EMET1001
Foundations of Economic and Financial Models
(An Introduction to Mathematical Economics)

The course teaches the mathematical foundations of models in economics, business and finance, along with its applications. Mathematical topics covered include set theory, functions, series, limits, univariate and multivariate calculus, unconstrained and constrained optimization, and matrix algebra. Applications include production functions, average and marginal cost functions, and profit maximization.

<table>
<thead>
<tr>
<th>Mode of Delivery</th>
<th>On campus.</th>
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<tbody>
<tr>
<td>Prerequisites</td>
<td>None listed.</td>
</tr>
<tr>
<td>Incompatible Courses</td>
<td>STAT1006, EMET7001.</td>
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<tr>
<td>Course Convener:</td>
<td>Dr Damien Eldridge.</td>
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<tr>
<td>Office hours for student consultation:</td>
<td>Monday 3 pm to 5 pm and Tuesday 3 pm to 5 pm (in teaching weeks only).</td>
</tr>
<tr>
<td>Research Interests</td>
<td>Microeconomic Theory, Applied Microeconomics, Mathematical Economics.</td>
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<tr>
<td>RSE Student Office Contact</td>
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<td><a href="mailto:enquiries.rse@anu.edu.au">enquiries.rse@anu.edu.au</a></td>
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<tr>
<td>RSE Students Webpage</td>
<td><a href="https://www.rse.anu.edu.au/students/">https://www.rse.anu.edu.au/students/</a></td>
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SEMESTER ONE, 2017
COURSE OVERVIEW

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 analyzing them.
3. Demonstrate an understanding of many of the common functional forms used in economics.
4. Apply the basic principles of maximization and minimization to optimization problems.
5. Apply matrix algebra to simple economic problems and models.
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>Potential Value</th>
<th>Due Date</th>
<th>Date for Return of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tutorial Assignments (Optional and Redeemable)</td>
<td>10 %</td>
<td>Submitted Weekly</td>
<td>Returned in tutorial classes.</td>
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<tr>
<td></td>
<td></td>
<td>(no later than 2:00 pm on Mondays)</td>
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<tr>
<td>2. Mid-Semester Exam (15 Minutes Reading, 2 Hours Writing)</td>
<td>35 %</td>
<td>TBA (In Week 6)</td>
<td>Results announced in Week 7. Exam viewing times TBA.</td>
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<tr>
<td></td>
<td></td>
<td>(Optional and Redeemable)</td>
<td></td>
</tr>
<tr>
<td>3. Final Exam (15 Minutes Reading, 3 Hours Writing)</td>
<td>55 %</td>
<td>TBA (In the official final exam period)</td>
<td>Exams may be viewed at some point after the final grades have been officially released.</td>
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</tbody>
</table>

Research-Led Teaching
The material taught in this course is directly relevant to research and analysis of most topics in microeconomics, macroeconomics, econometrics, statistics, finance, and many business disciplines.

Feedback

Staff Feedback
Students will be given frequent, individual feedback in the form of marked tutorial assignments, as well as detailed feedback after the midterm exam. Students will also have the opportunity to obtain feedback on any topic related to this course during their scheduled tutorial sessions and the regular consultation sessions that are held by the teaching staff in this unit. I highly encourage students to avail themselves of these opportunities.

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 Academic Misconduct Rules 2014 before the commencement of their course.

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

**Workload Expectations**

The amount of work required for successful completion of this subject may vary between students. As a rough guide, students should expect to devote at least 10 hours a week to this unit. This should include all of the following.

- 3 hours a week: lectures.
- 1 hour a week: tutorials.
- At least 6 hours a week: reading, research, writing, lecture and tutorial preparation.

**Examination material or equipment**

Other than writing related equipment (such as pens, pencils, erasers, sharpeners, and rulers), only a non-programmable calculator may be used in either of the exams for this subject.

**Recommended Resources**

- **Textbook:**

- **Supplementary References:**
COURSE SCHEDULE

In the following outline for this course, the expression “a.b.c” means week a, lecture b, part c (in other words, the cth component of the bth lecture in week a). Note that this outline is just a rough guide to the topics that will be covered in this course and the lectures in which they will be covered. If it becomes necessary, the timing and subject matter will vary from that set out below.

