UNSW Business School

School of Economics

ECON6004

Mathematical Economics

Course Outline

Semester 1, 2017

Part A: Course-Specific Information

Students are also expected to have read and be familiar with **Part B Supplement to All Course Outlines**. This contains Policies on Student Responsibilities and Support, Including Special Consideration, Plagiarism and Key Dates. It also contains the BUSINESS SCHOOL PROGRAM LEARNING GOALS.

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1 STAFF CONTACT DETAILS

Lecturer-in-charge: William Schworm
Room: Business School 439
Phone No: 9385 3578
Email: b.schworm@unsw.edu.au
Consultation Times: By Appointment

1.1 Communications with staff

The discussions about the subject matter of the course will be managed primarily through the Moodle discussion forum. If you would like to speak to me directly, please email me and arrange a time to meet.

2 COURSE DETAILS

2.1 Teaching Times and Locations

There will be a three-hour class from 6:00pm to 9:00pm each Monday commencing 27 February and ending 22 May.

We will not have a class on 17 April since this is during the break week, and there will be no tutorial in Week 7 (10 April). We will have a one-hour tutorial on 29 May.

Typically during the class, we will have a two-hour discussion of the new topic for the week followed by a brief break and then a tutorial on the topic for the previous week.

The lecture and tutorial will be held in Mathews 101.

2.2 Summary of Course

This course is an introduction to mathematical techniques that are widely used in Economics. We study the properties of sets, vector spaces, functions and equations and use them to describe economic environments. We employ mathematical techniques such as solving equations and finding fixed points, calculus and static and dynamic optimisation to analyse economic problems.

2.3 Aims and Relationship to Other Courses

This course is required in the Master of Economics and Ph.D. programs. It provides the mathematical prerequisites for the other courses in the Master of Economics and Ph.D. programs and provides the basic mathematical techniques needed by professional economists.

This course builds on undergraduate courses in quantitative methods, linear algebra and calculus. At the beginning of the course, you are expected to have a working knowledge of elementary algebra, matrix algebra, and introductory calculus.

2.4 Student Learning Outcomes

The Course Learning Outcomes describe what you should be able to accomplish by the end of this course if you participate fully in learning activities and successfully complete the assessment items.

For more information on the Postgraduate Program Learning Goals and Outcomes, see Part B of the course outline.

The following table shows how the Course Learning Outcomes relate to the overall Program Learning Goals and Outcomes, and indicates where these are assessed:

Program Learning Goals and Outcomes		**Course Learning Outcomes**	**Course Assessment Item**
This course helps you to achieve the following learning goals		*On successful completion of the course, you should be able to:*	*This learning outcome will be assessed in the following items:*
1	Knowledge	Understand the mathematical concepts and methods used by professional economists.	• Tutorial and forum discussions • Midterm exam • Final exam
2	Critical thinking and problem solving	Analyse economic models by using formal mathematical methods.	• Tutorial and forum discussions • Midterm exam • Final exam
3a	Written communication	Construct written work which is logically and professionally presented. Express economic ideas in the language of mathematics.	• Forum Discussions • Midterm exam • Final exam
3b	Oral communication	Communicate ideas in a succinct and clear manner.	• Tutorial discussion
4	Teamwork	Work collaboratively on weekly assignments.	Not specifically assessed.
5a.	Ethical, environmental and sustainability considerations	Not specifically addressed in this course.	Not specifically assessed.
5b.	Social and cultural awareness	Not specifically addressed in this course.	Not specifically assessed.

3 LEARNING AND TEACHING ACTIVITIES

3.1 Approach to Learning and Teaching in the Course

The philosophy underpinning this course and its teaching and learning strategies are based on the document “Guidelines on Learning that Inform Teaching at UNSW" which may be viewed at http://www.guidelinesonlearning.unsw.edu.au.

The lectures, tutorials, reading assignments, weekly tutorial assignments, tests and exams are designed to challenge you and to support the achievement of the desired learning outcomes. Your engagement in discussions during lectures and tutorials as well as online will assist you in achieving the learning outcomes.

