

**DEREE COLLEGE SYLLABUS FOR: EC 2350 MATHEMATICAL TECHNIQUES IN ECONOMICS****UK LEVEL: 4**  
**UK CREDITS: 15**  
**US CREDITS:3/0/3**

(Updated Fall 2021)

**PREREQUISITES:**EC 1000 Principles of Microeconomics  
MA 1008 College Algebra  
MA 2105 Applied Calculus**CATALOG DESCRIPTION:**

Use of economic models. Equilibrium analysis. Matrices. Derivatives. Exponential and Logarithmic functions. Optimization problems. Integration. Dynamic analysis. Mathematical programming.

**RATIONALE:**

This course is intended for economics majors, prospective graduate students and future economists. In addition, it should be immensely useful to both business and non-business students, as it provides knowledge of the techniques and methods used to analyze traditional economic and business decisions by firms and consumers, and other choice settings in politics, sociology, and law. Students are introduced to "model building" as practiced by the economics profession, developing the mathematical tools and concepts that are most frequently used in economic models of the firm and consumer behavior. The course focuses on mathematical representations of optimizing individuals in a wide variety of "choice settings." The models can be used to analyze decision making in any setting in which individuals have reasonably clear goals (objective functions) and confront reasonably clear constraints.

**LEARNING OUTCOMES:**

As a result of taking this course, the student should be able to:

1. Define mathematically and graphically an economic model.
2. Apply mathematical techniques on optimization problems.
3. Demonstrate understanding of dynamic analysis and mathematical programming.
4. Demonstrate understanding of published work in economic and business journals.

**METHOD OF TEACHING AND LEARNING:**

In congruence with the learning and teaching strategy of the college, the following tools are used:

- Classes consist of lectures, problem-solving in class, and class discussions of applied techniques, their advantages and limitations, as well as recent articles in economic journals assigned by the instructor.
- Office hours: students are encouraged to make full use of the office hours of their instructor, where they can ask questions and go over lecture material.
- Use of Blackboard platform, where instructors post lecture notes, assignment instructions, timely announcements, as well as additional resources.

**ASSESSMENT:****Summative:**

	<table border="1" data-bbox="483 205 1370 411"> <tr> <td data-bbox="483 205 1159 306">1<sup>st</sup> assessment: Two in-class quizzes (closed book, numerical problems, 30 minutes each, 25% each)</td> <td data-bbox="1159 205 1370 306"><b>50 %</b></td> </tr> <tr> <td data-bbox="483 306 1159 411">Final assessment: In-class written examination (Two-hours, closed book, comprehensive, numerical problems)</td> <td data-bbox="1159 306 1370 411"><b>50 %</b></td> </tr> </table> <p data-bbox="483 449 634 478"><b>Formative:</b></p> <table border="1" data-bbox="483 478 1370 550"> <tr> <td data-bbox="483 478 1159 550">In-class, 1-hour, "diagnostic" test - numerical problems</td> <td data-bbox="1159 478 1370 550"><b>0 %</b></td> </tr> </table> <p data-bbox="483 583 1503 651">The formative test prepares students for the examinations and ensures that students are actively engaged during the term.</p> <p data-bbox="483 684 1503 781">The 1<sup>st</sup> assessment tests Learning Outcomes 1 and 2. The final assessment tests Learning Outcomes 1, 2, 3, and 4 with emphasis on 3 and 4.</p> <p data-bbox="483 819 1503 982">The final grade for this module will be determined by averaging all summative assessment grades, based on the predetermined weights for each assessment. If students pass the comprehensive assessment that tests all Learning Outcomes for this module and the average grade for the module is 40 or higher, students are not required to resit any failed assessments.</p>	1 <sup>st</sup> assessment: Two in-class quizzes (closed book, numerical problems, 30 minutes each, 25% each)	<b>50 %</b>	Final assessment: In-class written examination (Two-hours, closed book, comprehensive, numerical problems)	<b>50 %</b>	In-class, 1-hour, "diagnostic" test - numerical problems	<b>0 %</b>
1 <sup>st</sup> assessment: Two in-class quizzes (closed book, numerical problems, 30 minutes each, 25% each)	<b>50 %</b>						
Final assessment: In-class written examination (Two-hours, closed book, comprehensive, numerical problems)	<b>50 %</b>						
In-class, 1-hour, "diagnostic" test - numerical problems	<b>0 %</b>						
<b>INDICATIVE READING:</b>	<p data-bbox="483 1016 792 1045"><b>REQUIRED READING:</b></p> <p data-bbox="483 1083 1386 1150">Chiang, A. and K. Wainwright. Fundamental Methods of Mathematical Economics. McGraw-Hill, latest edition</p> <p data-bbox="483 1184 1344 1251">Journal articles, accessible through the Library, as assigned by the instructor.</p> <p data-bbox="483 1285 873 1314"><b>RECOMMENDED READING:</b></p> <p data-bbox="483 1352 1409 1419">Dowling, E., Introduction to Mathematical Economics. Schaum's Outline Series, McGraw-Hill, latest edition</p> <p data-bbox="483 1453 1370 1520">Glass, J. C., An Introduction to Mathematical Methods in Economics, latest edition</p> <p data-bbox="483 1554 1425 1621">Hagle, T., Basic Math for Social Scientists: Concepts. Sage Publications, latest edition</p> <p data-bbox="483 1654 1393 1722">Hallett, D. Gleason, A. et al., Calculus, Single and Multivariable. Wiley, latest edition</p> <p data-bbox="483 1755 1370 1822">Jacques, I., Mathematics for Economics and Business. Prentice Hall, latest edition</p> <p data-bbox="483 1856 1409 1885">Rosser, M. Basic Mathematics for Economists. Routledge, latest edition</p>						

