

**Lecturer:** Michael Curran

**Email:** [mpcurran@tcd.ie](mailto:mpcurran@tcd.ie)

**Course Material:** [mymodule.tcd.ie](http://mymodule.tcd.ie) – Mathematical Economics

**Office Hours:** Wednesdays, 11.30-12.30

**Location:** Room 3010, Arts Building

**OVERALL EC3080 ECTS VALUE: 5**

**Textbooks:** (AR is important for first five topics; HW is important for last two topics)

[AR] Anton, H. & Rorres, C. (2010/2014) *Elementary Linear Algebra: Applications Version* 10<sup>th</sup> / 11<sup>th</sup> edition, Wiley.

[HW] Harrison, M. & Waldron, P. (2011) *Mathematics for Economics and Finance* Routledge.

[DM] Davidson, R. & MacKinnon, J.G. (2004) *Econometric Theory and Methods* Oxford University Press.

**Objectives:**

The first term module of EC3080 consists of weekly two-hour classes throughout MT excluding reading week (week 7) and weekly one-hour problem solving tutorials. There will be no tutorials during the first week of lectures. Problem set questions will be assigned in advance that will be answered in tutorials. The problem solving section is designed to go over homeworks. These sections are designed to facilitate your development as an economic scholar and to help with your preparation for examinations since homeworks contain similar types of questions. The link between lectures and tutorials is while lectures introduce material, tutorials will require more of your interaction with the subject matter and with each other. Active engagement and independent learning are key to your success. Firstly, I want you to be able to wield the concepts (memorising, applying, critiquing); based on this, I want you to be able to answer questions (formulating, method and application, solving accurately); and finally, I want you to be able to answer subject to time constraints, which will be up to you to practice. Solutions to homework exercises will not be handed out so it is vital to attend tutorials. As this course is a mathematically-oriented course, the best form of preparation is to work through problems throughout the term. Given the usefulness of MATLAB in solving mathematically formulated economic problems and LaTeX for writing mathematically dense documents, you will gain exposure to MATLAB and LaTeX throughout the course.

**Assessment:**

There will be a mid-term test in week 8 of MT accounting for 10% of the overall grade for the year. The first term's component of the annual exam is worth 40%. The remaining 50% is determined by the Hilary term component of EC3080. If you are having difficulties meeting the guidelines of a course (e.g. sickness, sport scholars, etc.), contact your tutor directly. Erasmus students will be given a take-home assignment at the end of MT and the MT marking for these students is broken into 70% (midterm) and 30% (take-home assignment). The 90 minute mid-term in week 8 will consist of a number of homework-type problem solving questions. The three-hour summer exam will be split evenly into questions from MT and HT. For the MT component, you will be asked to answer a number homework-type questions, possibly including sub-question(s) asking for short paragraph essay-style answers.

**Plagiarism** is taken very seriously by the University. `Plagiarism is interpreted by the University as the act of presenting the work of others as one's own work, without acknowledgement. Plagiarism is considered as academically fraudulent, and an offence against University discipline. The University considers plagiarism to be a major offence, and subject to the disciplinary procedures of the University.' (University Calendar, 2013-14)

### **Lecture & Tutorial Rules:**

- No ringing cell phones, no texting, no inappropriate computer use
- Respect the diversity of interests, experience, and background of your classmates

### **Contacting Me:**

I stop checking email around 10:00pm. Apart from weekends, I typically respond to emails within 24 hours. It may not always be necessary to see me in office hours so feel free to send me an email if you have a problem related to the course. If you plan to see me in office hours, do drop in, but you might wish to send me an email the day before (Monday) with some idea of the question(s) you may want to raise.

### **Syllabus: (MT)**

1. **Systems of Linear Equations and Matrices:** Linear Equations and Examples, Matrix Algebra. (AR chapter 1; HW chapter 1)
2. **Determinants:** Definition and Properties, Co-factor Expansions of Determinants, Solution of Systems of Equations. (AR chapter 2; HW chapter 2)
3. **Eigenvalues and Eigenvectors:** Definition and Examples, Computation, Unit Eigenvalues, Similar Matrices, Diagonalisation. (AR chapter 5.1-2; HW chapter 3)
4. **Quadratic Forms and Definite Matrices:** Definition, Properties and Examples. (AR chapter 7; HW chapter 4.1, 4.3-4)
5. **Vectors and Vector Spaces:** Vectors in 2-D and 3-D Space, n-D Euclidean Vector Spaces, General Vector Spaces. (AR chapter 3.1 [extra: chapter 3&4]; HW chapter 5)
6. **Algebra and Geometry of Ordinary Least Squares:** Linear Regression Model, Algebra and Geometry of Ordinary Least Squares in Scalar and Matrix Forms. Applications: AR MATLAB Lab Session 14. (HW chapter 14.2; DM chapter 2.3)
7. **Macroeconomic Applications Part I:** Dynamic Linear Macro Models, Input-Output Analysis. (HW chapter 11; AR chapter 1.10)
8. **Macroeconomic Applications Part II:** ("Introductions to...") (i) Data Preparation: Fourier Transform and Frequency Domain Filters; (ii) DSGE Models: Sunspots, Blanchard-Kahn, Stability and Multiplicity of Solutions, Other Solution Methods including Time-Iteration and Estimation; (iii) Other Quantitative Tools: Bayesian and Non-Linear / Non-Gaussian models; (iv) Computers: History, Simulation, Language Comparison and Parallel and Graphical Programming. (Course handout notes)

### **Resources:**

- Course Material: [mymodule.tcd.ie](http://mymodule.tcd.ie) – Mathematical Economics
- College Calendar: <http://www.tcd.ie/calendar/>