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<tr>
<th>Lectures (Rough Guide)</th>
<th>Summary of Activities</th>
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<td>1.1.1</td>
<td>Introduction and Administration</td>
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<td>1.1.2 to 1.2.1</td>
<td>Topic 1: Sets, Numbers, Coordinates, and Distances</td>
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<tr>
<td>1.3.1 to 1.3.2</td>
<td>Topic 2: Functions and Correspondences</td>
</tr>
<tr>
<td>2.1.1 to 2.2.1</td>
<td>Topic 3: Binary Relations, Equations, and Inequalities</td>
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<tr>
<td>2.2.2 to 2.3.1</td>
<td>Topic 4: Sequences, Series, and Limits</td>
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<tr>
<td>3.1.1 to 3.1.2</td>
<td>Topic 5: Financial Mathematics</td>
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<td>4.1.1 to 5.3.1</td>
<td>Topic 6: Univariate Differential Calculus</td>
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<tr>
<td>6.1.1 to 6.3.1</td>
<td>Mid-Semester Exam and Review of Mid-Semester Exam</td>
</tr>
<tr>
<td>7.1.1 to 7.3.1</td>
<td>Topic 7: Univariate Integral Calculus</td>
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<td>8.1.1 to 9.3.1</td>
<td>Topic 8: Multivariate Differential Calculus</td>
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<td>10.1.1 to 10.3.1</td>
<td>Topic 9: Optimisation Theory</td>
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<td>11.1.1 to 12.3.1</td>
<td>Topic 10: Linear Algebra</td>
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ASSESSMENT REQUIREMENTS

Assessment Task 1

Assessment Task: Tutorial Assignments

Details of task: Attempted solutions to assigned problems must be turned in by 2:00 pm on Monday in most teaching weeks.

Estimated return dates: Assignments will be returned in tutorials in the first teaching week after the submission week.

Value: In total, tutorial assignments will be worth (at most) 10 % of your raw mark in this course. However, this component is both optional and redeemable. It will only count towards your raw mark if it exceeds your mark on the final exam. If your tutorial mark does not exceed your mark on the final exam, then the ten percentage points allocated to tutorials will be reallocated to the final exam.

Assignment Grading: Each assignment will be graded on a “Good Attempt (2) – Poor Attempt (1) – No Attempt (0)” basis.

Purpose: The purpose of this assessment item is not to test whether or not you get the answers correct, but instead to motivate you to keep up with the material.
Note: Since this assessment item is both optional and redeemable, no special arrangements will be made for missed tutorial assignments.

**Assessment Task 2**

**Assessment Task:** Mid-Semester Exam

**Details of task:** This will be a formal exam consisting of fifteen minutes of reading time and two hours of writing time. It will consist of a number of problems that are related to the material covered in at least one of the following: (i) lectures in weeks one to four, (ii) tutorials in weeks two to five, and (iii) the associated readings. It will be held sometime during week six and will replace the first two hours of lectures for this course in that week.

**Estimated return dates:** Marks will be posted on the Wattle site for the unit by the end of week seven. Potential exam viewing times will be announced at that point.

**Value:** The mid-semester exam is worth (at most) 35% of your raw mark for this course. However, this component is both optional and redeemable. It will only count towards your raw mark if it exceeds your mark on the final exam. If your mid-semester exam mark does not exceed your mark on the final exam, then the thirty-five percentage points allocated to the mid-semester exam will be reallocated to the final exam.

**Purpose:** The purpose of this assessment item is to test both your understanding of the material covered in the relevant part of this course and your ability to apply that material to problems from economics, finance, and business studies.

**Note:** Since this assessment item is both optional and redeemable, no special arrangements will be made for the mid-semester exam in the event that it either cannot be sat by a student at the scheduled time or is missed by a student.

**Assessment Task 3**

**Assessment Task:** Final Exam

**Details of task:** This will be a formal exam consisting of fifteen minutes of reading time and three hours of writing time. It will consist of a number of problems that are related to any of the material covered in this course. This includes material covered in lectures, material covered in tutorials, and material covered in the suggested reading. It will be held sometime during the official final exam period. The date, time, and location will be determined by the University administration.
Estimated return dates: The final exam script books will be available for viewing at some point following the release of the official results for Semester One in 2017.

Value: The final exam is worth (at least) 55% of your raw mark for this course.

Purpose: The purpose of this assessment item is to test both your understanding of the material covered in this course and your ability to apply that material to problems from economics, finance, and business studies.

