

**THE UNIVERSITY OF HONG KONG**  
**HKU Business School**

**ECON2285 – Mathematical Economics**

<b>GENERAL INFORMATION</b>	
Instructor: Dr. Jianrong Tian  Email: <a href="mailto:jt2016@hku.hk">mailto:jt2016@hku.hk</a> Office: Room 1110, K K L Building Consultation time: By appointment Pre-requisites: ECON1001/ECON1210 Introductory microeconomics Co-requisites: NA Mutually exclusive: NA  Course Website: NA Other important details: NA	
<b>COURSE DESCRIPTION</b>	
Modern economic theory treated mathematically. Topics may include: applications of optimization to choice theory, monotone comparative statics, market equilibrium and the first and second Welfare theorems, dynamic programming, uncertainty and information, game theory	
<b>COURSE OBJECTIVES</b>	
<ol style="list-style-type: none"> <li>1. To understand the interconnection of economics and mathematics.</li> <li>2. To understand optimization (both static and dynamic), the cornerstone of all modern economic theory.</li> <li>3. To understand economic theory and application.</li> <li>4. To extend analytic economic research in a methodological way.</li> </ol>	
<b>Faculty Goals</b>	
Goal 1: Acquisition and internalization of knowledge of the programme discipline Goal 2: Application and integration of knowledge Goal 3: Inculcating professionalism Goal 4: Developing global outlook Goal 5: Mastering communication skills Goal 6: Cultivating leadership	
<b>COURSE LEARNING OUTCOMES</b>	
<b>Course Learning Outcomes</b>	<b>Aligned Faculty Goals</b>
CLO1 Ability to understand the interconnection of economics and mathematics.	Goal 1
CLO2 Competence in applying the concept and various theories of optimization.	Goal 1
CLO3 Skills in analyzing problems within the economic framework.	Goals 1, 4, 5
CLO4 Proficiencies in presenting and articulating ideas effectively on economic theories.	Goals 3, 5, 6

COURSE TEACHING AND LEARNING ACTIVITIES		
Course Teaching and Learning Activities	Expected contact hour	Study Load (% of study)

T&L1. Lectures: Instructor will give lectures on major concepts and issues.	36 hours	30%
T&L2. In-class and tutorial presentation and discussion: Students are expected to present their answers and engage in discussion during lectures and tutorial meetings. Most in-depth learning takes place when students actively engage in discussions and in sharing their ideas.	12 hours	10%
T&L3. Preparation of tutorial presentation	19 hours 3	
T&L4. Consultation: Both instructor and teaching assistant hold weekly consultation hours to answer students' questions.	hours	15.8%
T&L5. Self-study.	50 hours	2.5%
		41.7%
Total	120 hours	100%

Assessment Methods	Brief Description (Optional)	Weight	Aligned Course Learning Outcomes
A1. Homework (twice)		20%	CLO 1, 2, 3, 4 CLO
A2. Mid-term tests A3. Final Exam		20%	1, 2, 3, 4
		60%	CLO 1, 2, 3, 4
	Total	100%	

#### STANDARDS FOR ASSESSMENT

##### Course Grade Descriptors

A+, A, A-	Strong evidence of superb ability to fulfill the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesis.
B+, B, B-	Strong evidence of ability to fulfill the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesis.
C+, C, C-	Evidence of adequate ability to fulfill the intended learning outcomes of the course at low levels of learning; such as describe and apply, but not at high levels of learning such as evaluate and synthesis.
D+, D	Evidence of basic familiarity with the subject.

F	Little evidence of basic familiarity with the subject.
<b>Assessment Rubrics for Each Assessment</b> (Please provide us the details in a separate file if the space here is not enough)	
<p><b>A1. Homework</b> graded according to the marks assigned to each question.</p> <p><b>A2 and A3 Midterm and Final Exam</b> Midterm and final exam are consisted of calculation and proof problems which are graded according to the marks assigned to each question.</p>	

