EMET 7001

Introduction to the Analysis of Economic Models and Data

The course teaches the mathematical foundations of models in economics, business and finance and its applications. Mathematical topics covered include set theory, functions, series, limits, univariate and multivariate calculus, unconstrained and constrained optimisation, matrix algebra. Applications include effective interest rates, present value, annuities, production functions, average and marginal cost functions, profit maximisation.

<table>
<thead>
<tr>
<th>Mode of Delivery</th>
<th>On campus</th>
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<tbody>
<tr>
<td>Co-requisite</td>
<td>None</td>
</tr>
<tr>
<td>Incompatible Courses</td>
<td>EMET 1001</td>
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<tr>
<td>Course Convener:</td>
<td>Dr Damien Eldridge</td>
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<td>Research Interests</td>
<td>Microeconomics, Mathematical Economics, Industrial Economics, Public Economics.</td>
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SEMESTER ONE

2016

http://programsandcourses.anu.edu.au/course/EMET7001
COURSE OVERVIEW

Course Description
The course teaches the mathematical foundations of models in economics, business and finance and its applications. Mathematical topics covered include set theory, functions, series, limits, univariate and multivariate calculus, unconstrained and constrained optimisation, matrix algebra. Applications include effective interest rates, present value, annuities, production functions, average and marginal cost functions, profit maximisation.

Learning Outcomes
By the end of the course students will:
1. have a sound understanding of mathematical techniques discussed;
2. formulate economic problems in mathematical terms and apply the tools provided in the module for analysing them;
3. demonstrate an understanding of many of the common functional forms used in economics their derivatives;
4. apply the basic principles of maximisation and minimisation to optimisation problems;
5. apply matrix algebra to simple economic problems and models; and
6. make use of some basic principles of financial arithmetic in economic and financial problems.

Assessment Summary

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Value</th>
<th>Due Date</th>
<th>Date for Return of Assessment</th>
<th>Linked Learning Outcomes (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Final exam for the supplementary part of this unit.</td>
<td>15 %</td>
<td>To be scheduled by the ANU Administration. It will be sometime during the official final exam period.</td>
<td>Exam scripts can be viewed upon request at some point following the release of results for Semester One in 2016.</td>
<td>All learning outcomes.</td>
</tr>
<tr>
<td>2. Complete all required assessment tasks for EMET 1001.</td>
<td>85 %</td>
<td>Various.</td>
<td>See EMET 1001 course outline.</td>
<td>All learning outcomes.</td>
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</table>

Feedback

Staff Feedback
Students will have the opportunity to obtain verbal feedback during classes and consultation times.
Student Feedback

ANU is committed to the demonstration of educational excellence and regularly seeks feedback from students. One of the key formal ways students have to provide feedback is through Student Experience of Learning Support (SELS) surveys. The feedback given in these surveys is anonymous and provides the Colleges, University Education Committee and Academic Board with opportunities to recognise excellent teaching, and opportunities for improvement.

For more information on student surveys at ANU and reports on the feedback provided on ANU courses, go to

http://unistats.anu.edu.au/surveys/selt/students/ and
http://unistats.anu.edu.au/surveys/selt/results/learning/

Policies

ANU has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University’s academic standards, and implement them. You can find the University’s education policies and an explanatory glossary at:

http://policies.anu.edu.au/

Students are expected to have read the Student Academic Integrity Policy before the commencement of their course.

Other key policies include:
- Student Assessment (Coursework)
- Student Surveys and Evaluations

Recommended Resources

There is no required textbook for this unit. A reading guide is provided at the end of this course outline. The readings in that guide will, wherever possible, be made available online through links from the Wattle site for this course or in hardcopy through short-loan at the Chifley Library at ANU.

COURSE SCHEDULE

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Tentative Summary of Activities</th>
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### Linear and Quadratic Forms

- The characteristic equation and Eigen-values.
- Applications to linear Marshallian demand functions, linear inverse Marshallian demand functions, linear supply functions, linear inverse supply functions, single market linear Marshallian cross models, multi-market linear Marshallian cross models, linear Keynesian cross models, linear IS-LM models, input-output models and the classical linear regression model.

### Sequences, Series, Induction, and Financial Mathematics

- The concept of a sequence. Arithmetic progressions and geometric progressions as special types of sequences. Summation notation.
- Finite series as the partial sum of a sequence.
- Infinite series as the total sum of a sequence.
- The partial sum of an arithmetic progression.
- The partial sum of a geometric progression.
- Proof by induction.
- Applications to financial economics, including simple interest, compound interest, frequency of compounding, continuous compounding, present values and future values of payment streams, annuities, annuities due, perpetuities, perpetuities due, amortisation, net present values, internal rates of return, and benefit-cost ratios.

### Unconstrained Optimisation and Equality-Constrained Optimisation

- Unconstrained optimisation: Maximisation and minimisation, the objective function, first-order conditions, critical points, second-order conditions, optimal values of the independent variables, optimal value of the objective function.
- Equality-constrained optimisation: Maximisation versus minimisation, the objective function, the constraints, conversion to an unconstrained optimisation problem by using the constraints to eliminate some variables, recovery of the optimal values of the eliminated variables, the Lagrangian function, first-order conditions, critical values, second-order conditions, optimal values of the independent variables, optimal
value of the objective function, and the interpretation of the optimal value of the Lagrange multiplier.

Applications to utility maximisation problems, expenditure minimisation problems, cost minimisation problems, profit maximisation problems, Pareto efficiency problems, and the derivation of the ordinary least squares estimators of the coefficient parameters in the classical linear regression model.

ASSESSMENT REQUIREMENTS

Assessment Tasks

Assessment Task 1: Final exam for the supplementary part of this unit.

Details of task: This will be a closed book final exam that will be held at a time and location chosen by the ANU Administration. It will be sometime during the official final exam period.

Assessment Task 2: The assessment tasks for EMET 7001.

Details of task: See the EMET 7001 course outline for details.

SUPPORT FOR STUDENTS

The University offers a number of support services for students. Information on these is available online from http://students.anu.edu.au/studentlife/

READING GUIDE

Topic 1: Vectors, Matrices, and Linear Equation Systems


**Topic 2: Sequences, Series, Induction, and Financial Mathematics**


**Topic 3: Unconstrained Optimisation and Equality-Constrained Optimisation**

