ECON2125/6012

Fedor Iskhakov

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CONTENTS

Preliminary schedule

Week	Date	Topic	Notes
1	July 27	*Introduction*	Recorded lecture
2	Aug 3	*Optimization intro, examples*	Tutorials start
3	Aug 10	*Elements of set theory and analysis*	
4	Aug 17	*Elements of linear algebra*	
Test		15%	Submit by Aug 23
5	Aug 24	*Elements of Probability*	
6	Aug 31	*Fundamentals of optimization*	
Test		15%	Submit by Sept 3
Break			2 weeks
7	Sept 21	*Unconstrained optimization*	
8	Sept 28	*Constrained optimization*	
Test		15%	Submit by Oct 4
9	Oct 5	*Practical session/invited speaker*	TBA
10	Oct 12	*Envelope and maximum theorems*	
11	Oct 19	*Dynamic optimization*	
12	Oct 26	*Revision*	
Exam		55%	During exam period

Links to external resources

Course Wattle page Schedule, announcements, teaching team contacts, recordings, assignement, grades

Course overview Class summary General course description in ANU Programs and Courses

WELCOME

Course title: **"Optimization for Economics and Financial Economics"**

- Elective second year course in the *Batchelor of Economics* program ECON2125

- Compulsory second math course in the *Master of Economics* program ECON6012

The two courses are identical in content and assessment, but final grades may be adjusted depending on your program.

TWO

PLAN FOR THIS LECTURE

1. Organization

2. Administrative topics

3. Course content

4. Motivation

5. Self-learning materials

INSTRUCTOR

Fedor Iskhakov Professor of Economics at RSE

- Office: 1021 HW Arndt Building
- Email: fedor.iskhakov@anu.edu.au
- Web: fedor.iskh.me
- Contact hours: Thursday 9:30-11:30

TIMETABLE

Face-to-face:

- Lectures: Thursday 15:30 — 17:30
- Location: **DNF Dunbar Lecture Theatre, Physics Bldg 39A**

Online:

- Echo-360 recordings on Wattle
- All notes and materials on **optim.iskh.me**

Face-to-face is strictly preferred

FIVE

COURSE WEB PAGES

- Wattle Schedule, announcements, teaching team contacts, recordings, assignement, grades

- Online notes Lecture notes, slides, assignment tasks

- Lecture slides should appear online the previous day before the lecture

- Details on assessment including the exam instructions will appear on Wattle

SIX

TUTORIALS

- Enrollments open on *Wattle*

Tutorial questions

- posted on the course website

- not assessed, help you learn and prepare

Tutorials start on week 2

TUTORS

Wending Liu

- Email: Wending.Liu@anu.edu.au
- Room: 1018 HW Arndt Building
- Office hours: *TBA*

Chien Yeh

- Email: Wending.Liu@anu.edu.au
- Room: Room 2106, Copland Bld (24)
- Office hours: *TBA*

PREREQUISITES

See Course overview and Class summary

What you actually need to know:

- basic algebra

- basic calculus

- some idea of what a matrix is, etc.

$\approx$ content of EMET1001/EMET7001 math course

FOCUS?

Q: Is this optimization or a general math-econ course?

A: A general course on mathematical modeling for economics and financial economics. Optimization will be an important and recurring theme.

ASSESSMENT

- 3 timed open book tests (15% each)

- Final exam (55%)

The three tests spread out through the semester will check the knowledge of the immediately preceding material. The final closed book in-person exam will cover the entire course.

QUESTIONS

1. Administrative questions: RSE admin

- **Bronwyn Cammack** Senior School Administrator

- Email: enquiries.rse@anu.edu.au

- "I can not register for the tutorial group"

2. Content related questions: please, refer to the tutors

- "I don't understand why this function is conves"

3. Other questions: to Fedor

- "I'm working hard but still can not keep up"

- "Can I please have extra assignment for more practice"

TWELVE

ATTENDANCE

- Please, **do not** use email for *instructional* questions\Instead make use of the office hours

- Attendance of tutorials is *very highly* recommended
  You will make your life much easier this way

- Attendance of lectures is *highly* recommended
  But not mandatory

THIRTEEN

COMMENTS FOR LECTURES NOTES/SLIDES

- Cover exactly what you are required to know
- Code inserts are the exception, they are not assessable

In particular, you need to know:

- The definitions from the notes
- The facts from the notes
- How to apply facts and definitions

If a concept in not in the lecture notes, it is not assessable

FOURTEEN

DEFINITIONS AND FACTS

The lectures notes/slides are full of definitions and facts.

Definition

Functions $f : \mathbb{R} \to \mathbb{R}$ is called *continuous at x* if, for any sequence $\{x_n\}$ converging at x, we have $f(x_n) \to f(x)$.

Possible exam question: "Show that if functions f and g are continuous at x, so is $f + g$."

You should start the answer with the definition of continuity:

"Let {x_n} be any sequence converging to x. We need to show that $f(x_n) + g(x_n) \to f(x) + g(x)$. To see this, note that …"

FIFTEEN

FACTS

In the lecture notes/slides you will often see

Fact

The only N-dimensional subset of $\mathbb{R}^N$ is $\mathbb{R}^N$.

This means either:

- theorem
- proposition
- lemma
- true statement

All well known results. You need to remember them, have some intuition for, and be able to apply.

SIXTEEN

NOTE ON ASSESSMENTS

Assessable = definitions and facts + last year level math + a few simple steps of logic

Exams and tests will award:

- Hard work

- Deeper understanding of the concepts

In each question there will be a *easy* path to the solution

SEVENTEEN

READING MATERIALS

Primary reference: lecture slides

Books:

- "Mathematics for Economists" (1994) by Simon, C. and L. Blume
- "A First Course in Optimization" (1996) Theory by Rangarajan Sundaram
- "A Primer in Econometric Theory" (2016) by John Stachurski

Readings are supplementary but will provide a more detailed explanation with additional examples.

- Each lecture will reference book chapters

KEY POINTS FOR THE ADMINISTRATIVE PART

- Tutorials start next week, **please register before the next lecture**

- Course content = what's in lecture notes/slides

- Lecture slides are available online and will be updated throughout the semester

- Optimization is a recurring theme but not the only topic

NINETEEN

OPTIMIZATION INTRO, EXAMPLES

COMING SOON

TWENTY

ELEMENTS OF SET THEORY AND ANALYSIS

COMING SOON

TWENTYONE

ELEMENTS OF LINEAR ALGEBRA

COMING SOON

TWENTYTWO

ELEMENTS OF PROBABILITY

COMING SOON

TWENTYTHREE

FUNDAMENTALS OF OPTIMIZATION

COMING SOON

TWENTYFOUR

UNCONSTRAINED OPTIMIZATION

COMING SOON

TWENTYFIVE

CONSTRAINED OPTIMIZATION

COMING SOON

TWENTYSIX

PRACTICAL SESSION

COMING SOON

TWENTYSEVEN

ENVELOPE AND MAXIMUM THEOREMS

COMING SOON

TWENTYEIGHT

DYNAMIC OPTIMIZATION

COMING SOON

Chapter 28. Dynamic optimization

TWENTYNINE

REVISION

COMING SOON