

ECON5190  
Games and Strategic Behavior (MBA & MSc Econ)  
Time: 9:00am-12:20pm Thursday  
Location: 2001 (LSK Building)

Instructor: Wooyoung Lim  
Office: LSK 6080  
Office Hours: by appointment.  
Email: wooyoung@ust.hk

## 1 Course Objective

The course demonstrates how insights of game theory can be utilized by managers to address important decisions confronting the firm. The primary focus of the analysis is on understanding how other players form their strategies and expectations in order to identify one's own best response strategy. We will utilize game theoretic reasoning to analyze issues related to entry into new markets or exit from established businesses, changing the perceptions of competitors, the extent of product differentiation and proliferation that is implied by competition, and strategies aimed at alleviating price competition among firms.

This course introduces the basic concepts of game theory. The emphasis is on the unifying perspective that game theory offers to questions in economics, business, other disciplines, and everyday life. It will enable students to view social interactions as strategic games, to use game theoretic concepts to predict behavior in these interactions and to conceive of ways in which altering the game affects social outcomes.

## 2 Prerequisite

For MSc(ECON); FT-MBA and MBA Exchange students only. ECON5110 or 5130 or an approval from the instructor.

## 3 Required Readings

1. Harvard Business School Cases: A case pack will be provided soon.
2. Lecture Note 1-6: course web at [Canvas.ust.hk](http://Canvas.ust.hk)

## 4 Reference Books on Reserve in Library

1. Dixit, Avinash, Susan Skeath, and David H. Reiley Jr. (DSR) "Games of Strategy," W. W. Norton & Company, Third Edition 2009.
2. Dixit, Avinash, Barry J. Nalebuff (D&N) "The Art of Strategy," W. W. Norton & Company, 2008.

## 5 Course Requirement and Evaluation

- Evaluation will be based upon written assignments (20%), class participation (10%), presentation (35%), and a final exam (35%).
- Assignments to be conducted in teams of minimum 4 and maximum 5 people.
- Weekly assignments will be handed out. They are due at the beginning of class the following week. It will be collected in class. Late submission is not accepted in any circumstances.
- Group assignments:
  - a. Each group will put together and present a case study. Each presentation should last **20 minutes**, with an additional **5 minutes** of class discussion led by the group. The 25 minutes requirement will be implemented **strictly**.
  - b. Each group must discuss the case analysis with Wooyoung and get some feedback, at least 2 days prior to the presentation.
  - c. Each group will work jointly on, and submit a group solution to, the four problem sets & case summary in the course. Each case summary should be 1 page length. Each question will be graded on a check plus (20 points) / check (13 pts) / check minus (5 pts) scale.
    - \* Week 1: N/A
    - \* Week 2: Problem 1-3 by Feb.16
    - \* Week 3: Problem 4-8 & Case (1,2,3) summary by Feb.23
    - \* Week 4: Problem 9-10 & Case (4,5) summary by Mar.2
    - \* Week 5: Problem 11-12 & Case (6,7) summary by Mar.9
    - \* Week 6: Problem 13 & Case (8,9) summary by Mar.16
    - \* Week 7: Case (10) summary by Mar.23
- The final exam is scheduled on **March 30, 2017 (Thursday)**, 10:00AM - 12:00Noon (2 hours) in the room **2304** (main building, **Lifts 17-18**). The final exam contains all the materials covered throughout the semester. In the case of absence at an exam due to medical reasons, the student is required to submit medical certificate issued by a registered medical practitioner. Appropriate documentation will be required for absences due to other reasons. Announcements, lecture slides, and supplementary materials (if any) will be updated onto the course website. If a student finds difficulties in the course and has any concern about the course, it is his/her benefit to contact me or the teaching assistant at the early stage.
- Office hours for the final exam will be held on March 28 (Tuesday) between 9:00AM-12:00Noon.

## 6 Course Outline (tentative, subject to change.)

### Week1 (February 9): What is Game Theory? Strategy?

- Lecture Note 1: Elements of a Game, Thinking Strategically, Sequential-move Games (DSR Chapters 1,2,3).
- Lecture Note 2: Simultaneous-move Games (DSR Chapter 4)  
[Classroom Experiment] Guessing Game

### Week2 (February 16): Let me think about you who is thinking about me who is....

- Lecture Note 3: Best-response Curve Analysis (DSR Chapter 5, 6)
- Lecture Note 4: Mixed-strategy (reference only)  
[Classroom Experiment] Centipede Game, Ultimatum Bargaining

### Week3 (February 23): I do not know much about you... What should I do?

- Lecture Note 5: Games with Incomplete Information (DSR Chapter 9)  
[Classroom Experiment] Pure-Coordination Game, Assurance Game

Case 1. Entry Barriers (A): Deep Pockets [9-190-101]

Case 2. Sequential Entry [9-190-102]

Case 3. Selling Durable Goods [9-190-110]

### Week4 (March 2): Do I trust you? Can I?

- Lecture Note 5: Games with Incomplete Information (DSR Chapter 9)  
[Classroom Experiment] Monty Hall Game.