3.2 Learning Activities and Teaching Strategies

The examinable content of the course is defined by the reading assignments, the content of the lectures and the content of the assignments, tutorials and discussions.

The reading assignments present the mathematical ideas and methods with statements and proofs of the main theorems and many examples and problems. The readings give you an opportunity to learn the concepts and methods, see some simple applications and begin the process of learning to use these methods on your own. Since the lectures will assume you have a preliminary knowledge of the subject matter, you should study the assigned readings before coming to the lecture each week.

The lectures will focus on aspects of the reading that are more difficult to understand or apply with the aim of providing greater comprehension and facility. The lectures will proceed quickly with each lecture building on previous lectures. It is essential that you study and complete all assignments each week so that you do not fall behind.

You will be given weekly assignments to test your knowledge of mathematical methods and to give you practise with their application. Although the assignments will not be marked and you will not be asked to submit your work, they are an essential part of the course. We will discuss the answers in the online forums and in the tutorials. You will be expected to participate in these discussions. Since a facility with mathematical method and an understanding of the concepts is acquired primarily by *doing* mathematics, your serious effort on the assignments is a necessary condition for achieving the desired learning outcomes.

It is important to recognise that most learning will be achieved outside of class time. With limited class time, lectures and tutorials can only provide an overview and instruction on a few of the more difficult topics.

An “ideal" learning strategy includes

(i) a preliminary reading of the assigned sections of the text prior to attending the lecture;

(ii) attend the lecture and actively think about the content and engage in class discussion;

(iii) reread the assigned sections of the text and attempt to gain a deeper understanding of the ideas and greater facility with the techniques;

(iv) try the assignments with a focus on the method for solving the problem followed by consideration of the broader ideas exemplified in each problem;

(v) discuss any problems you are having on the assignments with your class-mates and try again;

(vi) attend the tutorial and discuss the answers to the assigned problems; and

(vii) every two to three weeks review the content of the previous several weeks and study their connections.

4 ASSESSMENT

4.1 Formal Requirements

In order to pass this course, you must attend lectures and tutorials, make a satisfactory attempt at all assessment tasks and achieve a mark of at least 50% overall. Some programs, such as the Economics PhD program, may require a higher mark for continuation in the program.

4.2 Assessment Details

Assessment Task	Weighting	Length	Due date
Discussion	10%	See 4.3 below	See 4.3 below
Tutorial Presentation	10%	See 4.4 below	See 4.4 below
Midterm exam	30%	2 hours	10 April
Final exam	50%	2 hours	University exam period
	100%		

4.3 Discussion

All students are expected to engage in discussions on course topics and assignments during the tutorials and through the discussion forums on Moodle. I will assess your contribution to these discussions and base a numerical score on my assessment. Good questions as well as good answers and clear explanations will be recognised.

If you do not attend most tutorials and your discussion on the Moodle forums are minimal, then you will receive a mark between 0 and 3. If you attend tutorials but do not participate in discussions, then your mark will be between 4 and 5. If you attend tutorials and engage in the discussion forums but restrict yourself to asking routine questions, your mark will be between 6 and 7. If you are actively engaged in the tutorials and the discussion forums and answer as well as ask questions, then your mark will be between 8 and 10.

4.4 Tutorial Presentation

All students will present an answer to an assigned problem in the tutorial. You will be evaluated on the content and clarity of your presentation. The oral communication component of your presentation will be marked according to the Assurance of Learning rubric of the UNSW Business School. This will be made available on the course website.

4.5 Midsession Exam

There will be one two-hour exam during the lecture time on Monday 10 April. The exam is designed to give you early feedback on whether or not you are meeting the expected outcomes of the course. In the exam, you will be asked to solve problems that are similar to the weekly assignments but will have new aspects.

Examples of exams from previous years will be provided on Moodle. These will provide you with an indication of the style of exam questions but you should keep in mind that the content and emphasis of the course changes from year to year. Therefore, some problems on previous exams may not be suitable questions for this year.

