DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES
UNIVERSITY OF TORONTO MISSISSAUGA

MAT136H5S LEC0101
Integral Calculus
Course Outline - Winter 2025

Class Location & Time	Mon, 09:00 AM - 10:00 AM MN 1210
	Wed, 03:00 PM - 05:00 PM DV 2080
	Fri, 05:00 PM - 07:00 PM ZZ TBA
Instructor	Ivan Khatchatourian (coordinator)
Office Location	
Office Hours	(see Quercus)
E-mail Address	(see below)
Course Web Site	https://q.utoronto.ca
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Co-Instructor	Nicholas Fleming (LEC0109)
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Co-Instructor	Akashdeep Dey (LEC0110, LEC0111)
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Teaching Assistant	Mike Pitocco (Assistant coord.)
E-mail Address	mike.pitocco@mail.utoronto.ca
Teaching Assistant	Several TAs

Course Description

Continuation of MAT135H5. Antiderivatives and indefinite integrals in one variable, definite integrals and the fundamental theorem of calculus. Integration techniques and applications of integration. Infinite sequences, series and convergence tests. Power series, Taylor and Maclaurin series. A wide range of applications from the sciences will be discussed.

Prerequisite:

MAT132H5 or MAT135H5 or MAT137H5 or MAT157H5 or MAT135H1 or MATA29H3 or MATA30H3 or MATA31H3

Exclusion:
MAT133Y5 or MAT134H5 or MAT137Y5 or MAT139H5 or MAT157Y5 or MAT159H5 or MAT133Y1 or MAT136H1 or MAT137Y1 or MAT157Y1 or MATA33H3 or MATA35H3 or MATA36H3 or MATA37H3

(SCI)
Distribution Requirement: SCI

Students who lack a pre/co-requisite can be removed at any time unless they have received an explicit waiver from the department. The waiver form can be downloaded from [here](#).

Learning Outcomes

Upon successful completion of MAT135H5, you should be able to solve problems related to integral calculus, which may involve definite and indefinite integrals, integration techniques, improper integrals, sequences and series, area and volume problems, and other related applications. A list of topics can be found below. You should aim for a level of understanding that allows you to:

1. Carry out **computations** with ease.
2. Use key concepts of calculus to **solve a range of problems**, both computational and conceptual, especially including ones that are different from, or a variation of, problems you have seen before.
3. **Produce well-written solutions,** which both contain all the relevant computations *and* written explanations of those steps and the key, general ideas involved. The goal is that a peer who has not thought about the problem before would be able to read your solution and completely understand how it was solved without having to fill in any details.
4. Use **problem solving strategies** to determine the best approach to solve a problem, and determine whether a particular theorem or technique applies.
5. Use **critical reasoning** to determine whether an argument is correct or not, and whether a statement is true or false, with justification.
6. Draw **connections** between the key concepts in calculus and articulate how some of the techniques from the courses can be applied to problems outside of mathematics.

Textbooks and Other Materials

Textbook

Our primary text is *OpenStax Calculus Volume 2,* an Open Educational Resource (a *free* textbook). The textbook can be [accessed online](#), or you can download a PDF, or you can purchase a printed copy.

Course website

You can access the MAT136H course website on [Quercus](#) at https://q.utoronto.ca. All important course information will be posted on Quercus throughout the course. We will send out reminder emails and updates about once per week.

Discussion board - Piazza

The discussion board can be used to post general course questions, and read and reply to other students' questions. See the Piazza page on Quercus.

Practice problem list and WeBWorK practice

A list of extra practice problems from the textbook, available on Quercus. You do not need to hand in your solutions. See the Textbook and Practice Problems page on Quercus.

There are also online practice problems on WeBWorK (the same software used for graded online assignments).

Assessment and Deadlines

Type	Description	Due Date	Weight
Final Exam	Cumulative Final Exam	TBA	40%
Term Test	Term Test 1	2025-01-31	19%
Term Test	Term Test 2	2025-03-14	19%
Other	Preparation checks (average of all except your lowest three)	On-going	5%
Assignment	Written assignments (average of all)	On-going	6%
Assignment	Online assignments (average of all except your lowest one)	On-going	8%
Class Participation	MathMatize polls (full marks for participating in at least 75% of polls)	On-going	3%
		Total	100%

More Details for Assessment and Deadlines

Final grades are based on student performance on assessments listed here. No extra work can be submitted to improve a student's final grade.