<b>COURSE CONTENT AND TENTATIVE TEACHING SCHEDULE</b>
<p><b>Part 1: Optimization method and applications</b></p> <ul style="list-style-type: none"> <li>A. Unconstrained optimization and applications (Profit maximization)</li> <li>B. Convex set and concave functions</li> <li>C. Optimization with constraints and applications (consumer's problem)</li> <li>D. Monotone Comparative statics based on FOC and implicit function theorem</li> <li>F. Envelope Theorem (modern version)</li> </ul> <p><b>Part 2: Complementarity and applications</b></p> <ul style="list-style-type: none"> <li>A. Supermodular functions over product sets</li> <li>B. Matching Problem</li> <li>C. Monotone Comparative Statics based on complementarity</li> </ul> <p><b>Part 3: Competitive Equilibrium in Simple Economy</b></p> <ul style="list-style-type: none"> <li>A. Definition of competitive equilibrium with and without production</li> <li>B. Solve some simple toy models</li> <li>C. Pareto efficiency and First fundamental theorem of welfare economics</li> </ul> <p><b>Part 4: Uncertainty</b></p> <ul style="list-style-type: none"> <li>A. Brief review of probability theory</li> <li>B. Von Neumann-Morgenstern (VNM) Expected Utility</li> <li>C. Risk attitudes and Comparative risk attitudes</li> <li>D. Stochastic Order</li> <li>E. Insurance and portfolio choice</li> </ul> <p><b>Part 5: Game theory</b></p> <ul style="list-style-type: none"> <li>A. Normal-Form games, mixed strategies, and Nash equilibrium</li> <li>B. Solving some toy games</li> </ul> <p><b>Part 6: Dynamic Programming</b></p> <ul style="list-style-type: none"> <li>A. Basic results in Lucas and Stokey <ul style="list-style-type: none"> <li>- Optimal growth, wage search</li> </ul> </li> </ul>
<b>REQUIRED/RECOMMENDED READINGS &amp; ONLINE MATERIALS</b> (e.g. journals, textbooks, website addresses etc.)

The materials related to each part will be posted on the Moodle before lecture.

#### MEANS/PROCESSES FOR STUDENT FEEDBACK ON COURSE

Conducting mid-term survey in additional to SETL around the end of the semester

#### COURSE POLICY (e.g. plagiarism, academic honesty, attendance, etc.)

##### **Academic Conduct:**

The University Regulations on academic dishonesty will be strictly enforced! Please check the University Statement on plagiarism on the web: <http://www.hku.hk/plagiarism/>. Academic dishonesty is behavior in which a deliberately fraudulent misrepresentation is employed in an attempt to gain undeserved intellectual credit, either for oneself or for another. It includes, but is not necessarily limited to, the following types of cases:

- a. Plagiarism - The representation of someone else's ideas as if they are one's own. Where the arguments, data, designs, etc., of someone else being used in a paper, report, oral presentation, or similar academic project, this fact must be made explicitly clear by citing the appropriate references. The references must fully indicate the extent to which any parts of the project are not one's own work. Paraphrasing of someone else's ideas is still using someone else's ideas, and must be acknowledged.
- b. Unauthorized Collaboration on Out-of-Class Projects - The representation of work as solely one's own when in fact it is the result of a joint effort. Where a candidate for a degree or other award uses the work of another person or persons without due acknowledgement:
  1. The relevant Board of Examiners may impose a penalty in relation to the seriousness of the offence;
  2. The relevant Board of Examiners may report the candidate to the Senate, where there is *prima facie* evidence of an intention to deceive where sanctions beyond those in (1) might be invoked.

**Cheating** on assignments or examinations is another act of academic dishonesty. If you are caught committing cheating, you will receive an "F" grade for the subject. Furthermore, the relevant Board of Examiners may impose a penalty in relation to the seriousness of the offence; or report the candidate to the Senate, where there is *prima facie* evidence of an intention to deceive.

**Class Conduct:** Students are required to attend all classes on time. If you miss a class, it is entirely your responsibility for what you have missed. The principle is based on mutual respect in the classroom. Mobile phone and/or alarming device must be switched off or muted. No eating is allowed during class periods. Discussions and questions are encouraged but student should first inform the instructor beforehand, but not chat with others in private.

#### ADDITIONAL COURSE INFORMATION (e.g. e-learning platforms & materials, penalty for late assignments, etc.)

Students are expected to be familiar with math at the level of University Mathematics 1.

**Special Examinations**

Student enquiries and applications for special examinations will be forwarded to the School Office to be handled in a formal and consistent manner. The School and the Chief Examiner may approach individual instructors for their recommendation if necessary. Controversial cases may be further discussed in the Internal Examiners' meeting and the Board of Examiners meeting.

In general, special examinations are not granted to students taking up summer internships. Students are advised to avoid starting their internships before the end of the examination period.

By default, special examinations would be approved:

- (1) if incoming/outgoing exchange students have time clash with the next academic semesters in their home/host universities;
- (2) due to compassionate reasons; and
- (3) on extraordinary medical situation.

**Plagiarism and Misconduct**

Plagiarism and misconduct cases will be directed to the Chief Examiner and will be permanently recorded in the School for future reference.