There will be no supplementary exam offered for the mid-session exam so you should make every effort to attend. Students who are unable to attend the exam and have a valid reason and can provide documentation should apply for Special Consideration as prescribed by UNSW policy. Employment obligations or holiday plans are not acceptable reasons for missing any examination.

4.6 Final Exam

There will be a two-hour final examination during the University's examination period which will cover all the material for the session. The exams will be designed to test your knowledge of the subject matter covered in the lectures, reading assignments and the problems. You will be asked to solve problems that are similar to the weekly assignments but may combine ideas and methods from different parts of the course. Further information about the content of the final exam will be provided in tutorial discussions.

Examples of exams from previous years will be provided on Moodle. These will provide you with an indication of the style of questions to expect on the exam but you should keep in mind that the content and emphasis of the course changes from year to year. Therefore, some parts of previous exams may not be suitable questions for this year.

The scheduling of examinations is managed by the University. The final examination for this course may be scheduled at any time during the session's examination period. Please be sure that you are available for the scheduled examination since no examinations will be given at alternate times. If you believe you may not be available for the full examination period you should withdraw from this course.

Students with employment commitments must make arrangements with employers to sit for examinations. The University adheres strictly to the rule that employment reasons will not be accepted as an excuse for absence from an examination.

When the provisional examination timetable is released, ensure that you have no clashes or unreasonable difficulty in attending the scheduled examinations. Please be aware, however, that the time of the final examination may change until the final timetable is released.

Further information on examination procedures and advice concerning illness or misadventure may be found on myUNSW.

4.7 Quality Assurance

The Business School is actively monitoring student learning and quality of the student experience in all its programs. Some assessments may be used to determine the extent to which program learning goals are being achieved. The information is required for accreditation purposes, and aggregated findings will be used to inform changes aimed

at improving the quality of Business School programs. All material used for such processes will be treated as confidential.

5 COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students and other stakeholders about the courses offered in the School and continual improvements are made based on this feedback. UNSW's myExperience Survey Tool is one of the ways in which student evaluative feedback is gathered. You are strongly encouraged to take part in the feedback process.

6 COURSE RESOURCES

6.1 Texts

The primary documents for reading assignments are lecture notes which are posted on Moodle. These will be revised frequently during the course.

If you would like some preliminary reading to improve your background in mathematics, I recommend the first of the books below. If you want additional reading or an alternative approach to the material, I recommend the second of these textbooks:

> Sydsæter, Knut, Peter Hammond, Arne Strøm and Andrés Carvajal, *Essential Mathematics for Economic Analysis*, Fifth Edition, Pearson, 2016.
>
> Sydsæter, Knut, Peter J. Hammond, Atle Seierstad, and Arne Strøm, *Further Mathematics for Economic Analysis*, Second Edition, Pearson, 2008.

You may purchase either or both of these at the University Bookshop. Also, both books are in the High Use Collection in the UNSW library.

There are numerous books that cover similar material at various levels. If you would like some supplementary reading or extra exercises on some topics, I recommend any of the following:

> Chiang, Alpha C. and Kevin Wainwright, *Fundamental Methods of Mathematical Economics*, McGraw-Hill, 2005.
>
> Novshek, W., *Mathematics for Economists*, Academic Press, 1993. Simon, Carl P., and Lawrence Blume, Mathematics for Economists, Norton, 1994.
>
> de la Fuente, Angel, *Mathematical Methods and Models for Economists*, Cambridge University Press, 2000.

These are listed in order of difficulty. Several of these may be found in the UNSW library in the High Use Collection.

6.2 Moodle

Subject documents, notifications, assignments, lecture notes, and exams from previous years may be obtained on UNSW Moodle. Also, discussion forums for topics related to the course will be conducted on this site.

To obtain access to Moodle with your browser, go to

http://moodle.telt.unsw.edu.au

and enter your student number prefixed with a lower case z and your zPass.

