

Measure Theory and Integration - MATH 403

(CRN 50461)

Department of Mathematics & Statistics,
University of Northern British Columbia

September 2020, Online, Tuesday & Thursday 2:30 pm-3:50 pm

ESSENTIALS

INSTRUCTOR: **Dr. Mohammad El Smaily**
EMAIL: mohammad.elsmaily@unbc.ca
TEL: 250-960-6624
OFFICE: T&L, 10-2044
OFFICE HOURS: Thursdays 4:00 pm –5:30 pm,
or by appointment (email)
Note: office hours are held online due to COVID-19

LECTURES:

Tuesday and Thursday 2:30 pm - 3:50 pm, **ONLINE**. The link [here](#) allows you to attend the MATH 403 classes online (TR, 2:30 pm - 3:50 pm, Pacific Time).

COURSE DESCRIPTION:

This course focuses on the development and properties of Lebesgue measure and the Lebesgue integral, with generalization to integration in abstract measurable spaces. Topics include outer measure, measurable sets and Lebesgue measure, measurable functions, differentiation of integrals, and the extension of these concepts to more general settings.

Prerequisites: (MATH 302 Minimum Grade of C⁻).

TEXTBOOK AND OTHER RECOMMENDED TEXTS:

An introduction to measure theory, by Terence Tao, Graduate Studies in Mathematics, Volume: 126; 2011; 206 pp.

other recommended text(s): *The Elements of Integration and Lebesgue Measure* by Robert G. Bartle

COURSE WEB PAGES:

- For lectures, we will meet on Zoom during class time ([please click here to follow the link](#)).
 - We will use Blackboard <https://learn.unbc.ca> to post all materials for this course and make announcements.
-

PRACTICE PROBLEMS

Each section in this book is followed by several exercises and problems which vary from easy to challenging. The book has also exercises which are of a project nature. Feel free to work out the exercises which are relevant

to each lecture on your own. I will solve some of these exercises during the semester. And will assign some others as homework. Remember that the homework is mainly to assess your understanding of the material and prepare you for the exams as well.

GRADING SCHEME:

Your Math 403 final grade is computed according to the following scheme:

Assignments: **35%**

Midterm exam: **25%**

Final Exam: **40%**

ASSIGNMENTS:

Assignments will be given/posted on Blackboard and will be **handed in online–Blackboard**.

The due dates will be written on the assignments. Assignments must be handed in on time. Late assignments will only be accepted for medical or compassionate reasons.

MIDTERM EXAM:

There will be **one midterm exam** on **Thursday, October 22**. The exams will start, online, at **2:30 pm** and last 50 minutes. If you have an unavoidable conflict with a scheduled exam, it is your responsibility to inform me as soon as possible (preferably one week in advance); decisions in this regard will be made on a case-by-case basis.

FINAL EXAM:

The final exam will be held online (Blackboard). TBA by the Registrar's Office. Final exam will be **comprehensive and will include all the material covered in the course**.

IMPORTANT DATES:

Midterm: **Thursday, October 22**

First Day of Classes: Wed 9 September

Add/Drop Date: Wed 23 September. 23

Withdrawal Date: Thursday, October 29

Last Day of Classes: Monday, December 7

Final Exam Period: Tuesday, December 8 – Friday, December 18

Holidays during the term

Thanksgiving Day: Monday, October 12

Remembrance Day: Wednesday, November 11.

EXPECTATIONS:

- It is recommended that you devote at least 8 extra hours of personal work per week to this course. Solve all problems from the assigned homework and the suggested problems posted on the Blackboard course webpage. Discussion with your classmates is encouraged. However keep in mind that on the exams you

work independently.

- Do not let yourself fall behind on assignments. Do not postpone getting help until the last minute. The main help in this course is provided by the instructor during office hours.
- Attend all lectures. Please be considerate of your classmates; try not to be late for class and do not use cell phones or laptop computers during class.
- Review your notes soon after class and prior to the next class.
- During the lecture, participate by answering questions and feel free to interrupt the instructor to ask questions.

SPECIAL ARRANGEMENTS:

Students with disabilities who would like to receive access and academic accommodations through the Access Resource Centre (ARC) need to self-identify and register with the centre. Please see <http://www.unbc.ca/access-resource-centre>. The students who have registered for accommodations with the ARC must ensure that the instructor is informed of the necessary arrangements as soon as possible.

ACADEMIC REGULATIONS:

It is the students' responsibility to familiarize themselves with the regulations concerning academic integrity and ensure that their course work conform to the principles of academic integrity. Please read the academic regulations found at:

<http://www.unbc.ca/calendar/undergraduate/general/regulations.html>.

In particular, read sections 40, 41, 42, 43, 44, and 45.

TENTATIVE SYLLABUS

Tentatively, the plan is to cover sections 1.1 through 1.7, as well as 2.3 from the textbook:

- 1.1. Prologue: The problem of measure
- 1.2. Lebesgue measure
- 1.3. The Lebesgue integral
- 1.4. Abstract measure spaces
- 1.5. Modes of convergence
- 1.6. Differentiation theorems
- 1.7. Outer measures, pre-measures, and product measures

COPYRIGHT NOTICE

Copyrighted items provided to you are normally licensed* through the library. Where not licensed, copies of materials (e.g. a PDF or WORD doc) in the course shell or distributed in class are made pursuant to the **Fair Dealing Policy**¹ of the University of Northern British Columbia. Each copy may only be used for the purpose

¹https://libguides.unbc.ca/ld.php?content_id=35082396

of research, private study, criticism, review, news reporting, education, satire, or parody. If the copy is used for the purpose of review, criticism, or news reporting the source and the name of the author must be mentioned. The use of each copy for any other purpose may require the permission of the copyright owner. Each copy should be deleted/discarded at the end of the course and/or research project.

*Licensed resources can be found electronically in library databases and are subject to the terms and conditions of the license (found on the database or journal record in the library catalogue).