Math 499, Game Theory, Spring 2025

Exterior Course Website: http://www.stevenheilman.org/~heilman/425as25.html
Recommended Prerequisite: MATH 290 or MATH 430 or MATH 432
Course Content: The real number system, metric spaces, limits, continuity, derivatives and integrals, infinite series.

Lecture Meeting Time/Location: Mondays, Wednesdays, and Fridays, 1PM-150PM, KAP 147
Instructor: Steven Heilman, stevenmheilman@gmail.com
Office Hours: Mondays, 10AM-12PM, KAP 406G
TA: TBD
TA Office Hours: Held in the the Math Center)
Discussion Session Meeting Time/Location: Tuesdays, 10AM-1150AM, KAP 147
Textbook: There is no required textbook. The recommended textbook is: Tao, Game Theory, Alive. (The book is freely available online.)
Other non-required textbooks: Strichartz, the Way of Analysis.

Exam 1: Friday, February 21, 1PM-150PM, KAP 147
Exam 2: Wednesday, March 26, 1PM-150PM, KAP 147
Final Exam: TBD [determined by USC schedule]

Other Resources: An introduction to mathematical arguments, Michael Hutchings,
An Introduction to Proofs
How to Write Mathematical Arguments

Email Policy:

- My email address for this course is stevenmheilman@gmail.com.

- It is your responsibility to make sure you are receiving emails from stevenmheilman@gmail.com, and they are not being sent to your spam folder.

- Do NOT email me with questions that can be answered from this document.

Exam Procedures: Students must bring their USCID cards to the midterms and to the final exam. Phones must be turned off. Cheating on an exam results in a score of zero on that exam. Exams can be regraded at most 15 days after the date of the exam. This policy extends to homeworks as well. All students are expected to be familiar with the USC Student Conduct Code. (See also here.)

Student Conduct: Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the Office of Equity and Diversity http://equity.usc.edu/or to the Department of Public Safety http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us. This is important for the safety whole USC community. Another member of the university community - such as a friend, classmate, advisor, or faculty member - can help initiate the report, or can initiate the report on behalf of another person. The Center for Women and Men http://www.usc.edu/student-affairs/cwm/ provides 24/7 confidential support, and the sexual assault resource center webpage sarc@usc.edu describes reporting options and other resources.

Accessibility Services: If you are registered with accessibility services, I would be happy to discuss this at the beginning of the course. Any student requesting accommodations based on a disability is required to register with Accessibility Services and Programs (OSAS) each semester. A letter of verification for approved accommodations can be obtained from OSAS. Please be sure the letter is delivered to me as early in the semester as possible. OSAS is located in 301 STU and is open 8:30am-5:00pm, Monday through Friday.
https://osas.usc.edu
213-740-0776 (phone)
213-740-6948 (TDD only)
213-740-8216 (fax)
OSASFrontDesk@usc.edu

Exam Resources: Here and here are pages with past exams for a related course. Here are some exams from when I taught related courses: Exam 1, Exam 1 Solution, Exam 2, Exam 2 Solution, Final, Final Solution, Exam 1, Exam 1 Solution, Exam 2, Exam 2 Solution, Final, Final Solution. Occasionally these exams will cover slightly different material than this class, or the material will be in a slightly different order.

Homework Policy:

- Homeworks are due roughly every week, at **10AM Tuesdays**.

- Homeworks are submitted in brightspace, under the "Assignments" tab. You are allowed unlimited submission "attempts" for an assignment, but only the last submission will be graded. To avoid internet issues, I recommend making your first submission of an assignment well in advance of the deadline. (Note that phone tethering can also give you an internet connection to a computer.)

- Homeworks should be submitted as single PDF documents. One way to create a PDF document from paper homework assignments is the freely available Adode Scan App.

- Late homework is not accepted.

- If you still want to turn in late homework, then the number of minutes late, divided by ten, will be deducted from the score. (The time estimate is not guaranteed to be accurate.)

- **Do not submit homework via email.**

- The **two lowest** homework scores will be dropped. This policy is meant to account for illnesses, emergencies, dropped internet connections, etc.

- You may not use the internet to try to find answers to homework problems.

- A random subset of the homework problems will be graded each week. However, it is strongly recommended that you try to complete the entire homework assignment.

- All homework assignments must be **written by you**, i.e. you cannot copy someone else's solution verbatim. However, collaboration on homeworks is allowed and encouraged.

