# DEPARTMENT OF MATHEMATICAL AND COMPUTATIONAL SCIENCES UNIVERSITY OF TORONTO MISSISSAUGA

## MAT257Y5Y LEC0101 Analysis II Course Outline - Fall 2019

**Class Location & Time** Tue, 02:00 PM - 03:00 PM IB 370

Thu, 01:00 PM - 03:00 PM IB 370

**Instructor** Tyler Holden

Office Location
Office Hours

E-mail Address tyler.holden@utoronto.ca

Course Web Site <a href="https://q.utoronto.ca">https://q.utoronto.ca</a>

## **Course Description**

A theoretical second course in calculus for students with a serious interest in mathematics. Topology of Rn; compactness, functions and continuity, extreme value theorem. Derivatives; inverse and implicit function theorems, maxima and minima, Lagrange multipliers. Integration; Fubini's theorem, partitions of unity, change of variables. Differential forms. Manifolds in Rn; integration on manifolds; Stokes' theorem for differential forms and classical versions. [72L, 48T] **Note: MAT257Y5 will be accepted anywhere where MAT232H5 or MAT236H5 are accepted.** 

Prerequisite: MAT157Y5, MAT240H5 Exclusion: MAT237Y1, MAT257Y1 (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 <a href="here">here</a>.

### **Detailed Course Description**

MAT257 is a second year course in analysis. It is designed for students who are interesting in pursuing a degree in mathematics, or a mathematically heavily field. It is a full credit course, and covers

- Metric space topology
  - Open and closed sets
  - Limits, sequences, and continuity
  - Compactness and connectedness
- Differentiation
  - The derivative and chain rule
  - Optimization
  - Taylor series
  - The Implicit and Inverse Function Theorems
- Scalar valued integration
  - Jordan measure
  - Integration in R n including improper integration
  - Fubini's theorem and change of variables
- Vector calculus
  - Embedded submanifolds of R n
  - Vector fields (closed and exact)
  - Line and surface integrals
  - The big three theorems (Green, Gauss, Stokes')

## **Learning Outcomes**

At the course level, the successful student will be able to accomplish the following:

- 1. Read mathematical statements and result. Students should be able to read and critique a proof, check its validity, and summarize the core idea of the proof.
- 2. Formulate original solutions to advanced questions in multi-variable analysis. This includes the creation of examples and

- counter examples to new definitions, and formulating original proofs to advanced questions.
- 3. Communicate mathematically and engage in a mathematical community. Students should be able to present their ideas to a group of their peers, and defend or adapt those ideas as necessary. Conversely, students are expected to ask questions of their peers.
- 4. Competently utilize a toolbox of mathematics built within the class. In particular, the student should be able to build upon a mathematical foundation, and use prior results in the class to build a rough map for solving a more complicated question. Students should then be able to fill in the details of that map.

#### **Textbooks and Other Materials**

There is no textbook in this class. Part of the structure of the course is such that you are not permitted to look at any books, texts, papers, or online resources.

## **Assessment and Deadlines**

Type	Description	<b>Due Date</b>	Weight
Assignment	Sixteen (16) at 1% each, lowest dropped	On-going	15%
Term Test	Term Test 1	2019-10-10	7%
Term Test	Term Test 2	2019-11-14	7%
Term Test	Term Test 3	2020-01-30	7%
Term Test	Term Test 4	2020-03-12	4%
Presentations	Weekly presentation of solved problems, classroom interaction	On-going	40%
Final Exam	Final Exam	TBA	20%
		Tota	l 100%

## More Details for Assessment and Deadlines

Students will be responsible for presenting solutions and defending their solutions during the assigned lecture times. You will not be required to present every week. Priority for both giving presentations and choice of problems will be given to students who have presented the least, ensuring a fair opportunity to present.

Your assessment will be based on how often you present, the clarity of your presentation, your ability to respond to questions, and the questions you ask as an audience member. Your assessment will be rolling and back-loaded; namely, the weight of this evaluation will be negligible at the beginning of the year, and significant at the end of the year.

Students who present will then be required to submit their solutions to the course wikipedia.

We will grow together as a class, and as long as you engage honestly and thoughtfully, you will perform well.

#### **Penalties for Lateness**

No late assignments will be accepted.

## **Procedures and Rules**

#### **Missed Term Work**

If you are forced to miss a term test because of an illness or other extenuating circumstance, you must alert the course instructor Tyler Holden within 24 hours of the term test, and provide supporting documentation no later than one week after the term test. In particular, the university has very precise procedures regarding documentation of sick notes, and a form for extenuating circumstances.

Failure to adhere to any of these policies will result in your term test being assigned a grade of zero (0).

Students granted an exemption will have the weight of all missed term tests transferred to the final examination.

#### **Missed Final Exam**

Students who cannot write a final examination due to illness or other serious causes must file an<u>online petition</u> within 72 hours of the missed examination. Original supporting documentation must also be submitted to the Office of the Registrar within 72 hours of the missed exam. Late petitions will **NOT** be considered. If illness is cited as the reason for a deferred exam request, a U of T

Verification of Student Illness or Injury Form must show that you were **examined and diagnosed at the time of illness and on the date of the exam, or by the day after at the latest**. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of \$70 is required for each examination approved.

#### **Academic Integrity**

Honesty and fairness are fundamental to the University of Toronto's mission. Plagiarism is a form of academic fraud and is treated very seriously. The work that you submit must be your own and cannot contain anyone elses work or ideas without proper attribution. You are expected to read the handout How not to plagiarize (<a href="http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize">http://www.writing.utoronto.ca/advice/using-sources/how-not-to-plagiarize</a>) and to be familiar with the Code of behaviour on academic matters, which is linked from the UTM calendar under the link Codes and policies.

## **Final Exam Information**

Duration: 3 hours Aids Permitted: None

## **Additional Information**

## **Email Policy**

All emails must originate from a utoronto.ca email address, and contain [MAT257] in the beginning of the subject. Failure to adhere to these policies will result in your email not making it through my filters, and your email will not be read.

Last Date to drop course from Academic Record and GPA is February 17, 2020.