Spring 2024:   Math 4350-002 Advanced Calculus I

Instructor: Dr. Alexander Solynin	**Place:** MATH 115
Office Hours: TR 2:00-4:00 or by appointment	**Text:** *Introduction to Real Analysis*, 4th Edition by Robert G. Bartle and Donald R. Sherbert
Office: MA 231	**Time:** TR 9:30 a.m.-10:50 a.m.
Email: alex.solynin@ttu.edu	**Prerequisites:** MATH 2350 or 2450 and 2360 and 3310

Expected Student Learning Outcomes: We will cover **Chapters 1 – 6.** Students will learn how to think and reason abstractly in the context of analysis of real line, and learn how to write correct and clear mathematical arguments in this context. There will be a heavy emphasis on proofs, especially epsilon-delta proofs. Concepts and skills to be mastered by the students include but are not limited to: suprema, infima, limits of sequences, limits of functions, continuous functions, derivatives of functions on the line.

Learning Procedures: Students have to read scheduled sections before the class. After a particular section is covered in class, students have to read it once more and do homework assignments for this section.

Methods for Assessment of Learning Outcomes: The expected learning outcomes for the course will be assessed through graded activities and ungraded activities. The graded activities include exams, homework and quizzes. The ungraded activities will be used to monitor your progress. A variety of these ungraded assessment techniques may be employed, including problems to be completed during class, direct questioning of students, answering students questions in class and discussions during office hours.

General Policies:
In general, no missed in class exams and quizzes will be made up and no homework will be accepted after the deadline. Whether an absence is excused or unexcused is determined solely by the instructor with the exception of absences due to religious observance and officially approved trips described below.

Absence due to religious observance: The Texas Tech University OP 34.19 states that a student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. As your instructor, I request that notification be made in writing and submitted no later than the 15th class day of the semester. Absence due to officially approved trips - The Texas Tech University OP 34.04 states department chairpersons, directors, or others responsible for a student representing the university on officially approved trips must notify the student's instructors of the departure and return schedules. The instructor so notified must not penalize the student, although the student is responsible for material missed. Any student absent because of university business must be allowed to make up missed work within a reasonable span of time or have alternate grades substituted for work due to an excused absence. Students absent because of university business must be given the same privileges as other students.

Academic Integrity (extracted from OP 34.12): It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.
Scholastic dishonesty includes, but it not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such

as, but not limited to, submission of essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

Civility in the Classroom: Incivility is any action that interferes with the classroom learning environment. This includes, but is not limited to, eating, arriving late, leaving early, a ringing cell phone, text messaging, sleeping, chatting during class, dominating the class discussion by not allowing other students to speak, and putting books away before the end of class. Be respectful to the instructor and to your fellow students. I will ask anyone participating in what I perceive to be inappropriate behavior to stop immediately.

Accommodation for Students with Disabilities **(extracted from OP 34.22):** Any student who, because of a disability, may require some special arrangements in order to meet course requirements should contact the instructor as soon as possible to make the necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note instructors are not allowed to provide classroom accommodations to a student until the appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Absence due to officially approved trips: The Texas Tech University Catalog states that the person responsible for a student missing class due to a trip should notify the instructor of the departure and return schedule in advance of the trip. The student may not be penalized and is responsible for the material missed.

Title IX Syllabus Statement - TTU Resources for Discrimination, Harassment, and Sexual Violence: Texas Tech University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from gender and/or sex discrimination of any kind. Sexual assault, discrimination, harassment, and other Title IX violations are not tolerated by the University. Report any incidents to the *Office for Student Rights & Resolution*, (806)-742-SAFE (7233) or file a report online at titleix.ttu.edu/students. Faculty and staff members at TTU are committed to connecting you to resources on campus. Some of these available resources are: **TTU Student Counseling Center,** 806-742-3674, https://www.depts.ttu.edu/scc/ *(Provides confidential support on campus.)* **TTU Student Counseling Center 24-hour Helpline**, 806-742-5555, *(Assists students who are experiencing a mental health or interpersonal violence crisis. If you call the helpline, you will speak with a mental health counselor.)* **Voice of Hope Lubbock Rape Crisis Center**, 806-763-7273, voiceofhopelubbock.org *(24-hour hotline that provides support for survivors of sexual violence.)* **The Risk, Intervention, Safety and Education (RISE) Office**, 806-742-2110, rise.ttu.edu *(Provides a range of resources and support options focused on prevention education and student wellness.)* **Texas Tech Police Department**, 806-742-3931, http://www.depts.ttu.edu/ttpd/ *(To report criminal activity that occurs on or near Texas Tech campus*.)

