University of North Texas at Dallas
Fall 2025
SYLLABUS

MATH 4441.001	Real Analysis I		4Hrs
Department of	Mathematics & Information Sciences	**Division of**	Liberal Arts & Sciences
Instructor Name:	Dr. Noureen Khan		
Office Location:	Founders Hall - 223		
Office Phone:	972 338 1567		
Email Address:	noureen.khan@untdallas.edu For course related communications, use Canvas course email.		
Office Hours:	Monday & Wednesday 12:00 pm – 1:00 pm, or by appointments.		
Virtual Office Hours:	Monday & Wednesday 7: 30am – 8: 30am Zoom Meeting ID: 940 173 4070		
Classroom Location:	Founders Hall # 339		
Class Meeting: **Recitation:**	Monday & Wednesday 10: 00 am – 11: 20 am Monday & Wednesday 11: 30 am – 11: 50 am		
Course Catalog Description:	Introduction to mathematical proofs through real analysis. Topics include sets, relations, types of proofs, continuity and topology of the real line.		
Prerequisites:	MATH 3320 with grade C or better.		
Required Text:	Analysis with an Introduction to Proof, 5/E Steven R. Lay ISBN-10: 032174747X. Selective book chapters are available on canvas.		
Reference Books:	Book of Proof by Richard Hammack Available online: http://www.people.vcu.edu/~rhammack/BookOfProof/		

Access to Learning Resources:	UNT Dallas Library:
	      phone: (972) 780-3625;
	      web: http://www.unt.edu/unt-dallas/library.htm
	
	 UNT Dallas Bookstore:
	      phone: (972) 780-3652;
	      e-mail: 1012mgr@fheg.follett.com		

Course Goals: This course is designed to develop students' understanding of:	
1.	Logical concepts used in mathematical proofs.
2.	Various proof techniques, including direct, contrapositive, and contradiction methods.
3.	Fundamentals of set theory: set operations, equivalent and denumerable sets, combinatorial and uncountable sets, and cardinalities.
4.	Topology of the real line, including completeness, convergence, sequences, subsequences, limit theorems, and Monotone and Cauchy sequences.
5.	Functions and their limits, continuous functions, and uniform continuity.

Learning Objectives / Outcomes – Mathematical Reasoning (MR):	
MR 1.	Read, interpret, formulate, explain, and apply mathematical statements.
MR 2.	Develop conjectures by moving from specific examples to general principles.
MR 3.	Determine appropriate methods to prove or disprove conjectures.
MR 4.	State and apply the Principle of Mathematical Induction in proofs.
MR 5.	Use a range of proof strategies such as proof by contradiction, direct application of axioms, and previously proven theorems to establish propositions.

General Skills (GS):	
GS 1.	Solve mathematical problems independently and collaboratively.
GS 2.	Formulate strategies for solving novel analytical problems, both theoretical and applied.
GS 3.	Communicate mathematical ideas effectively, both orally and in writing, at technical and intuitive levels.

Course Outline:

This course provides a deep exploration of the theoretical foundations of Real Analysis, examining the principles that underpin Calculus and its applications in mathematics. Students will learn to apply these principles to solve problems, construct rigorous arguments, and write precise mathematical proofs.

We will use a variety of proof techniques to analyze and demonstrate complex mathematical statements, with an emphasis on developing a strong understanding of abstract concepts and the structure of formal reasoning.

To support mastery of the material, the course includes **mandatory recitation sessions** that provide additional guidance and practice. Regular attendance at office hours or scheduled appointments is strongly encouraged. Success in this course will require consistent engagement, timely completion of assignments, and ongoing practice with the skills learned in class.

Course Evaluation Methods – The following instruments will be used to evaluate student performance and measure proficiency in the course learning outcomes:

Instrument	Description	Percentages (%)
Class Participation	Class attendance & participation	20
Homework Assignments	Weekly assignments	20
Projects / Written Reports	Research Paper	10
Midterm Exams	Two (best) midterm exams	30
Final Exam	Comprehensive final exam	20
Total		**100**

Class Policies

Participation – Regular attendance and active participation in class discussions are essential for success. Weekly quizzes will be given based on the previous week's material.

