ECON205 INTERMEDIATE MATHEMATICS FOR ECONOMICS
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COURSE DESCRIPTION

This course covers univariate and multivariate calculus, basic matrix algebra, and optimization theory. The prerequisite for the course is Calculus; the course assumes basic familiarity with the concept of a function, the basic properties of elementary functions, and derivatives of functions with single variable. The basic calculus will be reviewed very briefly in the first or second class. Students may refer to the textbook to review the basic topics found in Chapters 1-6.

LEARNING OBJECTIVES

The objective is to provide economics students with the fundamental mathematical skills required for undergraduate economics and econometrics.

ASSESSMENT METHODS

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Class participation</td>
<td>10%</td>
</tr>
<tr>
<td>Homework</td>
<td>50%</td>
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<tr>
<td>Final examination</td>
<td>40%</td>
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<tr>
<td>Total</td>
<td>100%</td>
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There will be two kinds of homework.

1. **Group Homework (Weekly Homework 30%)**: Students are strongly encouraged to work together on the problem sets. Students can make one group (the maximum number is four), and hand in homework together, with every member’s name on it. Doing homework is a crucial learning process in this course. *Copying others’ homework will cause a serious consequence in the in-class exams.* If you make some effort doing homework, then you will get at least 9 points out of 10 points in each homework. Therefore, you would have no gains from copying others’ homework.

2. **Individual Homework (Homework Review 20%)**: In order to provide each individual student with the incentive to work on homework, there will be a review test of homework in class right before the interim recess. The questions will be very similar to those in the weekly homework.
ACADEMIC INTEGRITY

All acts of academic dishonesty (including, but not limited to, plagiarism, cheating, fabrication, facilitation of acts of academic dishonesty by others, unauthorized possession of exam questions, or tampering with the academic work of other students) are serious offences.

All work (whether oral or written) submitted for purposes of assessment must be the student’s own work. Penalties for violation of the policy range from zero marks for the component assessment to expulsion, depending on the nature of the offense.

When in doubt, students should consult the instructors of the course. Details on the SMU Code of Academic Integrity may be accessed at http://www.smuscd.org/resources.html.

CLASS TIMINGS

Class sessions are of 3-hour duration per week. There will be no presentations or case studies in this course. You are encouraged to participate in the lecture on a spontaneous or voluntary basis. You may interrupt the instructor anytime in the lecture.

OFFICE HOURS

You may use weekly office hours: (i) 2 hours of consultation session by TA when you have any question about homework; (ii) 2 hours of office hours by instructor when you have questions about the lecture or homework.

RECOMMENDED TEXT AND READINGS

1. Lecture note by the instructor: Lecture note is comprehensive and self-contained. You will be able to download it from the course website.

2. Sydsaeter, K. and Hammond, P. (Third edition), Essential Mathematics for Economic Analysis, FT-Pearson. The book by Sydsaeter and Hammond (SH) will be used for weekly homework. You may refer to the book when you want to learn what is not covered in the lecture. All the exams will be based on lecture note and homework.

WEEKLY LESSON PLAN

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Chapter</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Differentiation</td>
<td>Lecture note Chapter 6, 7 in SH</td>
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<tr>
<td></td>
<td>• Differentiability</td>
<td></td>
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<tr>
<td></td>
<td>• Chain Rule</td>
<td></td>
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<tr>
<td></td>
<td>• Continuity</td>
<td></td>
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<tr>
<td></td>
<td>• Intermediate Value Theorem</td>
<td></td>
</tr>
<tr>
<td>Week</td>
<td>Date</td>
<td>Topic</td>
</tr>
<tr>
<td>------</td>
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| 2    | 27 Aug - 2 Sep | Derivatives in Use  
• Concavity, Convexity  
• Partial Derivatives  
• Young’s Theorem  
• Total Differential | Lecture note  
Chapter 6, 7, 11 in SH |
| 3    | 3 Sep - 9 Sep | Implicit Function Theorem  
• Partial Derivatives in use  
• Chain Rules in Use  
• Implicit Function Theorem in a Single Equation: Derivation and Use  
• Homogeneous Function | Lecture note  
Chapter 12 in SH |
| 4    | 10 Sep - 16 Sep | System of Equations  
• Matrices  
• Cramer’s Rule | Lecture note  
Chapter 15, 16 in SH |
| 5    | 17 Sep - 23 Sep | Matrix Applications  
• Implicit Function Theorem in a System of Equations  
• Vector Algebra | Lecture note  
Chapter 5, 16 in SH |
| 6    | 24 Sep - 30 Sep | Integral: Present Discount Value  
Quadratic Forms | Lecture note  
Chapter 9, 10 in SH |
| 7    | 1 Oct - 7 Oct | Review of Homework (In-Class Quiz)  
Optimization without Constraint:  
• Introduction  
• Necessary Conditions | Lecture note  
Chapter 8, 13 in SH |
| 8    | 8 Oct - 14 Oct | Recess | |
| 9    | 15 Oct - 21 Oct | Optimization without Constraint:  
• Necessary and Sufficient Conditions | Lecture note  
Chapter 13 in SH |
| 10   | 22 Oct - 28 Oct | Optimization with Equality Constraint:  
• Conditions for Local Maximum or Minimum | Lecture note  
Chapter 13, 14 in SH |
| 11   | 29 Oct - 4 Nov | Optimization with Equality Constraint:  
• Conditions for Global Maximum or Minimum  
• Envelope Theorem | Lecture note  
Chapter 14 in SH |
<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>5 Nov - 11 Nov</td>
<td>Optimization with Inequality Constraint:</td>
<td>Lecture note</td>
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<tr>
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<td>- Kuhn-Kucker Conditions</td>
<td>Chapter 14 in SH</td>
</tr>
<tr>
<td>13</td>
<td>12 Nov - 18 Nov</td>
<td>Differential Equations</td>
<td>Lecture note</td>
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<tr>
<td>14</td>
<td>19 Nov - 25 Nov</td>
<td>Revision Week</td>
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<tr>
<td>15</td>
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<td>Final</td>
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