Instructor: Yaozhong Hu
Office: CAB 673
E-mail: yaozhong@ualberta.ca
Personal Web Page: https://sites.ualberta.ca/~yaozhong
Lecture Room: TB 45
Lecture Time: Tuesdays and Thursdays 2:00pm - 3:20pm
Office Hours: Tuesdays and Thursdays 12:30pm - 1:40pm or by appointment

Course Description:

This is a three credit course on the basic concepts and methods of rigorous analysis. It prepares students for future courses that use analytic ideas, such as real and complex analysis, partial and ordinary differential equations, numerical analysis, fluid mechanics, and differential geometry.

You have already had several calculus courses in which you evaluated limits, differentiated functions, and computed integrals. You may even remember some of the major results of calculus, such as the Chain Rule, the Mean Value Theorem, and the Fundamental Theorem of Calculus. Although you are probably less familiar with multivariable calculus, you have taken partial derivatives, computed gradients, and evaluated certain line and surface integrals. In view of all this, you must be asking: Why another course in calculus? The answer to this question is twofold. Although some proofs may have been presented in earlier courses, it is unlikely that the subtler points (e.g., completeness of the real numbers, uniform continuity, and uniform convergence) were covered. Moreover, the skills you acquired were mostly computational; you were rarely asked to prove anything yourself. This course develops the theory of calculus carefully and rigorously from basic principles and gives you a chance to learn how to construct your own proofs. It also serves as an introduction to analysis, an important branch of mathematics which provides a foundation for numerical analysis, functional analysis, harmonic analysis, differential equations, differential geometry, real analysis, complex analysis, and many other areas of specialization within mathematics.
Course Prerequisites:

The prerequisites to take this course are a good calculus-based undergraduate courses.

Course Objectives and Expected Learning Outcomes:

Students are expected to understand the foundation of the modern (rigorous) analysis. They are required to master the basic concepts, ideas and techniques of analysis. We shall cover the real number systems \( \mathbb{R} \), sequences, functions, differentiability, integrability, infinite series of real numbers, infinite series of functions in \( \mathbb{R} \). We shall also discuss the corresponding concepts in finite dimensional Euclidean space \( \mathbb{R}^n \).

Lecture Schedule & Assigned Readings:

The pace of lectures will be adapted accordingly throughout the semester. The ambitious intention of the course is to cover chapter 1 - 9 of the book.

Required Learning Resources:

The main book to be used in this course is

An Introduction to Analysis (4th Edition)
by William R. Wade (Author)
Series: Pearson Modern Classics for Advanced Mathematics Series
ISBN-10: 9780134707624

Recommended or Optional Learning Resources:

There are many other nice books on analysis. We recommend the following

1. Ross, Kenneth A.

2. Rudin, Walter

3. Apostol, Tom M.
Mathematical Analysis. 2nd edition
Grade Evaluation:

The course mark will be calculated based on the following breakdown:

<table>
<thead>
<tr>
<th>Course Component</th>
<th>Weight</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments</td>
<td>30%</td>
<td>Due every Tuesday unless otherwise announced</td>
</tr>
<tr>
<td>Midterm 1</td>
<td>25%</td>
<td>Thursday October 3, 2019</td>
</tr>
<tr>
<td>Midterm 2</td>
<td>25%</td>
<td>Thursday November 7, 2019</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
<td>To be determined</td>
</tr>
</tbody>
</table>

*Note: The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this document. Students must verify this date on BearTracks when the Final Exam Schedule is posted. The final letter grade will be determined from the course mark as follows: Grades are unofficial until approved by the Department and/or Faculty offering the course.

Assignments:

Homework will be assigned after each lecture.

Exam Format:

The (not the content) format of all midterm exams and final will look like

TOTAL: __________

Student Name: ____________________________

Exam for Stat 571, Probability and Measure
©Winter 2018 by Professor Yaozhong Hu

*Problem 1*  A bowl contains twenty cherries, exactly fifteen of which have had their stones removed. A greedy pig eats five whole cherries, picked at random, without remarking on the presence or absence of stones. Subsequently, a cherry is picked randomly from the remaining fifteen.

(a) What is the probability that this cherry contains a stone?

(b) Given that this cherry contains a stone, what is the probability that the pig consumed at least one stone?
Problem 2  A purse contain 12 quarters and 2 pennies. All the coins are to be drawn, one at a time, without replacement. You are keep all the quarters that are drawn between the two pennies, which is denoted by $X$ (The total number of quarters between the two pennies). Find $E(X)$ and $\text{var}(X)$.

Exam Aids:

All exams are close book exam. This means it is not allowed to use textbook or any other books. However, Students are allowed to use all kinds of calculators (but no laptop or cellphone can be used). They are also allowed to use one normal size ($8 \times 11$) page of note which can be written on both sides.