Homework – Weekly assignments will be based on class content. Only selected problems will count toward your grade. Work must be neat and clear. Homework is due on Canvas by Monday at midnight**.**

Project – The course project requires in-depth research, analysis, and application of mathematical concepts. Students will present their research in class.

Midterm Exams – Three one-hour midterms will be given, with the average score forming your midterm grade. Attendance at study sessions before each exam is expected.

Comprehensive Exam – The final exam will assess your overall ability to apply mathematical reasoning and critical thinking skills.

Make-Up Policy – Midterms may only be retaken if failed, and only after demonstrating progress. Per UNT Dallas policy, students with documented family or medical emergencies may request to reschedule. Please follow the tentative class schedule to stay on track.

Grade Determination:

Grade	Percentage (%)	Grade	Percentage (%)
A	90 or better	C	70 – 79
B	80 – 89	D	60 – 69
		F	less than 60

Recitation Class

Recitation sessions are designed to deepen your understanding of lecture topics through additional explanations, applications, and problem-solving practice. At times, we will explore how these concepts can be applied in different contexts or examine them from new perspectives.

The primary goals of the recitation class are to strengthen your:

- Problem-solving and critical-thinking skills
- Mathematical self-efficacy and competency
- Engagement in student-centered, collaborative learning

These sessions provide an interactive space where you can exchange ideas with peers, clarify concepts, and engage in active learning. They also give me the opportunity to better understand your study habits, needs, and progress.

To succeed in quizzes and assignments, you should come prepared—having completed readings and assignments in advance. **Attendance in all recitation classes is required for the entire semester.**

Course Calendar

The schedule is subject to change at the instructor's discretion. Any updates will be announced in class and/or posted on Canvas.

Class Lecture	Class Lecture	Assignments
Monday	Wednesday	
Aug 25 Chapter 1 Logic and Proof	Aug 27 Logic	
Sep 01 **No Class**	Sep 03 Logic	
Sep 08 Techniques of Proof	Sep 10 Techniques of Proof	Homework 1
Sep 15 Chapter 2 – Sets and Functions	Sep 17 Relations & Equivalence Relations	
Sep 22 Fundamentals of Set Theory	Sep 24 Cartesian Products	Homework 2
Sep 29 Functions	Oct 01 Bijective Functions	**Midterm Exam – 1**
Oct 06 Inverse & Composite Functions	Oct 08 Cardinality	
Oct 13 Chapter 3 – The Real Numbers	Oct 15 Natural Numbers and Induction	
Oct 20 Ordered Field	Oct 22 Completeness axiom	Homework 3
Oct 27 Topology of Real Numbers	Oct 29 Topology of Real Numbers	**Midterm Exam – 2**
Nov 03 Completeness axiom	Nov 05 Compactness & Convergence	
Nov 10 Chapter 4 – Sequences	Nov 12 Monotone Sequence	Homework 4
Nov 17 Cauchy Sequences	Nov 19 Subsequences	**Project Reports**
Nov 24 Chapter 5 – Limits and Continuity	Nov 26 Limit of a Function	**Midterm Exam – 3**
Dec 01 Continuous Function	Dec 03 Continuous Function	Homework 5
Dec 08 **Final Exam**	Dec 10	**Project Presentation**

University Policies and Procedures:

Students with Disabilities (ADA Compliance): The University of North Texas at Dallas makes reasonable academic accommodation for students with disabilities. Students seeking accommodations must first register with the Disability Services Office (DSO) to verify their eligibility. If a disability is verified, the DSO will provide you with an accommodation letter to be delivered to faculty to begin a private discussion regarding your specific needs in a course. You may request accommodations at any time; however, DSO notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet/communicate with each faculty member prior to implementation in each class. Students are strongly encouraged to deliver letters of accommodation during faculty office hours or by appointment. Faculty members have the authority to ask students to discuss such letters during their designated office hours to protect the privacy of the student. For additional information see the Disability Services Office website at http://www.untdallas.edu/disability. You may also contact them by phone at 972-338- 1777; by email at UNTDdisability@untdallas.edu or at Founders Hall, room 204. (UNTD Policy 7.004)

NOTE: *Additional instructional technology tools, such as Turnitin, Respondus, Panopto, and publisher cartridge content (i.e. MyLab, Pearson, etc.) may NOT be fully ADA compliant. Please contact our Disability Office should you require additional assistance utilizing any of these tools.*

Student Evaluation of Teaching Effectiveness Policy: Student's evaluations of teaching effectiveness is a requirement for all organized classes at UNT Dallas. This short survey will be made available to you at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in the feedback I get from students, as I work to continually improve my teaching. I consider students' evaluations to be an important part of your participation in this class.