6.3 Library

The texts for this course are available in the High Use Collection in the UNSW Library. Further information about the library and its training and support services may be found at the following website:

http://www.library.unsw.edu.au/

6.4 UNSW IT Service Desk

The UNSW IT Service Desk offers technical support for problems with the IT services on campus. For further information, see their website at

http://www.it.unsw.edu.au/students

7 COURSE SCHEDULE

Texts: The reading assignments refer to the following textbooks which I abbreviate by EMEA and FMEA, respectively.

Sydsæter, Knut, Peter Hammond, Arne Strøm and Andrés Carvajal, *Essential Mathematics for Economic Analysis*, Fifth Edition, Pearson, 2016.

Sydsæter, Knut, Peter J. Hammond, Atle Seierstad, and Arne Strom, *Further Mathematics for Economic Analysis*, Second Edition, Prentice Hall, 2008.

7.1 Lecture Schedule

Lectures start in Week 1 and finish in Week 12.

LECTURE SCHEDULE		
Week	Topic	Reading
Week 1 27 February	Sets, Functions and Euclidean Spaces	Lecture Notes 1.1 - 1.8. EMEA: 1, 2. FMEA: 13.1, 13.2, 13.5, 13.6, 1.2, 2.2.
Week 2 6 March	Functions on Euclidean Spaces	Lecture Notes 2.1 - 2.5 EMEA: 4, 5. FMEA: 13.3, 2.3 (pp. 53-55), 2.5 (pp. 68-72), 2.9.
Week 3 13 March	Linear Functions and Linear Equations	Lecture Notes 3.1 - 3.5. EMEA: 15, 16. FMEA: 1.1, 1.3-1.6.
Week 4 20 March	Linear Approximation of Functions	Lecture Notes 4.1 - 4.3. EMEA: 6, 7, 11. FMEA: 2.1, 2.4-2.6.
Week 5 27 March	Solving Nonlinear Equations	Lecture Notes 5.1, 5.2. EMEA: 3. FMEA: 2.10, 14.1, 14.3, 14.4.
Week 6 03 April	Difference Equations	Lecture Notes 6.1 - 6.6. FMEA: 11.
Week 7 10 April	Midterm exam on readings, lectures, and assignments for weeks 1-5.	
Mid-semester break: Friday 14 – Saturday 22 April inclusive		
Week 8 24 April	Implicit Functions and Comparative Statics	Lecture Notes 7. EMEA: 12. FMEA: 2.7, 2.8.
Week 9 1 May	Quadratic Approximations and Unconstrained Optimisation	Lecture Notes 8.1 - 8.6. EMEA: 8, 13. FMEA: 1.7, 1.8, 2.3, 2.5 (pp. 74-76), 3.1, 3.2.
Week 10 8 May	Constrained Optimisation	Lecture Notes 9.1, 9.2, 9.3. EMEA: 14. FMEA: 3.3-3.5, 3.7-3.9.
Week 11 15 May	Duality	Lecture Notes 10. FMEA: 13.1, 13.2, 13.5, 13.6, 1.2, 2.2.
Week 12 22 May	Dynamic Programming	Lecture Notes 11.1, 11.2. FMEA: 12.1-12.5

7.2 Tutorial Schedule

Tutorials start in Week 2 and finish in Week 13.

TUTORIAL SCHEDULE	
Week	Topic
Week 1 27 February	No Tutorial
Week 2 6 March	Assignment 1 on Lecture 1 topics.
Week 3 13 March	Assignment 2 on Lecture 2 topics.
Week 4 20 March	Assignment 3 on Lecture 3 topics.
Week 5 27 March	Assignment 4 on Lecture 4 topics.
Week 6 03 April	Assignment 5 on Lecture 5 topics
Week 7 10 April	No Tutorial
Mid-semester break: Friday 14 – Saturday 22 April inclusive	
Week 8 24 April	Assignment 6 on Lecture 6 topics.
Week 9 1 May	Assignment 7 on Lecture 7 topics.
Week 10 8 May	Assignment 8 on Lecture 8 topics.
Week 11 15 May	Assignment 9 on Lecture 9 Topics.
Week 12 22 May	Assignment 10 on Lecture 10 topics.
Week 13 29 May	Assignment 11 on Lecture 11 topics.