

Math 9055A/4155A Calculus on Manifolds

Course Outline

1. Course Information

Course Information: Math 4155/9055A cross-listed course Calculus on Manifolds, Fall 2022. Course meets Tu 12:30-2:30, Th 12:30-1:30, location TBA. The first class is on Tuesday, September 13.

List of Prerequisites: Calculus 2503A/B and Mathematics 3122A/B, or by special permission of the instructor.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course, and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

2. Instructor Information

Instructor: Prof. Rasul Shafikov, email: shafikov@uwo.ca. Office hours: TBA, office location: MC112

Students must use their Western (@uwo.ca) email addresses when contacting their instructor.

Office hours will be held in person. In case a student has time conflict, Zoom office hours can be arranged upon request.

3. Course Syllabus, Schedule, Delivery Mode

Material covered in the course: Manifolds (definition, examples, constructions), orientation, functions, partitions of unity, tangent bundle, cotangent bundle, vector fields, integral curves, differential forms, integration, manifolds with boundary, Stokes' theorem, submersions, immersions, embeddings, submanifolds, Sard's theorem, Whitney embedding theorem. Some additional topics may also be covered in the course.

The appendix of the main textbook is a good summary of the background material needed for the course.

There will be an in-class Midterm, and Final Exam.

Approximate schedule: Chapters are taken from Introduction to Smooth Manifolds by John Lee.

Week	Date	Material/Activity
1	Sept 12	Chapter 1 (Smooth Manifolds)
2	Sept 19	Chapter 2 (Smooth Maps)
3	Sept 26	Chapter 3 (Tangent Vectors); <i>Homework 1 due Sept 29</i>
4	Oct 3	Chapter 4 (Vector Fields)
5	Oct 10	Chapter 6 (Cotangent Bundle)
6	Oct 17	Catch-up; <i>Homework 2 due Oct 20</i>
7	Oct 24	In-class Midterm: Oct 25
	Oct 31	Reading week
8	Nov 7	Chapter 7 (Submersions, ...)
9	Nov 14	Chapter 10 (Embedding and Approximation Theorems); <i>Homework 3 due Nov 17</i>
10	Nov 21	Chapter 12 (Differential Forms)
11	Nov 28	Chapter 14 (Integration on Manifolds)
12	Dec 5	Catch-up; <i>Homework 4 due Dec 7</i>
	Dec 10 – 22	Final Exam , time/location TBA

Key Sessional Dates:

Classes begin: September 13, 2022

In-class Midterm: October 25

Fall Reading Week: October 31 – November 6

Last day to withdraw from the course without academic penalty: Nov 14

Classes end: December 8

Exam period: December 10 – 22, 2022

Contingency plan for an in-person class pivoting to 100% online learning: In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, synchronously, i.e., at the times indicated in the timetable. The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

4. Course Materials

Textbook: *Introduction to Smooth Manifolds* by John Lee, Springer Graduate Texts in Mathematics 218. The electronic version of the book is available for free for Western students through the Western library.

All additional course material will be posted on the course OWL page.

Students are responsible for checking the course OWL site (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements: In the event the course goes online students are required to have stable internet connection and a computer/laptop with working microphone and webcam.

5. Methods of Evaluation

The overall course grade will be calculated as listed below:

Assignments (4)	30%
Midterm Test	31%
Final Exam	39%

Midterm: October 25 in class.

Final Exam: will be scheduled by the registrar during the final exam period.

There will be 4 homework assignments, each worth 7.5% of the course mark. Assignments should be submitted on time, there will be an automatic 15% reduction in the assignment evaluate for late submission, unless late submission has a valid documented excuse. No assignment can be submitted once the papers are returned to students. There will be a 1% bonus if assignments are typed using LaTeX.

6. Student Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

The Student Medical Certificate is available at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

If the Midterm is missed with a valid excuse, there will be a make-up midterm, time/location: TBD.

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

Note: missed work can *only* be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is **not** sufficient on its own.

7. Accommodation and Accessibility

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

8. Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

No electronic devices are allowed during the Midterm and Final

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

If the course goes online, the university administration may require that tests and examinations in this course to be conducted using a remote proctoring service. In this case and only in this case, by taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at:

<https://remoteproctoring.uwo.ca>.

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.