Aims

The aim of this course is to give students a mathematical and statistical background necessary for studying Economics at postgraduate level. The course will cover basic analytical methods used in Economics and Finance with a particular emphasis on optimisation, but will also introduce basic matrix analysis and statistics.

Learning Outcomes

Upon completion of the course students should be:
1. confident in differentiation and integration of standard functions;
2. confident with basic manipulations of vectors and matrices;
3. able to understand and solve various optimisation problems, both unconstrained and constrained with equality or inequality constraints;
4. confident with the probability and distribution theory
5. confident with estimation and inference and be able to use the main theorems of the large sample distribution theory.

Course Delivery

The course will be delivered through a two-hour lecture and a one-hour seminar each week. Specific learning outcomes and prescribed reading are provided for each week of the course. Seminars will be based upon assigned problems distributed in the lecture. I will be available for consultation during advertised office hours or by appointment.

Assessment

- 2 on-line tests (1 hour each), which contributes 10% of the final grade (6th and 11th week, 5% each test).
- 2-hour unseen final exam, which contributes 90% of the final grade.
- These exams will test your knowledge and understanding of the material covered in the course; your ability to apply models to 'real' economic situations; your ability to critically appraise models and their application.

Reading

- Alpha C. Chiang & Kevin Wainwright: "Fundamental Methods of Mathematical Economics", McGraw-Hill
• The "Mathematical methods for economic theory: a tutorial" by Martin J. Osborne is very useful and it is strongly recommended to use it. You find it at the following URL: http://www.economics.utoronto.ca/osborne/MathTutorial/index.html
• Additional readings will be assigned from time to time. They are an integral part of the class and you are expected to read them.

TIMETABLE
Please note that the following planned lecture schedule is only indicative and changes are possible. It may be the case that more (or less) time needs to be spent on certain topics, so the actual lectures may not be in complete correspondence with the plan. Therefore, coverage of topics may sometimes overflow from one session to the other.

Lecture 1
Integration: Definite and indefinite integrals of one and several variables, partial integration, substitution

Lecture 2
First order differential equations, higher order differential equations. Economic applications.

Lecture 3:
First order difference equations, higher order difference equations. Economic applications.

Lecture 4:
Unconstrained optimisation: First and second order condition for local and global extrema

Lecture 5
Optimisation with equality constraints: Lagrange multipliers, first order conditions, validity of Lagrange's theorem and examples where it fails, second order conditions, the bordered Hessian. Envelope theorem

Lecture 6
Optimisation with inequality constraints: The Kuhn-Tucker theorem, with examples of cases where it works and where it doesn't. When Kuhn-Tucker condition are necessary and sufficient. Positivity constraints.

Lecture 7
Dynamic Optimisation: Hamiltonians and Eulero conditions

Lecture 8

Lecture 9

Lecture 10