Due dates

A complete schedule of due dates is available on the Course Outline and Schedule page on Quercus.

Final exam

There will be a final exam during the exam period in April. The exam will be cumulative, meaning it may include problems from the entire course. The date, time, and location of the exam will be decided by the UTM Exam Office.

Term tests

Two term tests will be held on the following dates:

- Test 1 - Friday, 31 January 2025 at 5:10-7pm
- Test 2 - Friday, 14 March 2025 at 5:10-7pm

Details such as room numbers and what material is covered on each term test will be provided later, on Quercus.

The two term tests are each worth 19% of your final grade. However,**if you write two term tests, the higher test grade will count for 22% of your final grade and the lower grade will count for 16% of your final grade.**

Calculators will **NOT** be allowed during term tests and the final examination. (Any calculator may be used while working on assignments and homework.)

See the Missed Term Work section below for what to do if you have to miss a term test. Note that once you begin writing one of the term tests, it must count toward your final grade; you cannot decide to miss a test or write the Make-Up test after you have begin writing a regular term test.

Preparation Checks (Prep Checks)

Before classes each week, you will be expected to read certain sections in the textbook, guided by Reading Guides which can be found on Quercus. The reading guides let you know which sections can be skipped, and have room for notes and questions you may have.

After (or during) these readings, you will complete short Preparation Check (Prep Check) quizzes on Quercus. Prep Checks are designed so that if you work hard on them without any help other than the textbook, then you are ready for class!

- You will be required to read between one and three sections per week.
- There is one Prep Check consisting of three to five questions per section for that week.
- Prep Checks are due every Mondays at 9pm, starting the second week of class (see the Course Outline and Schedule page on Quercus for a complete schedule of due dates).
- You will have an unlimited number of attempts before the deadline, and your grades on Prep Checks will count towards your final grade in the course.
- All but your lowest three Prep Check scores will count toward your final grade.

Online and Written Assignments

There is an assignment due every Saturday at 9pm, except for the first week and the weeks of the two term tests.

Every assignment has an **online** component which you will complete on WeBWorK, a free service. In total there are nine online assignments, of which your best eight scores will count toward your final grade. See the Online Assignments page on Quercus for more details.

Three assignments also have **written** components, which you will write by hand and submit via Crowdmark, another free service. All three of your written assignment scores will count toward your final grade. See the Written Assignments page on Quercus for more details.

See the Course Outline and Schedule page on Quercus for a complete schedule of due dates.

There will be **no make-up assignments**.

The purpose of the written assignments is to give you some practice with writing solutions to mathematical problems,*without any*

time pressure. You will receive feedback on your writing and on your solutions. You will receive feedback from the graders on your writing and on your solutions. You are encouraged to take these opportunities to carefully write your solutions and think about how to best present your reasoning behind them.

Questions on the assignments (or questions like them) may also appear later on tests and/or the final exam.

Note: Deadlines to submit assignments are **extremely strict, and enforced by software**. Missing a deadline *by even a minute* will normally mean that you get a grade of 0 for that assignment, even if you have technical difficulties just before the deadline. **This may seem strict, but it is essential in a large course and it is meant to help you practice keeping strict deadlines.** Plan to finish well before the deadline, even the day before if you can. This is especially important for written assignments.

MathMatize in-class polling

During lectures we will use MathMatize, a simple polling system. It is free and easy to use. Instructions for creating your MathMatize account and logging in can be found on the MathMatize page on Quercus.

Your **participation** in Mathmatize polls in class will count for 3% of your final grade. In order for your participation to be recorded, you must log in and respond to polls using the MathMatize account associated with your @mail.utoronto.ca email address only. You will get an invitation to set up such an account before the first day of class, and you can see the MathMatize page on Quercus for more details on setting up an account.

