ECON8007
Mathematical Techniques for Advanced Economic Analysis
Course Outline [PRELIMINARY] (2014)

Administration
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Consultation: Immediately after lectures or by appointment
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Course Description
This is an overview of the basic mathematical techniques for understanding and successfully completing graduate course-work in economics at the Australian National University. The course is targeted towards incoming doctoral students with minimal college-level mathematics.
This course will explain and review the mathematical techniques most relevant for economic analysis and economic understanding. It will build up to optimization, the cornerstone of modern economics, in a coherent manner, with the ultimate objective being the ability to use appropriate techniques to solve optimization problems.

Dates of the Course
The course will run from Monday 12th January to Friday 6th February.

Lectures
Lectures will be held from 09:30 to 13:00, Mondays, Tuesdays, Wednesdays and Thursdays, with a short break around 10:45 (it is suggested to bring a snack as the course is mentally demanding, so it will require full attention).
Assessment
There will be three basic assessment tasks throughout the course; homework exercises accounting for 50% of the grade, a personal project for 20%, and a final exam accounting for the final 30%. You can also gain extra credit of 10% by submitting “weekly typed notes”.

Homework Assignments (50%)
Homework will be given each day on the day’s material. Homework is designed to cement understanding. This means that if submitted homework does not demonstrate understanding, you will be asked to resubmit those questions which did not demonstrate understanding. There will also be group projects each week, with presentations on Mondays.

Final Exam (30%)
The final exam will be held on Friday 6th February at 09:30 of four hours in duration. (Note: it will be written as a two hour exam (this is so there is no time pressure).

Personal Project (20%)
As part of this course you will be asked to complete a personal project. This will be discussed in greater detail during class.

Weekly Typed Notes (10%) - Bonus
On Monday of each week (except the first), handing in a comprehensive, typed set of notes of the topics discussed during the previous week, explained in their own words will allow you to gain bonus marks (these must be typed in a LaTeX distribution, LyX is easiest, I’ve found TeXnic Centre to be very nice.

Textbooks and Other References
I will be drawing from a range of sources including the introductory text A First Course in Optimisation Theory, by Asano; the preliminary unpublished notes by J. Kielbasa; Linear Algebra by Lay; and Calculus by Adams. The relevant sections of these texts will be made available to students during the course on the website.

Tentative Topics
The rough chronology of topics will be:

- Sets and Logic
- Functions and Proof Methods
- Naïve Differentiation and Simple Sequences
- Matrix Algebra
- Orthogonality and Econometric Foundations
- Vector Spaces
- Differential Calculus
- Unconstrained Optimisation in $n$ dimensions
- Constrained Optimisation in $n$ dimensions
- Further Topics

**Rules, Policies, etc.**
Full details of CBE rules, policies and procedures can be found at: http://cbe.anu.edu.au/Current_Students/general_info/
All students are expected to be familiar with the College rules and procedures.