Instructor: Stephen Ching  
Email: steve.ching@hku.hk  
Tel: 2857 8504  
Office: KK1013  
Office Hours: 3:30-4:30pm (Tuesday and Friday) or by appointment  
TA: TBA  


**Course Description**  

This course is divided into two parts. Part I of the course introduces graph theory and game theory. Graph theory is used to describe the structure of a network and game theory to understand how people behave in networks with different structures. It is expected that the first four weeks of the course will be used to cover graph theory and game theory.  

Part II of the course focuses on analyzing network structures and understanding behavior in different network structures. It covers the following topics in network economics:  

*Markets and Strategic Interaction in Networks*  

Applications of graph theory and game theory in network economics are first illustrated by matching markets, network models of markets with intermediaries, and bargaining and power in networks.  

*Information Networks*  

Graph theory is used not only to provide a systematic analysis of the structure of the Web, but also, with game theory, to help understand how link analysis, Web search, and sponsored search markets operate.  

*Network Dynamics: Population Effects*  

Two classes of reasons, information cascades and network effects, are introduced to help understand aggregate behavior in network dynamics, e.g. power laws and rich-get-richer phenomena.
Each of the above topics is expected to take 2-3 weeks.

Course Schedule

<table>
<thead>
<tr>
<th>Part I: Graph Theory and Game Theory</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 1-2</td>
<td>Graph Theory</td>
</tr>
<tr>
<td>Weeks 3-4</td>
<td>Game Theory</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part II: Topics in Network Economics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weeks 5-7</td>
<td>Markets and Strategic Interaction in Networks</td>
</tr>
<tr>
<td>Weeks 8-9</td>
<td>Information Networks</td>
</tr>
<tr>
<td>Weeks 10-11</td>
<td>Network Dynamics: Population Effects</td>
</tr>
</tbody>
</table>

* These are chapters of the following textbook.

Textbook


Reserved Topics

The course will cover the following additional topics if time permits:

*Network Dynamics: Structural Effects*

The structure of a network is used to provide an in-depth analysis of cascading behavior, which is important for understanding other network dynamics such as the small-world phenomenon and epidemics.

*Institutions and Aggregate Behavior*

It shows how the analyses developed in previous topics can be extended to address problems, such as markets and information, voting, and property right, in large social institutions.

Course Objectives

- To provide an introduction of graph theory and game theory
- To provide a systematic analysis of network structure based on graph theory
- To provide an explanation of behavior in networks with different structures based on game theory and graph theory
Intended Learning Outcomes

Upon completion of the course, students should be able to:

- Master basic graph theory and game theory
- Master a systematic analysis of network structures using graph theory
- Apply game theory and graph theory to economic problems in different networks

Alignments of Program and Course ILOs

<table>
<thead>
<tr>
<th>Program ILOs</th>
<th>Course ILOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLO1. Understanding of fundamental theories and new development in economics</td>
<td>ILO1, ILO2</td>
</tr>
<tr>
<td>PLO3. Demonstration of ability to apply economic knowledge and analytical skills to address policy and business problems</td>
<td>ILO3</td>
</tr>
</tbody>
</table>

Assessment

The assessment of the course consists of three components: homework (20%), individual term paper (30%), and final examination (50%).

Homework (20%)

There are 4-5 sets of homework. They are of equal weight and to be submitted every other week (approximately).

Individual Term Paper (30%)

Each of the students is required to submit an individual term paper of less than 3,000 words. Students can work on any topic as long as it is an application of game theory and graph theory to economic problems in networks. The term paper is due at 6:45pm on May 2, 2018 (Wednesday). Turnitin will be used to collect your term papers.

Final Examination (50%)

The final examination covers both parts of the course. The final examination is scheduled by the MEcon Office within the assessment period from May 7-12, 2018. The exact date of the final examination will be announced by the MEcon Office in due course.

Assessment and Course ILOs
<table>
<thead>
<tr>
<th>Assessment</th>
<th>Course ILOs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>ILO1, ILO2</td>
</tr>
<tr>
<td>Term Examination</td>
<td>ILO1, ILO2, ILO3</td>
</tr>
<tr>
<td>Term Paper</td>
<td>ILO2, ILO3</td>
</tr>
</tbody>
</table>