UG Course Outline
EC2503: Quantitative Methods II (Mathematical Pathway)
2018/19

Autumn:
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Spring:
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Autumn Term

Aims
The first half of the course (Autumn Term) provides students with a rigorous understanding and practical experience of the essentials of empirical research (i.e. econometrics) used by applied economists.

Learning Outcomes
By the end of this term, students should be able to:
- Use, understand and distinguish between standard econometric techniques
- Perform formal statistical tests of economic hypotheses
- Manipulate and analyse economic datasets
- Conduct econometric analysis using computer software

Course Delivery
There will be two one-hour lectures and a two hour seminar each week combining written and computer based problems.

Attendance at both lectures and the seminar session is compulsory.

The lectures will introduce core econometric theory and techniques, and demonstrate how to use the econometrics package Stata to do econometric analysis. There will be a weekly problem set that comprises both theoretical problems and computer-based applied exercises.

Students should attempt to solve these prior to the seminar classes, and be prepared to discuss solutions in class. There may not be time to discuss the answers to every question. Students will be expected to work through any questions not covered in the classes in their own time.

Some of the course material (in the form of slides, datasets, problem sets and solutions) will be available on the Moodle course page. Some after the lectures, some before. Students are expected to make their own notes during the lectures and seminars to complement the course material.

Assessment
Progress and learning outcomes will be evaluated by:
- A 3-hour unseen examination, taken in the summer term, which contributes 60% of the final mark. The exam will be based on the material covered in both the Autumn and Spring terms.
• An applied econometric project, which contributes 15% of the final mark, based on material covered in the Autumn term. Students will devise and undertake their own research project including finding relevant data and doing and interpreting the relevant econometrics, to be completed toward the middle of the Spring term.

• Two Mid-term exams. One in the Autumn term comprising 5% of the final mark. One in the Spring term comprising 20% of the final mark.

Students will receive standardised feedback on the project. Hand-in dates are specified in the student handbook, and reminders will be provided on Moodle.

Reading
The course does not follow one particular textbook. The text that comes closest to the course is:


Multiple copies of this text will be provided in the Bedford library; however, students are strongly encouraged to buy their own copy.

Other useful texts are:


Time permitting, the course will follow the following areas:

• Week 1 – Introduction to Econometrics, Review of mathematics and statistics prerequisites, The simple linear regression model
• Week 2 – Assumptions underlying the classical linear regression model, Properties of regression coefficients.
• Week 3 - Hypothesis Testing, Prediction, Model Specification.
• Week 4 - Multiple Regression Analysis: Estimating Models with >1 explanatory variable
• Week 5 – Dummy Variables, Heteroskedasticity
• Week 6 – Endogeneity, measurement error, Omitted Variables, Simultaneous Equations Estimation, Instrumental Variables
• Weeks 7 & 8 – Time Series models, Stationarity, Autocorrelation, VAR, VEC and ARCH models.
• Week 9 – Panel Data: Analysing data that combines cross-section and time series
• Week 10 – Limited Dependent Variables: What to do if dependent variable is binary or categorical
**Spring Term**

**Aims**
The aim of this part of the course is to develop a set of mathematical techniques required for advanced theoretical analysis in economics (in particular, courses studied in the third year).

**Course Summary**
The course focuses on developing the mathematical language and toolkit necessary for advanced analysis. In terms of content, we will mainly cover the theory of optimization. The topics covered will roughly be the same as in the Spring Term section of EC2203, but the treatment will be more rigorous.

**Course Delivery**
The course consists of a two-hour lecture and a one-hour seminar each week. Given the subject's mathematical content, the only way to understand the material is to work through problems and exercises. I highly recommend that you collaborate in groups to solve these problems. If you get stuck while working on a problem, tell me where and I’ll give you a hint. Problem sets will be assigned during lectures and answers to selected problems will be discussed during seminars. These problems will not be part of the overall grade.

**Assessment**
- 3-hour examination, which contributes 60% of the final mark and is taken during the Summer term. The exam will be based on the material covered in both the Autumn and Spring terms.
- A one hour midterm test, during the Spring term, which contribute 20% of the final mark. The exam will take place the class after reading week.

**Reading**
We will broadly follow the following book: Alpha Chiang and Kevin Wainwright, *Fundamental Methods of Mathematical Economics*, McGraw-Hill. You can also use the older version by Chiang alone, but the chapter numbers will be different.

**Timetable**
- Weeks 1 & 2: Vectors, matrices and linear equations (chapters 4 and 5)
- Weeks 3 & 4: Multivariate calculus and its application to Comparative Static exercises (chapters 6 through 8)
- Weeks 5 & 6: Unconstrained optimization (chapter 9 through 11).
- Weeks 7 & 8: Optimization with equality constraints (chapter 12)
- Weeks 9 & 10: Optimization with inequality constraints (chapter 13).