If you participate in most (half or more) of the polls during most (75% or more) of your lectures, you will receive full marks. Your lecture will meet 24 times throughout the term, meaning you will receive full marks if you participate in most of the polls during 18 of these meetings. So if you are ill or otherwise unable to come to class on some days, you can still get full marks (but you should come as often as possible, of course).

MathMatize polls will track your **participation only** - you do not need to choose the correct answer to get the grade. However, we strongly suggest that you try your best on each problem because it will help you learn the material, and it will help your instructor tailor the classes to your needs.

Please note that this requires you to bring a device (e.g. smart phone, tablet, or laptop) which can connect to the internet, to class. If you do not have access to such a device, please contact the course coordinator

Penalties for Lateness

There will be no make-up assignments (written or online) or make-up preparation checks.

Late assignments or preparation checks will not be accepted unless there are highly extenuating circumstances.

Procedures and Rules

Missed Term Work

Missing Assignments

As described above, the grading scheme of the course automatically drops your lowest online (WeBWorK) assignment score, meaning any student can miss one online assignment without penalty if necessary. Any other homework assignments (written or online) that are missed or handed in late will receive a grade of 0. There will be no make-up assignments of any kind, under any circumstances.

Missing Tests

Students should only miss term tests if they are sick or for very severe circumstances otherwise. Students who miss one or more term tests typically do not do as well in the course, so **students should write both term tests if at all possible**.

For students who have to miss Term Test 1 or Term Test 2, no documentation is needed (no doctor's notes are required to verify an injury or illness, for example). However, such students must fill out a MAT136 Absence Declaration Form, which will be available on Quercus before each test.

Students who miss Term Test 1 and/or 2 (and **only** those students) are entitled to write a make-up test, taking place during Week 10 on Friday, 21 March (location TBA). All students who are entitled to do so (see below) will write the same make-up test, regardless of which test they missed. The make-up test will cover all the material covered by **both** Term Test 1 and Term Test 2.

If you miss one term test, you have one of two options:

- **(Recommended!)** Write the make-up test.

- If you choose this option, your grade on the make-up test will "replace" your grade on the missed test, including the preferential weighting for your higher test grade as described above.
- **(Not recommended!)** Don't write the make-up test.
  - If you choose this option, the term test that you do write will be worth 22% of your final grade, and the final exam will be worth 56% of your final grade.
  - Note that you cannot choose this option if you start writing the make-up test. In other words, you cannot decide to have your make-up test not count if you start writing it.

If you miss both term tests, you will write the make-up test, which is not optional in this case. If you do, the make-up test will be worth 25% of your final grade, and the final exam will be worth 53% of your final grade. If you miss both term tests and you miss the make-up test, we will normally record a grade of zero for the make-up test (which, again, in this case is worth 25% of your final grade), and your final exam will be worth 53% of your final grade.

A note on the value of tests

It is *highly* recommended that you write the two regular Term Tests if you are able. If you miss a term test, you will miss out on receiving valuable feedback earlier in the course. Also, the material on the Make-Up Test may be different than the material tested on the missed test.

In the past, students who wrote all of the the regular term tests tended to do significantly better in the course, on average. Although we do not set out to make our final exams more difficult than term tests, students often find them more difficult, likely due to the larger amount of material being covered. We often hear about students who miss a test and believe they will study extra hard and make up for it on the final, but that rarely works out in the student's favour. It is therefore **highly** recommended to write both of the regular Term Tests if possible.

For those who must miss a test (for example due to illness), writing the Make-Up Test provides an opportunity to not have as much weight shifted to their final exam grade.

Missed Final Exam

Students who cannot complete their final examination due to illness or other serious causes must file an online petition **within 72 hours of the missed examination**. Late petitions will **NOT** be considered. Upon approval of a deferred exam request, a non-refundable fee is required for each examination approved. See the Office of the Registrar Administrative Fees for Services page for more information.

Academic Integrity

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto Mississauga is a strong signal of each student's individual academic achievement. As a result, UTM treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters outlines behaviours that constitute academic dishonesty and the process for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course, or more than once in the same course, without the permission of the instructor.
3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or

from other [institutional resources](#).

