignment.

Assignment submission Turnitin type

This is not a Turnitin assignment

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

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Class Test

Assessment Overview

You will have a 45-minute test in week 5 on the first weeks of material. The exact topics will be announced 2 weeks earlier.

The test will consist of several problems to be solved and a few definitions/theorems to state.

Written feedback on the test will be returned to you within 2 weeks.

Course Learning Outcomes

- CLO1 : Solve problems of the differential geometry and topology of curves, including calculating their invariants and using them in applications.
- CLO2 : Apply intrinsic and extrinsic theorems of differential geometry of manifolds to calculate the curvature of a surface and the properties of special curves on surfaces.
- CLO4 : Compare and contrast the differences and connections between topology and

differential geometry for surfaces.

Detailed Assessment Description

The test is on week 5, Friday 1-2 pm during the tutorial time.

Assessment Length

45 minutes

Assignment submission Turnitin type

This is not a Turnitin assignment

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

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General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Differential Curves I
Week 2 : 16 September - 22 September	Lecture	Differential Curves II. Differential Surfaces.
Week 3 : 23 September - 29 September	Lecture	Differential Surfaces II. First Fundamental Form.
Week 4 : 30 September - 6 October	Lecture	Differential Surfaces III. Second fundamental Form.
Week 5 : 7 October - 13 October	Lecture	Differential Surfaces. Gauss-Bonnet theorem.
Week 7 : 21 October - 27 October	Lecture	Differential Manifolds I
Week 8 : 28 October - 3 November	Lecture	Differential Manifolds II. Topology-fundamental group.
Week 9 : 4 November - 10 November	Lecture	Classification of surfaces I
Week 10 : 11 November - 17 November	Lecture	Classification of surfaces II

Attendance Requirements

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

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
	Mircea Voineagu					No	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](https://www.unsw.edu.au).

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

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.**