

University of Toronto, Department of Mathematics

MAT157Y Analysis I: Syllabus **Fall/Spring 2010-11** **1.0 credit**

Course Instructor and Contact

Instructor: Professor Kumar Murty, Ph.D., F.R.S.C

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Office Hours: Tuesday 11 – 12 or by appointment

Course Description

A theoretical course in calculus; Emphasizing proofs and techniques, as well as geometric and physical understanding, trigonometric identities, limits and continuity; least upper bounds, intermediate and extreme value theorems. Derivatives, mean value and inverse function theorems, integrals; fundamental theorem; elementary transcendental functions. Taylor's theorem; sequences and series; uniform convergence and power series.

Course Format

This course will consist of twice weekly lectures and weekly tutorials. Additional information on the course can be found on the course website.

Course Learning Outcomes/Objectives

By the end of the course, students will be able to:

- Understand what constitutes a proof in mathematics
- Give rigorous arguments to justify the mechanical aspects of Calculus
- Understand the beginnings of mathematical analysis
- Embark on a study of deeper aspects of real and complex analysis of one and several variables

Course Outline

Week of (due the following week in Thursday tutorial)	Sections	Topics	Problems 1) <i>Each week several problems will be required</i> 2) <i>Additional problems may be assigned</i>
Sept 13	Chapters 1 and 2	Properties of Numbers	Ch. 1: 7, 13, 15, 16, 19 Ch. 2: 1-3, 5, 13
Sept 20	Chapter 3 and 4	Functions and Graphs	Ch.3: 7-9, 12,13,16, 17 Ch.4: 1, 2, 3, 5, 7, 9, 11, 22
Sept 27	Chapter 5	Limits	Ch.5: 1, 2-4, 6, 7, 14, 24
Oct 4	Chapter 6	Continuous Functions	Ch.6: 1, 2, 6, 7, 10, 12-14
Oct 11	Chapter 7	Three Hard Theorems	Ch.7: 1, 2, 5, 10, 11, 14, 17
Oct 18	Chapter 8	Least Upper Bounds	Ch.8: 1, 2, 4, 6, 8, 13, 14, 15
Oct 25	Midterm Exam	Chapters 1-7	No Problem Set
Nov 1	Chapter 9	Derivatives	Ch.9: 1, 3, 4, 9, 11, 15, 21, 23, 28
Nov 8	Chapter 10	Differentiation	Ch.10: 1, 2, 3, 4, 5-7, 11, 12, 20
Nov 15	Chapter 11	Significance of the Derivative	Ch.11: 1, 2-4, 8, 9, 10, 11, 12, 19, 29, 40, 48
Nov 22	Chapter 12	Inverse Functions	Ch.12: 1, 3, 5, 8, 11, 18, 23
Nov 29	Midterm Exam	Chapters 8 – 11	No Problem Set
Jan 3	Chapter 13	Integrals	Ch.13: 1, 3, 4, 5, 6, 9, 13, 15, 16, 39
Jan 10	Chapter 14	The Fundamental Theorem of Calculus	Ch.14: 1-3, 7, 9, 10, 12, 15, 21
Jan 17	Chapter 15	The Trigonometric Functions	Ch.15: 2, 3, 4, 6, 8, 9-13
Jan 24	Chapter 18	The Logarithm and Exponential Functions	Ch.18: 1, 2-7, 15, 19, 20, 22, 32
Jan 31	Midterm Exam	Chapters 12 – 15	No Problem Set
Feb 7	Chapter 19	Integration in Elementary Terms	Ch.19: 1, 2-10, 12, 13, 14
Feb 14	Chapter 20	Approximation by Polynomial Functions	Ch.20: 1, 2, 3, 7, 9-11, 13
Feb 21	Reading Week (No Classes)		
Feb 28	Chapter 22	Infinite Sequences	Ch.22: 1-3, 4, 5, 9, 10, 13, 18, 27, 29
Mar 7	Chapter 23	Infinite Series	Ch.23: 1, 2, 4, 6, 7, 10, 16, 27
Mar 14	Chapter 24	Uniform Convergence and Power Series	Ch.24: 1-3, 4, 5, 6, 7-10
Mar 21	Chapter 25	Complex Numbers	Ch.25: 1-3, 4, 8, 9-12
Mar 28	Midterm Exam	Chapters 19 – 24	No Problem Set

Course Structure

Lectures:

- Monday's 2 – 4, MP103
- Tuesday's 10 – 11, Room MP202

Tutorials: (first tutorial September 23rd)

- Student Last Name A – I: Room LM155, Thursday's 9 – 11
- Student Last Name J – Q: Room HA401, Thursday's 9 – 11
- Student Last Name R – Z: Room RS208, Thursday's 9 – 11

Homework/Problem Sets:

- There will be 20 weekly problem sets (see above).
- Each week several problems will be required and collected in tutorial. Additional problems from the above may be assigned.
- You are expected to do all the problem sets and try all the recommended problems.
- If there is a problem you cannot solve make sure you learn how to do it in tutorial.

Exams:

- Term exams are written during Thursday tutorials

Grading Scheme:

- Final Exam – 40%
- Term Exams – 12% each
- All homework assignments – 12%

Course Resources

Course Textbook:

- Calculus by M. Spivak (4th Edition) (Publish or Perish)

Website:

More information on the course can be found by login into the UofT Portal (<http://portal.utoronto.ca>). Click on the MAT157 website link in the "My Courses" module.

Additional Resources:

None