Case 4. Judo and the Art of Entry [9-794-103]

Case 5. Bitter Competition: The Holland Sweetener Company vs. NutraSweet (A) [9-794-079] & The Fog of Business [9-793-098]

### Week5 (March 9): What if I meet you again tomorrow?

- Lecture Note 6: The Prisoners' Dilemma and Repeated Games (DSR Chapter 11)
- Chanters' Dilemma (Reading material will be provided.)

Case 6. Bitter Competition: The Holland Sweetener Company vs. NutraSweet (A) [9-794-079] & Signaling Costs [9-793-125]

Case 7. Competition and Product Variety [9-190-100]

### Week6 (March 16): Applications

Case 8. Product Proliferation and Preemption [9-190-117] & The Breakfast Cereal Industry: The 1972 Antitrust Complaint [9-190-116]

Case 9. Competition and Compatibility: Mix and Match [9-190-112]

### **Week7 (March 23): Advanced Topics in Game Theory**

Case 10. Olympian Competition: Bidding For Olympic Television Rights [IB50-PDF-ENG]

– Introduction to some advanced topics in Game Theory (Auction, Matching, Experimental Economics, and so on.)

– Review, Q/A

**Final Exam: March 30 (Thursday) 10:00am-12:00noon, Room 2304 (main building, Lifts 17-18).**

## **7 HBS Cases for Presentations and Some Key Words**

- Entry Barriers: Net Present Value, Sunk Cost, Backward Induction
- Sequential Entry / Selling Durable Goods: Backward Induction, Game Tree
- Judo Economics: Backward Induction, Game Tree
- Fog of Business: Backward Induction, Game Tree, Asymmetric Information
- Signaling Costs: Backward Induction, Game Tree, Asymmetric Information
- Competition and Product Variety: Simultaneous-Move Game, Best Response Analysis
- Product Proliferation: Backward Induction, Game Tree, Application to Law and Economics
- Competition and Compatibility: Simultaneous-Move Game, Best Response Analysis
- Olympian Competition: Games of Incomplete Information

## **8 Schedule of Group Presentations**

Week3 Group1 (Entry Barriers), Group 2 (Sequential Entry & Selling Durable Goods)

Week4 Group3 (Judo Economics), Group4 (Fog of Business + Bitter Competition)

Week5 Group5 (Signaling Costs + Bitter Competition), Group6 (Competition and Product Variety)

Week6 Group7 (Product Proliferation & Cereal Industry), Group8 (Competition and Compatibility)

Week7 Group9 (Olympian Competition: Bidding For Olympic Television Rights)

## **9 Learning Environment**

Matured conduct in classroom is the requirement for this course. Distractive behaviors such as use of cell phone, instant messaging and chatting are not tolerated. Violation of this rule will result in significant deduction of points from student's grade. Please refer to following website for the guideline for good learning environment:

[http://www.ust.hk/vpaa0/conduct/good\\_learning\\_experience.pps](http://www.ust.hk/vpaa0/conduct/good_learning_experience.pps).

## **10 Academic Integrity Policy**

Honesty and Integrity is central value in HKUST. Please be aware of the importance and maintain high standard of honesty in the problem sets and examinations in this course. Familiarize yourself to the university rules and the HKUST academic honor code by visiting following website: <http://www.ust.hk/vpaa0/integrity/>.

## A Guideline for Case Analysis

### 1. Entry Barriers (A); Deep Pockets

- (a) Formulate a game between the incumbent and the entrant as follows: (1) in each quarter, the entrant decides whether to enter or not; (2) if the entrant enters, the incumbent decides whether to fight or not in the given quarter; (3) the two firms continue to compete for the next quarter as long as the entrant enters the market.
- (b) Explain how to derive Figure 1 in the case.
- (c) As a potential entrant into the industry how do you assess the possible reaction of the incumbent firm to your entry? Do you expect to be accommodated?

