ECN594: Math Bootcamp

Syllabus and Schedule

August 2022

1 Course information

1.1 Logistics

Instructor: Kun Zhang
Email: kunzhang@asu.edu
Classes: See schedule below
Classroom: CRTVC 416
Office hour: Every class day 5:15–6:00pm, or by appointment, at CRTVC 425G
Recommended references (all optional):

- Halmos, Paul R. (1960). *Naive Set Theory.* Martino Fine Books, Eastford, CT.
- Osborne, Martin J. (2016). "Mathematical Methods for Economic Theory", online tutorial.
- Sundaram, Rangarajan K. (1996). *A First Course in Optimization Theory.* Cambridge University Press. Cambridge, UK.

Course website: Use your My ASU account to access the course website on Canvas.

1.2 Course description

ECN594: Mathematical Economics is the math bootcamp for incoming graduate students in W.P. Carey School of Business. I will divide this course to three (interconnected) modules: a quick introduction to logic and set theory, a brief overview of some facts from real analysis, and an introduction to basic techniques in optimization. I also plan to briefly review Riemann integration theory if time permits.

1.3 Outline

Module I: Logic and set theory (Roughly 2.5 regular sessions and 1.5 practice sessions)

- Sets
- Logical operators and quantifiers

- Proofs
- Set operations
- Relations, functions and correspondences

Module II: Real analysis (Roughly 3.5 regular sessions and 2 practice sessions)

- Euclidean spaces
- Sequences
- Basic topology
- Continuity
- Differentiability
- Convexity and concavity

Module III: Optimization (Roughly 4 regular sessions and 2.5 practice sessions)

- Existence and uniqueness of solution
- Interior optima
- Implicit function theorem
- Optimization problems with equality constraints
- Optimization problems with inequality constraints

Additional topic (1 regular session *if time permits*)

- Riemann integration

Please note: Lecture notes will be distributed at the beginning of each module.

2 Course policies

2.1 Exams

We will have two exams. One is called the diagnostic quiz: as the name suggests, it is purely for diagnostic purpose, so I would be able to adjust the pace and some contents based on the results. The quiz will be on August 8, our first class day, at 8:30am. The result of the diagnostic quiz does

not affect your final grade, but you are required to revise it, which is due at 11:59PM Arizona time on August 22 and constitutes of 40% of your final grade. If you do not submit your diagnostic quiz, you will automatically lose this 40%.

Another exam is the final exam, which will be distributed on Aug 17th in class. 60% of your final grade comes from the final exam.

2.2 Assignments

I will assign some practice questions. You do not need to submit your solution, but I will discuss many of them in the practice sessions. In my opinion, there is only one way to learn mathematics, which is learning by doing—that is, merely reading the definitions and theorems or staring at other people's proofs or solutions would not help you much. So I suggest everyone to try their best to do these exercises.

2.3 Grading

Course grade of a "pass" (P) will be determined by your performance on rewriting the diagnostic quiz (40%) and the final exam (60%).

3 Tentative schedule

Please note that the schedule is subject to change, and I may cancel classes if necessary. Any change will be notified at least 24 hours in advance.

Monday, August 8

8:30am–11:00am: Diagnostic quiz

11:00am–11:45pm: Econ students: Meet with DGS Eddie Schlee via Zoom; students from other departments can leave

1:00pm–2:30pm: Mathematical logic

3:00pm–5:00pm: Basic set theory I & practice session

Tuesday, August 9

9:00am–10:45am: Basic set theory II

1:00pm–2:30pm: Real analysis I

3:00pm–5:00pm: Practice session

Wednesday, August 10

9:45am–11:30am: Real analysis II

1:00pm–2:30pm: Real analysis III

3:00pm–5:00pm: Practice session

Thursday, August 11

9:45am–11:30am: Real analysis IV & practice session

1:00pm–2:30pm: Optimization overview

3:00pm–5:00pm: Practice session

Friday, August 12

9:00am–12:00pm: International Graduate Student Orientation

12:00pm-1:30pm: Graduate TA/RA Orientation

2:30pm-4:30pm: Open hours: I will be in the usual classroom and those who do not attend the orientation can come to discuss and ask questions

Monday, August 15

9:45am–11:30am: Unconstrained optimization

1:00pm–3:00pm: Practice session

Tuesday, August 16

9:45am–11:30am: Constrained optimization II

1:00pm–2:30pm: Constrained optimization III & practice session

3:00pm–5:00pm: Practice session

Wednesday, August 17

9:15am–11:45am: Final Exam

Monday, August 22

Diagnostic quiz revision due