

MACT 4127 (Real Analysis II)

Spring 2025

Course Syllabus

What's the course schedule?

Lectures	Days	Location
8:30 am - 9:45 am	MR	SSE CP33

How will I communicate with my instructor and TA?

Below are our contacts. ***Note:** For the most updated hours, please check CANVAS.

Instructor: Hany M. El-Hosseiny
 Email: hany.hosseiny@aucegypt.edu
 Office: SSE 1048
 Office Hours*: Monday and Thursday from 11:30 am – 12:30 pm, or by appointment.
 Zoom Link: <https://aucegypt.zoom.us/j/96977965657>

Teaching Assistant: Hagar Ibrahim
 Email: hagar_ibrahim@aucegypt.edu
 Office:
 Office Hours*: Monday from 8:00 pm - 12:00 pm
 Zoom Link:

Are there any prerequisites for this course?

- **Formally:** MACT 4126 (Real Analysis I).
- **Informally:** You need to be comfortable with understanding and writing simple proofs, as well as basic concepts of limits, continuity, derivatives and integrals.

Are we going to follow a particular textbook?

- **Main Text:** Course Notes: Real Analysis – A Detailed Guide, Part 3, by Hany M. El-Hosseiny. It will be published in parts on CANVAS.
- **Supplementary Text 1:** Foundations of Mathematical Analysis, by S. Ponnusamy. Birkhauser 2012. Only Chapter 11.
- **Supplementary Text 2:** A Primer of Lebesgue Integration, 2nd Edition, by H.S. Bear, 2002.

What's this course?

MACT 4127 (as its name indicates) is a second course on Real Analysis, and it covers Integration and function spaces.

Below is coarse plan of the course:

- Chapter 1: The Riemann Integral
- Chapter 2: The Riemann-Stieltjes Integral and Functions of Bounded Variation
- Chapter 3: The Lebesgue Measure on The Real Line
- Chapter 4: The Lebesgue Integral
- Chapter 5: Abstract Measures and Integration.
- Chapter 6: Spaces of Integrable Functions.

Where can I find the homework assignments?

The homework assignments with their due dates can be found on CANVAS.

Can I use a calculator in this class?

All types of calculators are allowed but not very useful.

How is my grade determined?

Your grade will be determined according to your total score, which will be calculated as follows:

- Homework Assignments: 40%
- Two Midterms: 15%, each
- Comprehensive Final: 30%

Is there anything I need to know concerning academic integrity:

The AUC has zero-tolerance for violations of the academic integrity code. This includes, but is not limited to, the following categories: cheating, plagiarism, fabrication, multiple submissions, obtaining unfair advantage, unauthorized access to academic or administrative systems, aiding and abetting, impersonation, threatening harm, and copyright infringement. See <http://www.aucegypt.edu/academics/academic-integrity-0>.

What is the schedule of the lectures, homework assignments, and exams?

Below is a tentative schedule, including the homework due dates, with sections from the course notes. **Please read each section from the text before we cover it.**

Week	Monday Lecture	Lecture Title	Tuesday Exams	Thursday Lecture	Lecture Title	Assignments
1	Feb 3	Revision		Feb 6	Introduction to Integration	
2	Feb 10	Step Functions and Riemann Sums		Feb 13	Riemann Integrable Functions and Their Properties	Assignment 1 due Thursday Feb 20
3	Feb 17	Integrability and Darboux Sums		Feb 20	The Theorem of Lebesgue- Vitali	
4	Feb 24	Monotone Functions		Feb 27	RS Sums and RS-integrable functions	Assignment 2 due Thursday Mar 6
5	Mar 3	Properties of RS Integrable Functions.		Mar 6	Computing RS Integrals	
6	Mar 10	Discussion and Examples	First Midterm Exam	Mar 13	What is wrong with the Riemann (and RS) Integral?	
7	Mar 17	Jordan Content and Borel Measures		Mar 20	Set Algebras	Assignment 3 due Thursday Mar 27
8	Mar 24	Outer Measures and Measures		Mar 27 ^(D)	Measurable sets	
9	Mar 31	Holiday		Apr 3	Measurable Functions	Assignment 4 due Thursday Apr 10
10	Apr. 7	The Lebesgue integral of a positive measurable function		Apr 10	The Theorem of Egorov	

Week	Monday Lecture	Lecture Title	Tuesday Exams	Thursday Lecture	Lecture Title	Assignments
	Apr 14	Lebesgue Integrable Functions		Apr 17	Holiday	Assignment 5 due Monday Apr 28
11	Apr 21	Holiday		Apr 24	Holiday	
12	Apr 28	Convergence Theorems	Second Midterm Exam	May 1	Holiday	
13	May 5	Examples		May 8	Double Integrals	Assignment 6 due Thursday May 15
14	May 12	L^p spaces		May 15	Examples	
15	May 19	Applications		May 22	Wrap-Up	