Generative AI

The use of generative artificial intelligence tools or apps for assignments in this course, including tools like ChatGPT and other AI writing or coding assistants, is prohibited.

Code of Behaviour on Academic Matters

UTM wishes to remind students that they are expected to adhere to the [Code of Behaviour on Academic Matters](#). Potential academic offences in a digital context include, but are not limited to:

- Accessing unauthorized resources (search engines, chat rooms, Reddit, etc.) for assessments.
- Using technological aids (e.g. software) beyond what is listed as permitted in an assessment.
- Posting test, essay, or exam questions to message boards or social media.
- Creating, accessing, and sharing assessment questions and answers in virtual "course groups."
- Working collaboratively, in-person or online, with others on assessments that are expected to be completed individually.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other [institutional resources](#).

Plagiarism Detection

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq).

Students may wish to opt out of using the plagiarism detection tool. In order to opt out, contact your instructor by email no later than two (2) weeks after the start of classes. If you have opted out, then specific information on an alternative method to submit your assignment can be found below.

Informed Consent – Email Lists

As a student enrolled in this course, you understand that you are providing your implicit consent to be included in an email list for the department to send you non-essential information from time to time. If you do not wish to be included in such an email list, please request to be removed by contacting one of the Academic Advisors & Undergraduate Program Administrators. Their information can be found on the MCS Website Contact Us [page](#) .

Final Exam Information

Duration: 3 hours

Additional Information

Weekly Cycle

This course is taught in an *active learning* style. This means that you will be learning some basics on your own **before** class, and in class you will **participate** in working on a variety of activities, problems, and examples. Studies have shown that courses in which students actively participate throughout lead to better results, and in particular that students learn more in such an environment than in a passive, "lecture-style" environment.

A typical week in MAT136

- **Before class**
  - Complete guided readings from the textbook.
  - Complete short preparation check (Prep Check) quizzes on Quercus. (Always due Sundays at 9pm, starting 12 January.)
- **During class**
  - Brief introductions and summaries of what you read before class.
  - Actively work on problems. Come to class prepared to work and engage!
  - Participate in MathMatize polling and discussions with your classmates.
- **After class**

- Tutorials, work on a variety of problems in small groups with TAs.
- Independent and group study, working on practice problems
- Assessments. (Due Sundays at 9pm on weeks without tests.)

Classes

All classes are in-person except for LEC0105 which will have online classes on Zoom (see the LEC0105 page on Quercus for more information). To find the day, time and room of your class, check your timetable on ACORN.

Prof. Herman plans to record his online lectures for LEC0105, which will be posted and made available for all students on the LEC0105 page on Quercus.

Tutorials

Tutorials will begin during the second week of classes. All students must be enrolled in a tutorial section, and should only attend the tutorial in which they are enrolled. All tutorials are held in-person, and students should attend every week.

A list of which TA is responsible for which tutorial can be found on the Contact Info page on Quercus.

The primary purpose of tutorials is to give students an opportunity to ask questions and work through examples together with your classmates and your TA. Although we do not track tutorial attendance, the tutorials in this course **should not** be thought of as optional, as they will contain valuable examples, and extra writing and computational practice beyond what is covered in lectures. Attending tutorials and actively participating in them will increase your chances of doing well in the course.

Each week we will post a worksheet that your TA will have you work on, either in small groups or independently, and then discuss the how to approach and solve some or all of those problems after you have worked on them. These worksheets will be posted in the Weekly Guides at least a few days before the week's tutorials. To get the most from tutorials, you should review lecture material and attempt the assigned tutorial problems before each week's tutorials.

Help and Other Resources

Office Hours

All instructors will be available for help outside of class. Most times may be drop-in sessions, and certain times you can book ahead. Some may be online office hours, and some may be in person. See the Office Hours page on Quercus for up-to date information, which may change week-to-week.

Math Learning Centre (MLC)

The Math Learning Centre is located in DH2027. TAs are available for drop-in help at certain times. You do not need to make an appointment; just show up! The MLC is also a great place to sit and work for a while, and to meet other math students. See the linked page or the Office Hours page on Quercus for the schedule, which will become available around the second week of the term.