- Homework solutions will be posted a few days after the homework is turned in.

Grading Policy:

- The final course grade is weighted as the larger of the following two schemes:

- Scheme 1: class participation (3%), homework (17%), the first midterm (20%), the second midterm (25%), and the final (35%).

- Scheme 2: class participation (3%), homework (17%), the largest midterm grade (30%), and the final (50%).

- The grade for the semester will be curved. However, I do not "curve down" since anyone who exceeds my expectations in the class by showing A-level performance on the exams and homeworks will receive an A for the class.

- If you cannot attend one of the exams, you must notify me within the first two weeks of the start of the quarter. Later requests for rescheduling will most likely be denied.

- Class participation is not the same as attendance. I will never explicitly take attendance, but I will notice if someone is frequently absent. Things that increase your class participation grade include: asking good questions, paying attention in class, showing up on time or early to class, etc. Things that decrease your class participation grade include: excessive talking or disruptions during class, frequent absences, excessive texting/smartphone usage in class, frequent tardiness, etc.

- You must take the final exam to pass the course.

Tentative Schedule: (This schedule may change slightly during the course.)

Week	Monday	Tuesday	Wednesday	Th	Friday
1	Jan 13: Introduction	Jan 14: No homework due	Jan 15: S2, Integers, rationals		Jan 17: S10, Cauchy sequences of rationals
2	Jan 20: No class	Jan 21: Homework 1 due	Jan 22: S3, S4, S5, Real numbers		Jan 24: Sets and functions
3	Jan 27: Cardinality of sets	Jan 28: Homework 2 due	Jan 29: Countable and uncountable sets		Jan 31: S7, S8 Sequences and convergence
4	Feb 3: S9, S10, S12 Limit points, lim sup, lim inf	Feb 4: Homework 3 due	Feb 5: S14, Standard sequences, series, absolute convergence		Feb 7: S15, Convergence tests
5	Feb 10: S15, Root and ratio tests	Feb 11: Homework 4 due	Feb 12: S11, Subsequences, Bolzano-Weierstrass theorem		Feb 14: S20, Limiting values of functions
6	Feb 17: No class	Feb 18: Homework 5 due	Feb 19: S17, Continuity		Feb 21: Midterm #1
7	Feb 24: S18, Maximum principle, intermediate value theorem	Feb 25: No homework due	Feb 26: S19, Uniform continuity		Feb 28: S28, Differentiability
8	Mar 3: S28, Properties of differentiable functions	Mar 4: Homework 6 due	Mar 5: S32, Riemann integral definition		Mar 7: S33, Riemann integral, existence
9	Mar 10: S34, Fundamental theorem of calculus	Mar 11: Homework 7 due	Mar 12: S33, Riemann integral, properties		Mar 14: S29, Mean value theorem
10	Mar 17: No class	Mar 18: No homework due	Mar 19: No class		Mar 21: No class
11	Mar 24: Integration by parts	Mar 25: No homework due	Mar 26: Midterm #2		Mar 28: Integration by parts
12	Mar 31: Change of variables	Apr 1: Homework 8 due	Apr 2: Metric Spaces		Apr 4: Metric Spaces
13	Apr 7: Cauchy sequences	Apr 8: Homework 9 due	Apr 9: Compactness		Apr 11: Continuity
14	Apr 14: Continuity	Apr 15: Homework 10 due	Apr 16: Sequences of Functions		Apr 18: Uniform convergence
15	Apr 21: Uniform convergence	Apr 22: Homework 11 due	Apr 23: Series of Functions		Apr 25: Uniform approximation by polynomials
16	Apr 28: Power Series	Apr 29: Homework 12 due	Apr 30: Exponential and Logarithm		May 2: Review of Course

Advice on succeeding in a math class:

- Review the relevant course material **before** you come to lecture. Consider reviewing course material a week or two before the semester starts.

- When reading mathematics, use a pencil and paper to sketch the calculations that are performed by the author.

- Come to class with questions, so you can get more out of the lecture. Also, finish your homework at least **two days** before it is due, to alleviate deadline stress.

- Write a rough draft and a separate final draft for your homework. This procedure will help you catch mistakes. Also, I would very much recommend typesetting your homework. Learning LaTeX is a very important skill to have for doing mathematics. Here is a template .tex file if you want to get started typesetting.

- If you are having difficulty with the material or a particular homework problem, review Polya's Problem Solving Strategies, and come to office hours.