### 2. Sequential Entry

- (a) Do you expect two incumbent firms to deter a third potential entrant?
- (b) Do you expect a single incumbent firm to deter a second potential entrant?
- (c) How many firms will be established in this industry

### 3. Selling Durable Goods

- (a) What is the pricing policy of the monopoly supplier of the durable good to maximize the profit?
- (b) What are the respective sales for January and July under the profit-maximizing pricing policy?
- (c) What if there are two identical suppliers competing each other? (Assume that two suppliers simultaneously choose the prices in January and July.)

### 4. Judo Economics

- (a) Suppose that: (i) each buyer has a willingness-to-pay of \$200 for one unit of either the incumbent's or the entrant's product; and (ii) both incumbent and entrant have a \$100 unit cost of serving buyers. Formulate a strategy for the entrant. How much money can the entrant make?
- (b) Now suppose that: (i) each buyer has a willingness-to-pay of \$200 for one unit of the incumbent's product and \$160 for one unit of the entrant's product; and (ii) the incumbent has a \$100 unit cost and the entrant a \$120 unit cost. Formulate a new strategy for the entrant. How much money can the entrant now make?
- (c) Finally, suppose that: (i) each buyer has a willingness-to-pay of \$200 for one unit of either the incumbent's or the entrant's product; and (ii) the incumbent has a \$120 unit cost and the entrant an \$80 unit cost. Formulate a new strategy for the entrant. How much money can the entrant make this time?

5. Bitter Competition: The Holland Sweetener Company vs. NutraSweet
  - (a) Background Information to analyze the following two cases: *The Fog of Business* and *Signaling Costs*.
6. The Fog of Business
  - (a) Should player E1 enter market 1?
  - (b) In answering 1 above, what assumptions are you making as to what E1 believes about the players? rationality, about what the players believe about one another's rationality, and so on?
  - (c) How does your answer change if there is a small probability that the incumbent is irrational?
7. Signaling Costs
  - (a) Might player A want to signal its cost to player B?
  - (b) Is there a way for it to do so? In answering, pay particular attention to the question of the credibility of any signal that A might send B. (**Hint:** Note that if both firms are established in the market it is the firm with the lower unit cost that will dominate the market. It sets a price slightly lower than the unit cost of the higher cost producer.)
8. Competition and Product Variety
  - (a) Which product types will firms A and B choose to make? Try to provide an intuition for your answer.
  - (b) Now suppose that firm A enters the market first and wishes to try to deter subsequent entry by firm B. Which product type should A decide to make?
  - (c) Now assume that there is only one firm, A for instance, in the market. Which product type will A decide to make?
  - (d) Suppose that the marginal psychic costs of the consumers rise. Which product types will the firms now choose? Will the resulting prices and profits be lower, higher, or the same as before?
9. Product Proliferation and Preemption
  - (a) Suppose that firm A is the only firm in the market and it anticipates no entrants in the future. How many products should A introduce and where should these be positioned?
  - (b) Suppose that a potential entrant, firm B, decides to enter the market with a single product. Given A's strategic choice above, should B enter and, if so, where should it position itself?

- (c) Now suppose A were to introduce two products before B's entry into the market. By suitably positioning these products can A make B's entry unprofitable? Is it worthwhile for A to do so?
- (d) Next suppose that firms can withdraw products from the market. How much does this affect your answer to question (c) above?

10. Competition and Compatibility: Mix and Match

- (a) Would the firms prefer to make compatible or incompatible systems? Be prepared to defend your answer at an intuitive level.

11. Olympian Competition

Consider the following case: A seller auctions off an item. The seller's utility from the item is normalized to be 0. There are two bidders, 1 and 2. For  $i = 1, 2$ , bidder  $i$ 's value  $v_i$  is independent and equally likely to be 2 or 3. Each bidder **privately** observes his value and bids 0, 1, 2, or 3.

- (a) Consider the first-price sealed-bid auction. Show bidding one's own value is not an equilibrium.
- (b) In the first-price auction, find a symmetric pure strategy Nash equilibrium in which every bidder's bid is increasing in his value.
- (c) Consider the second-price sealed-bid auction. Is the strategy you found in (b) still an equilibrium?
- (d) In the second-price auction, show bidding one's own value is an equilibrium.
- (e) Compare the expected revenues of the seller from the first-price and second-price auctions.
- (f) Is it possible to increase the revenue by setting minimum bids?
- (g) Is it possible to increase the revenue by having multiple rounds of bids?