Academic Integrity: Academic integrity is a hallmark of higher education. You are expected to abide by the University's code of Academic Integrity policy. Any person suspected of academic dishonesty (i.e., cheating or plagiarism) will be handled in accordance with the University's policies and procedures. Refer to the Student Code of Academic Integrity at *http://www.untdallas.edu/sites/default/files/page_level2/pdf/policy/* for complete provisions of this code. Academic dishonesty includes, but is not limited to, cheating, plagiarizing, fabrication of information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students.

Web-based Plagiarism Detection: Please be aware in some online or hybrid courses, students may be required to submit written assignments to Turnitin, a web-based plagiarism detection service, or another method. If submitting to Turnitin, please remove your title page and other personal information.

Classroom Policies
Online Attendance and Participation:
The University attendance policy is in effect for this course. Class attendance in the Blackboard classroom and participation is expected because the class is designed as a shared learning experience, and because essential information not in the textbook will be discussed in the discussion board. Online presence and participation in all class discussions is essential to the integration of course material and your ability to demonstrate proficiency.
Attendance for this online or hybrid course is considered when you are logged in and active in Blackboard,

i.e., posting assignments, taking quizzes, or completing Discussion Boards. To maintain financial aid award eligibility, activity must occur before the census date of the session or term of the course. Refer to http://www.untdallas.edu/registrar for specific dates. If you are absent/not active in the course shell, it is YOUR responsibility to let the instructor know immediately, upon your return, the reason for your absence if it is to be excused. All instructors must follow university policy 7.005 covering excused absences; however, it is the instructor's discretion, as outlined in the course syllabus, of how unexcused absences may or may not count against successful completion of the course.

Inclement Weather and Online Classes: Online classes may or may not be affected by campus closures due to inclement weather. Unless otherwise notified by your instructor via e-mail, online messaging, or online announcement, students should assume that assignments are due as scheduled.

Online "Netiquette: In any social interaction, certain rules of etiquette are expected and contribute to more enjoyable and productive communication. Emails, Discussion Board messages and/or any other forms of written communication in the online environment should use proper "netiquette" (i.e., no writing in all caps (usually denotes yelling), no curse words, and no "flaming" messages (angry, personal attacks).
Racial, ethnic, or gender slurs will not be tolerated, nor will pornography of any kind.
Any violation of online netiquette may result in a loss of points or removal from the course and referral to the Dean of Students, including warnings and other sanctions in accordance with the University's policies and procedures.   Refer to the Student Code of Student Rights Responsibilities and Conduct at http://www.untdallas.edu/osa/policies. Respect is a given principle in all online communication. Therefore, please be sure to proofread all of your written communication prior to submission.

Diversity/Tolerance Policy: Students are encouraged to contribute their perspectives and insights to class discussions in the online environment. However, offensive & inappropriate language (swearing) and remarks offensive to others of particular nationalities, ethnic groups, sexual preferences, religious groups, genders, or other ascribed statuses will not be tolerated. Disruptions which violate the Code of Student Conduct will be referred to the Dean of Students as the instructor deems appropriate.

Technology Requirements: In order to successfully access the materials in an online or hybrid course, UNT Dallas advises that your computer be equipped with the minimum system requirements. Blackboard Learn 9.1 is the platform software for this course. Blackboard Learn supports major web browsers such as Windows Internet Explorer, Apple Safari, Mozilla Firefox, and Google Chrome. However, since the latter two are updated continually, some recent versions may not be compatible. If you experience difficulty accessing or using components of the course, try using Internet Explorer. Also, no matter what browser you use, always enable pop-ups. For more information see:

- http://www.untdallas.edu/dlit/ecampus/requirements
- https://help.blackboard.com/en-us/Learn/9.1_SP_12_and_SP_13/Student/040_Browser_Support_for_SP_13
- https://learn.unt.edu/bbcswebdav/institution/BrowserCheck/check_full.html