Excused Absence Where the Cause is Religious Belief:

For an excused absence where the cause is religious belief, a student must contact the instructor(s) within two weeks of the start of Fall or Winter classes to request accommodation for the term (including the final exam, where relevant). Instructors may request adequate documentation to substantiate the student request.

Missed Term Work

A student who cannot write a midterm To apply for an excused absence, a student must inform the instructor within two working days following the scheduled date of the term work or term exam missed, or as soon as the student is able, having regard to the circumstances underlying the absence. In all cases, instructors may request adequate documentation to substantiate the reason for the absence at their discretion.

An excused absence is a privilege and not a right; there is no guarantee that an absence will be excused. Misrepresentation of Facts to gain an excused absence is a serious breach of the Code of Student Behaviour.

Missed Final Examination:
A student who cannot write the final examination due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for a deferred final examination. Students who failed at the start of term to request exam accommodations for religious beliefs are expected to follow the normal deferred final examination process. Such an application must be made to the student’s Faculty office within two working days of the missed examination and must be supported by a Statutory Declaration (in lieu of a medical statement form) or other appropriate documentation (Calendar section 23.5.6). Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. Misrepresentation of Facts to gain a deferred examination is a serious breach of the Code of Student Behaviour.

Any deferred final examinations are scheduled as follows:

Date: TBA
Time: TBA between 8:00 -13:00
Location: TBA

Re-examination:

A student who writes the final examination and fails the course may apply for a re-examination. Re-examinations are rarely granted in the Faculty of Science. These exams are governed by University (Calendar section 23.5.5) and Faculty of Science Regulations (Calendar section 192.5.3). Misrepresentation of Facts to gain a re-examination is a serious breach of the Code of Student Behaviour.

STUDENT RESPONSIBILITIES

Academic Integrity:

The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.governance.ualberta.ca) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All forms of dishonesty are unacceptable at the University. Any offense will be reported to the Senior Associate Dean of Science who will determine the disciplinary action to be taken. Cheating, plagiarism and misrepresentation of facts are serious offenses. Anyone who engages in these practices will receive at minimum a grade of zero for the exam or paper in question and no opportunity will be given to replace the grade or redistribute the weights. As well,
in the Faculty of Science the sanction for **cheating** on any examination will include a **disciplinary failing grade** (NO EXCEPTIONS) and senior students should expect a period of suspension or expulsion from the University of Alberta.

**Collaboration on Assignments:**

Students should work alone for each of their assignments. But they can collaborate to work on the homework assignments. However, the midterm exams are not collaborative and close book.

**Exams:**

Students will not be allowed to begin an examination after it has been in progress for 30 minutes. Students must remain in the exam room until at least 30 minutes has elapsed. Electronic equipment cannot be brought into examination rooms.

**Cell Phones:**

Cell phones are to be turned off during lectures, labs and seminars. Cell phones are not to be brought to exams.

**Audio or Video Recording:**

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

**Students Eligible for Accessibility-Related Accommodations (students registered with Student Accessibility Services – SAS):**

Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with SAS deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact SAS (www.ssds.ualberta.ca) for further information.

**Student Success Centre:**

Students who require additional help in developing strategies for better time management, study skills, or examination skills should contact the Student Success Centre (2-300 Students Union Building).
Decima Robinson Support Centre for Mathematical & Statistical Sciences:

Students who require additional help with assignments or have questions about the course material in general are encouraged to visit the Decima Robinson Support Centre (528 Central Academic Building). Graduate students will be available to provide one-on-one help. In order to get maximum help during each visit, students are asked to be specific about the problem with which they are seeking help. The Centre is open Monday to Friday, 9:00–15:00.

Policy about course outlines can be found in section 23.4(2) of the University Calendar.

Important dates of Fall 2019

<table>
<thead>
<tr>
<th>September 2</th>
<th>Labour Day</th>
<th>University buildings closed</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 4</td>
<td>First day of classes</td>
<td></td>
</tr>
<tr>
<td>October 14</td>
<td>Thanksgiving</td>
<td>University buildings closed</td>
</tr>
<tr>
<td>November 11</td>
<td>Remembrance Day</td>
<td>University buildings closed</td>
</tr>
<tr>
<td>November 12-15</td>
<td>Reading week</td>
<td></td>
</tr>
<tr>
<td>December 6</td>
<td>Last day of Fall Term classes</td>
<td></td>
</tr>
</tbody>
</table>

Disclaimer:

Any typographical errors in this Course Outline are subject to change and will be announced in class.

Copyright:

©Dr. Yaozhong Hu, Department of Mathematical & Statistical Sciences, Faculty of Science, University of Alberta, 2019