Discussion Board - Piazza

In this course we will be using Piazza for discussions about math. It is a *free* online discussion forum, where you can post questions related to the course and get answers from instructors, TAs, and other students. Using Piazza is completely optional; however, it is a great place to get help from fellow students and see what questions others are asking as well! Rather than emailing questions to the teaching staff, we encourage you to post your questions on Piazza.

See the Piazza page on Quercus for details.

Academic skills centre

The Robert Gillespie Academic Skills Centre (RGASC) offers individual consultations, workshops, and a wide range of programs to help students identify and develop the academic skills they need for success in their studies. Visit the RGASC website to explore their online resources, book an appointment, or learn about other programming such as Writing Retreats, the Program for Accessing Research Training (PART), Mathematics and Numeracy Support, and dedicated resources for English Language Learners. Links are available on Quercus under "Additional Help".

Email policy

Instructor and TA email addresses can be found on the Contact Info page on Quercus. Before you send an email to any course staff, please check whether the answer to your question is in this syllabus or on Piazza.

For general course questions (questions that don't involve personal information), and in particular for any questionsabout math, please make a post on **Piazza** (see the Piazza page on Quercus for more information). As a courtesy to your fellow students, first check if another student has already asked the same question, and if not please give your post a descriptive title, referring to the assessment and question number if applicable. We will not answer questions about math over email.

For questions about grades or otherwise involving personal information, you **must** email us from your UofT email address only. **Please include "MAT136" in the subject line**. Here's whom you should email:

- For assignments, email the assistant course coordinator (Mike Pitocco)
- For other personal questions and other grades, email the course coordinator (Ivan Khatchatourian).

Technology requirements and recommendations

All classes (except LEC0105, as outlined above) are planned to be in-person. However, there are circumstances when a class or tutorial may need to be delivered online, via Zoom. Note that some office hours will be held online as well. Please register for a UTM Zoom account using your UTORid and password, and see the UofTRecommended Technology Requirements for Remote/Online Learning.

Please bring a device (e.g. smart phone, tablet, or laptop) which can connect to the internet, to class. If you do not have access to such a device, please contact the course coordinator.

In addition, students will also need a camera or scanner, in order to digitize hand-written assignment work for submission to Crowdmark. If you're using a camera, we recommend finding a "camera scanner" app to facilitate taking clear, easy to read images of your pages. If we cannot read your photos/scans, we cannot grade them!

Since it is possible that some classes may be delivered online in certain circumstances, we include the following notice:

Some meetings of this course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session. Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation, and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor. For questions about recording and use of videos in which you appear please contact your instructor.

Course feedback

There are several ways to provide feedback on the course:

- Through the course suggestion box.
- Through anonymous feedback forms for your instructor.
- Through the official UofT course evaluation system, conducted near the end of the semester.

Details will be posted on the Course Feedback page on Quercus. You are strongly encouraged to participate and provide feedback!

Equity and Accessibility

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. UofT does not condone discrimination or harassment against any persons or communities.

The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs. At UTM, the Accessibility Services can provide more information about accessibility accommodations for

students.

Copyright policy

Please be advised that the intellectual property rights over the material referred to on this syllabus and posted on Quercus, may belong to the course instructors or other persons. You are not authorized to reproduce or distribute such material, in any form or medium, without the prior consent of the intellectual property owner. Violation of intellectual property rights may be a violation of the law and University of Toronto policies and may entail significant repercussions for the person found to have engaged in such act. If you have any questions regarding your right to use the material in a manner other than as set forth in the syllabus, please speak to your instructor.

- Course materials are made available to you for personal use. You may share (or publish) material anywhere.
- You may not record lectures or tutorials (either in-person or online) without explicit permission from the instructor or the TA.
- You may not post any course material to any website, study group or online forum.
- If you post assignment or test questions to any website, study group or online forum (except the course Piazza discussion board), it may be a copyright violation and it may be an academic offence.

Course Schedule

See the Course Outline and Schedule page on Quercus for a schedule of topics and a list of exact due dates for all assessments.

Last Date to drop course from Academic Record and GPA is March 10, 2025.

Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.