MACS 33000 - Computational Mathematics and Statistics Camp (September Term 2024)

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- Meeting day: August 26-September 13, MTWThF
- Time: 9:00am-1:00pm
- Location: 107 Kent Hall

TA TEAM!

- Alejandro Sarria: asarria@uchicago.edu
- Huanrui Chen: hchen0628@uchicago.edu
- Nalin Bhatt: nalinb@uchicago.edu
- Charlotte Zhou: jialez@uchicago.edu

Course description

This course surveys mathematical and statistical tools that are foundational to computational social science. Topics to be reviewed include mathematical notation and linear equations, calculus, linear algebra, probability theory, and statistical inference. Students are assumed to have encountered most of these topics previously, so that the camp serves as a refresher rather than teaching entirely new topics. Class sessions will emphasize problem solving and in-class exercises applying these techniques. Students who successfully complete the camp are situated to pass the MACSS math and statistics placement exam and enroll in computationally-enhanced course offerings at the University of Chicago without prior introductory coursework.

Who should take this course

- Students in the Masters in Computational Social Science
- MA and PhD students in the social sciences who have significant prior training and experience in mathematics and statistics and seek to complete the Certificate in Computational Social Science
- Students looking for a slower-paced camp focused specifically on algebra, calculus, and probability should enroll in SOSC 30100 - Mathematics for Social Sciences. This two-

week course makes no assumption of prior math/stats training. Those of you who struggle with the material of this course may switch after the first week to SOSC 30100.

Attendance

Attendance is expected but not required. Students are responsible for the content covered in class.

COURSE: CANVAS

Join our canvas classroom by clicking this link This code should enable anyone to join. For assignments, please be sure to upload a CLEAR AND READABLE DOCUMENT that is labeled with the assignment name and your name.

Grades

This course may only be taken for pass/fail (non-credit), not for a letter grade or audit. Assignments are comprised of daily problem sets. You are encouraged to work in groups, and the instructional staff is available for consultation during class hours. We expect most students should be able to finish the problem sets during class hours. Grades will be based upon performance on the problem sets.

Final Placement Exam

The final exam is in-person, on paper only. You may bring one double sided sheet of notes and a non-graphing calculator. The study sheets will be collected at the end of the exam. One example kind of calculator would be this calculator. Loaner calculators are available by request if requested by 9/7/23.

Exam study guide

Submit your practice questions here. We will use this to generate the final exam and we will circulate the questions here to all students. Note that not all questions here will be on the exam -- it depends upon the quality and variety of submissions.

Disability services

The University of Chicago is committed to diversity and rigorous inquiry from multiple perspectives. The MAPSS, CIR, and Computation programs share this commitment and seek to foster productive learning environments based upon inclusion, open communication, and mutual respect for a diverse range of identities, experiences, and positions.

This course is open to all students who meet the academic requirements for participation. Any student who has a documented need for accommodation should contact Student Disability Services (773-702-6000 or disabilities@uchicago.edu) as soon as possible.

Core texts

Course texts are subject to change for 2024

- Bertsekas, D. P., & Tsitsiklis, J. N. (2008). *Introduction to probability*, 2nd edition. Belmont, MA: Athena Scientific.
- Pemberton, M., & Rau, N. (2015). *Mathematics for economists: an introductory textbook*, 4th edition. Oxford University Press.

Course schedule: NOTE contents will change! Check back regularly.

Date	Topic	Subtopic/Slides	Assignment
26-Aug	Linear equations	[Linear equations, inequalities, and sets and functions](#)	[Pset 1](#) & [answer key](#)
27-Aug	Linear equations	[Quadratics, logarithms, sequences, and limits](#) and [Differentiation](#)	[Pset 2](#) & [answer key](#)
28-Aug	Calculus	[Critical points and approximation + Intro Linear Algebra](#)	[Pset 3](#) & [answer key](#)
29-Aug	Matrix algebra	[Matrix algebra](#)	[NO HOMEWORK!]
30-Aug	Linear algebra	[Systems of linear equations and determinants](#)	[Pset 4](#) & [answer key](#)
2-Sep	No class (Labor Day)		
3-Sep	Calculus	[Functions of several variables and optimization with several variables](#)	[NO HMWK]
4-Sep	Calculus	[Integration and integral calculus](#)	[Pset 5/6](#) & [answer key](#)
5-Sep	Calculus	[Sample space and probability](#)	[Pset 7](#) & [answer key](#)
6-Sep	Probability	[Discrete random variables](#)	[Pset 8](#) + [Survey](#) & [answer key](#)
9-Sep	Probability	[General random variables](#)	[Pset 9](#) & [answer key](#)
10-Sep	Probability	[Multivariate distributions](#)	[Pset 10](#) & [answer key](#)

Date	Topic	Subtopic/Slides	Assignment
11-Sep	Statistical inference	[Classical statistical inference](#)	[Pset 11/12](#) & [answer key](#)
12-Sep	Statistical inference	[Applied Classical Stats and intro to Bayesian statistical inference](#)	[Review questions (student submissions)](#)
13-Sep	Placement exam		Placement exam