Assignment submission
- Please submit your tutorial assignments by placing a hardcopy of the assignment in the appropriate assignment box on Level One of the H. W. Arndt Building (near the Research School of Economics Enquiries Desk).
- Please ensure that your submitted assignments have a completed and signed assignment cover sheet attached.
- Please keep a copy of your submitted assignments for your own use in tutorial classes and for exam revision.

Extensions and penalties
No submission of assessment tasks without an extension after the due date will be permitted. If an assessment task is not submitted by the due date and an extension has not been granted or alternative arrangements have not been authorised, then a mark of 0 will be awarded.

Scaling
Your final mark for the course will be based on the raw marks allocated for each of your assessment items. However, your final mark may not be the same number as produced by that formula, as marks may be scaled. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed the scaled mark of that student), and may be either up or down.

Privacy Notice
The ANU has made a number of third party, online, databases available for students to use. Use of each online database is conditional on student end users first agreeing to the database licensor’s terms of service and/or privacy policy. Students should read these carefully.

In some cases student end users will be required to register an account with the database licensor and submit personal information, including their: first name; last name; ANU email address; and other information.

In cases where student end users are asked to submit ‘content’ to a database, such as an assignment or short answers, the database licensor may only use the student’s ‘content’ in accordance with the terms of service – including any (copyright) licence the student grants to the database licensor.

Any personal information or content a student submits may be stored by the licensor, potentially offshore, and will be used to process the database service in accordance with the licensors terms of service and/or privacy policy.
If any student chooses not to agree to the database licensor’s terms of service or privacy policy, the student will not be able to access and use the database. In these circumstances students should contact their lecturer to enquire about alternative arrangements that are available.

**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/](http://students.anu.edu.au/studentlife/)

**Other Information**
Building Access Hours
Both CBE and HW ARNDT are:
TEACHING PERIOD = Mon – Fri 07.45 to 21.15 and SAT, SUN and Public Holidays is not accessible by students.
Both CBE and HW ARNDT are:
NON TEACHING PERIOD = Mon – Fri 08.00 to 18.00 and SAT, SUN and Public Holidays is not accessible by students.

RSE has a Frequently Asked Questions page where you can find relevant policies and information on a broad range of topics, the onus is on the student to familiarise themselves with this page and the information available. [https://www.rse.anu.edu.au/students/students/frequently-asked-questions/](https://www.rse.anu.edu.au/students/students/frequently-asked-questions/)
READING GUIDE

Core References

- Textbook:

- Supplementary References:

**Topic 1: Sets, Numbers, Coordinates, and Distance**

- Sydsaeter, Hammond, Strom, and Carvajal (2016): Chapters 1 and 2 (pp. 1–66).
- Haeussler and Paul (1987): Chapter 0 (pp. 1–33).

**Topic 2: Functions and Correspondences**

- Shannon (1995): Chapters 2 and 6 (pp. 28–82 and 231–284).

**Topic 3: Binary Relations, Equations, and Inequalities**

- Sydsaeter, Hammond, Strom, and Carvajal (2016): Chapters 2 and 3 (pp. 19–87).
- Haeussler and Paul (1987): Chapters 1 and 2 (pp. 34–74).
- Shannon (1995): Chapters 1, 2, and 6 (pp. 1–27, 28–82, and 231–284).

**Topic 4: Sequences, Series, and Limits**

- Sydsaeter, Hammond, Strom, and Carvajal (2016): Chapters 2.8, 2.9, 2.10, 2.11, 6.5, 7.9, 7.11, and 10 (pp. 52–62, 182–188, 257–266, 270–273, and 375–406).

**Topic 5: Financial Mathematics**

Topic 6: Univariate Differential Calculus

- Sydsaeter, Hammond, Strom, and Carvajal (2016): Chapters 6, 7, and 8 (pp. 169–317).

Topic 7: Univariate Integral Calculus


Topic 8: Multivariate Differential Calculus


Topic 9: Optimisation Theory

- Haeussler and Paul (1987): Chapters 12, 13, 17.7, 17.8, 17.9, and 17.10 (pp. 473–532 and 697–723).
- Shannon (1995): Chapters 8.6, 8.7, 10.4, 10.5, 10.6, and 10.7 (pp. 383–396 and 462–501).

Topic 10: Linear Algebra