	<p>Silberberg, E. The Structure of Economics: A Mathematical Analysis. McGraw-Hill, latest edition</p> <p>Simon C. and Blume, L., Mathematics for Economists. W.W. Norton &amp; Company, latest edition</p> <p>Sydsaeter, K. and Peter Hammond. Essential Mathematics for Economic Analysis. Prentice Hall, latest edition</p> <p>Varian, H., Intermediate Microeconomics, latest edition</p>
<p><b>INDICATIVE MATERIAL:</b> (e.g. audiovisual, digital material, etc.)</p>	<p><b>REQUIRED MATERIAL:</b> N/A</p> <p><b>RECOMMENDED MATERIAL:</b> N/A</p>
<p><b>COMMUNICATION REQUIREMENTS:</b></p>	<p>Use of appropriate academic conventions as applicable in oral and written communication.</p>
<p><b>SOFTWARE REQUIREMENTS:</b></p>	<p>Word, Excel, Maple, Mathematica</p>
<p><b>WWW RESOURCES:</b></p>	<p><a href="http://www.SSRN.com">www.SSRN.com</a></p>
<p><b>INDICATIVE CONTENT:</b></p>	<ol style="list-style-type: none"> <li>1. Economic Models <ol style="list-style-type: none"> <li>1.1. Use of economic models</li> <li>1.2. Types of functions</li> <li>1.3. Graphs</li> </ol> </li> <li>2. Equilibrium Analysis <ol style="list-style-type: none"> <li>2.1. Partial</li> <li>2.2. General</li> <li>2.3. Examples</li> </ol> </li> <li>3. Matrices <ol style="list-style-type: none"> <li>3.1. Matrix operations</li> <li>3.2. Determinants and inverses</li> <li>3.3. Cramer's rule</li> <li>3.4. Leontief's input-output model</li> </ol> </li> <li>4. Derivatives <ol style="list-style-type: none"> <li>4.1. Concept of rules of differentiation</li> <li>4.2. Partial differentiation</li> <li>4.3. Total differential and total derivatives</li> <li>4.4. Exponential and logarithmic functions</li> </ol> </li> </ol>

#### 4.5. Examples

### 5. Optimization Problems

- 5.1. Maximum and minimum values
- 5.2. Second order derivatives
- 5.3. Utility max and consumer demand
- 5.4. Least cost combination of inputs

### 6. Integration

- 6.1. Definite and indefinite integrals
- 6.2. Applications
- 6.3. Domar growth model

### 7. Dynamic Analysis

- 7.1. First-order differential equations: Application
- 7.2. First-order difference equations: Application

### 8. Mathematical Programming

- 8.1. Examples of linear program formulations
- 8.2. Simplex method
- 8.3. Duality
- 8.4. Non-linear programming: Kuhn-Tucker conditions