Course: CAAM 501
Term: Fall 2017
Room: DCH 1046
Class: TR, 10:50-12:10

Instructor Contact Information

Instructor: Paul E. Hand
Office: Duncan 3086
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Office Hours: Mondays 4-5:30 PM and by appointment
Website: www.caam.rice.edu/~caam501

Course Objectives and Learning Outcomes

The objectives of this course are: (1) to provide you with a firm understanding of the basic ideas of mathematical analysis; (2) to improve your proof writing skills; (3) to improve problem solving skills needed for the CAAM analysis qualifier exam; and (4) to improve your mathematical communication skills. The specific analysis topics covered include Real numbers, completeness, sequences and convergence, compactness, continuity, the derivative, the Riemann integral, the Fundamental Theorem of Calculus, vector spaces, dimension, linear maps, inner products and norms, derivatives in R^d, Inverse Function Theorem, Implicit Function Theorem, Multiple Integration, Change of Variable Theorem.

Required Texts and Materials

"Undergraduate Analysis" By Serge Lang

Outside Resources

You are not allowed to use the Problems and Solutions book accompanying Lang's Undergraduate Analysis text for any of the homeworks.

Homeworks

You will have about three homework problems a week. They will be due on Tuesdays. Your proofs should be your absolute best quality work. They will each be graded out of one point, taking into account the correctness and the exposition. After you receive your graded solution, you may resubmit it once (at the next homework due date). The grade of the second submission will be final. Two homework assignments will be pledged and will serve as simulated qualifier exams.

Class Time

Class will primarily consist of a discussion and Q&A on the topics assigned that week. It will also include some problem solving and presentation of solutions to homework problems. You are expected to read and think deeply about the day's topics before the beginning of class. During the discussion, I will choose students randomly to present and answer questions on that day's topics.

Grade Policies

Your grade will consist of three parts: homework and pledged homework and class participation. Your grade will be given by 45% homework, 45% pledged homework, and 10% class participation

Absence Policies

You are expected to attend class (almost) every day. If you miss more than 4 classes, your class participation score will be 0.

RICE HONOR CODE

In this course, all students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at http://honor.rice.edu/honor-system-handbook/. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.

DISABILITY SUPPORT SERVICES

If you have a documented disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Support Services (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

COURSE TOPICS

The course will cover the following topics that correspond to the provided sections in Lang's book

- Real Numbers (I.1 – I.4)
- Convergence of sequences of real numbers (II.1)
- Limits and continuity of functions (II.2)
- Derivatives (III.1-III.3)
- Riemann integrals (V.1-V.2)
- Series (IX.1 – IX.3)
- Normed vector spaces (VI.1-VI.3)
- Dimensionality of vector spaces (Not in Lang)
- Completeness of normed vector spaces (VI.4)
- Open and closed sets in normed vector spaces (VI.5)
- Limits in normed vector spaces (VII.1-VII.3)
- Completion of normed vector spaces (VII.4)
- Compact subsets of normed vector spaces (VIII.1-VIII.2, VIII.4)
- Integrals (X.1-X.7)
- Derivatives in Vector spaces (XVII.1-XVII.3, X.VII.7-XVII.8)
- Inverse and Implicit Function Theorems (XVIII.1-XVIII.4)
- Multiple Integration and Change of Variables (XX.1-XX.4)