Important Dates:
Wednesday, January 10 – Classes begin.
Monday, January 15 – MLK Day. University holiday.
Tuesday, January 16 - Last day to add a course.
Friday, January 26 - Last day to drop a course without academic penalty.
Wednesday, February 7 - Last day to withdraw and receive a partial refund.
Saturday - Sunday, March 9-17   Spring Vacation.
Monday, April 1 – No Classes.
Monday, April 22 - Last day to drop a course.
April 24 – May 1 – Period of no examinations.
Tuesday, April 30 - Last Day of classes.
Monday, May 6 - 7:30 a.m. – 10:00 a.m.   Final Exam.

STUDENT EVALUATION:

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♦ **Monday, May 6   FINAL EXAMINATION 7:30 a.m. – 10:00 a.m.**   **150 pts**
Final Exam is scheduled before the semester begins. Date and time of this exam
cannot be changed. Students should **eliminate any conflicts NOW.**

• **IN-CLASS EXAMS:** February 20, April 11   **2×100 = 200 pts**

• 15 min **QUIZZES**:   **6×20 = 120 pts**
  Each 15 minute quiz consists of 2 problems**:**   2×10 = 20 pts
• 5 min **QUIZZES**:
  There will be several 5 minute pop quizzes (usually first 5 minutes of a class),   total = **30 pts**
  where students will be asked to write a particular formula/definition/theorem/etc.
• **HOMEWORK**:   I will collect homework eight times – approximately every
  third class. Each homework is worth 15 pts: **8×15 = 120 pts**
• **Perfect attendance**   (≤2 missed classes,
all excused absences must be supported by official notes).   **30 pts**

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• **MAXIMAL TOTAL (100%):**   **650 pts**

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GRADING PROCEDURE:

A - **90 - 100%**

B -   **80 - 89%**

C - **70 -79%**

D -   **60 - 69%**

F -   **≤ 59%**

Course Calendar

Date	Textbook	Tentative Lecture Topics
Jan. 11	Section 1.1	Sets and Functions.
Jan. 16	Section 1.2	Mathematical Induction.
Jan. 18	Section 1.3&App.B	Finite, Infinite, and Countable Sets.
Jan. 23 **Q1**	Section 2.1	The Algebraic and Order Properties of R.
Jan. 25	Section 2.2	Absolute Value and Real Line,
Jan. 30	Section 2.3	The Completeness Property of R. .
Feb. 1	Section 2.4	Applications of the Supremum Property.
Feb. 6 **Q2**	Section 2.5	Intervals.
Feb. 8	Section 3.1	Sequences and Their Limits.
Feb. 13	Section 3.2	Limit Theorems.
Feb. 15	Section 3.3	Monotone Sequences.
Feb. 20	**Lecture Exam #1 covered Sections 1.1 – 3.3.**	
Feb. 22	Section 3.4	Subsequences and the Bolzano-Weierstrass Theorem.

Feb. 27		Section 3.5	The Cauchy Criterion.
Feb. 29 **Q3**		Section 3.6	Properly Divergent Sequences.
Mar. 5		Section 3.7	Introduction to Infinite Series.
Mar. 7		Section 4.1	Limits of Functions.
Mar. 19		Section 4.2	Limit Theorems.
Mar. 21 **Q4**		Section 4.3	Some Extensions of the Limit Concept.
Mar. 26		Section 5.1	Continuous Functions.
Mar. 28		Section 5.2	Combinations of Continuous Functions.
Apr. 2 **Q5**		Section 5.3	Continuous Functions on Intervals.
Apr. 4		Section 5.4	Uniform Continuity.
Apr. 9		Review for Exam #2	
Apr. 11		**Lecture Exam #2, covered Sections 3.4 – 5.4.**	
Apr. 16		Section 5.6	Monotone and Inverse Functions.
Apr. 18		Section 6.1	The Derivative.
Apr. 23 **Q6**		Section 6.2	The Mean Value Theorem.
Apr. 25		Review of the course.	
Apr. 30		Review of the course.	
May 6	**Monday**	**7:30a.m. – 10:00 a.m.**	**FINAL EXAM**

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Tentative Homework Assignments

	Assignment
HW1	1.2.16, 1.3.9, 1.3.12, 2.1.18.
HW2	2.2.4, 2.3.7, 2.4.11, 2.5.10.
HW3	3.1.5, 3.1.17, 3.2.7, 3.2.23.
HW4	3.3.4, 3.4.7, 3.4.12, 3.5.10.
HW5	3.6.1, 3.7.9, 4.1.9, 4.1.12.
HW6	4.2.2, 4.3.5, 4.3.9, 5.1.7.
HW7	5.2.12, 5.3.13, 5.4.2, 5.4.7.
HW8	5.6.12, 6.1.10, 6.2.5, 6.2.8.