

## **Advanced Microeconomics (Fall term+Spring term)**

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Class Times and Locations: TBA

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### **Section 1. General information about the course**

The course is comprised of two parts: the first part (Fall term) serves as an introduction to advanced microeconomics and is primarily designed for those students that have the Bachelors' Degree in other field. This part examines how economic decisions are made by households and firms, and how they interact to determine the quantities and prices of goods and the allocation of resources. It also investigates the microeconomic policy and the role of government in allocating resources.

The second part (Spring term) presents some formal techniques used in economic research as well as critical perspectives and possible alternatives. Topics include theory of the consumer and the firm, uncertainty, general equilibrium theory and welfare economics, a formal treatment of game theory, public goods, externalities, asymmetric information and mechanism design.

### **Section 2. Course goals, learning objectives, expected learning outcomes**

The objectives of the course are:

- to provide students with the knowledge of core concepts and models in the field of microeconomics;
- to provide students with the knowledge of basic microeconomic models' assumptions, internal logic and predictions, grounding the explanations on intuitive, graphical and analytical approaches;
- to develop students' ability to apply the knowledge acquired to the analysis of specific economic cases, recognizing proper framework of analysis and constructing and analyzing adequate economic model within this framework.

Prerequisites: the first part requires knowledge of calculus and some basic tools of constrained optimization (Lagrangian function).

The second part requires prior familiarity with multivariate calculus, constrained optimization, probabilities theory, abstract notation, reasoning and proof making.

### Section 3. Course Outline

№	Topic/Focus /Activity	Week	Course format			Readings
			lectures	classes	self-study	
	Part I: Fall term					
1	Consumer theory: <ul style="list-style-type: none"> <li>▪ preferences and utility, budget constraint, consumer choice</li> <li>▪ demand and comparative statics, Slutsky decomposition</li> <li>▪ choice under in-kind income, labour supply and intertemporal choice</li> <li>▪ consumer surplus</li> </ul>	1-3	12	6	18	P&R Chs. 3-4, 14.2 V. Chs. 2-10, 14
2	Uncertainty <ul style="list-style-type: none"> <li>▪ contingent commodities</li> <li>▪ expected utility and attitude toward risk</li> <li>▪ choice under uncertainty</li> <li>▪ demand for insurance</li> <li>▪ demand for risky asset</li> <li>▪ price of information</li> </ul>	4-5	6	4	10	P&R Ch. 5 V. Ch. 12
3	Producer theory <ul style="list-style-type: none"> <li>▪ technologies and their properties</li> <li>▪ cost minimization (SR and LR)</li> <li>▪ profit maximization and firm's supply</li> </ul>	5-7	8	4	12	P&R Chs. 6-8 V. Chs.18-22
4	Perfectly competitive market <ul style="list-style-type: none"> <li>▪ market demand</li> <li>▪ industry supply</li> <li>▪ partial equilibrium and efficiency</li> <li>▪ government policies analysis</li> </ul>	7-9	8	4	12	P&R Chs. 8-9, 14.1 V. Chs. 15-16, 23
5	Monopoly and monopolistic behavior <ul style="list-style-type: none"> <li>▪ pure monopoly</li> <li>▪ inefficiency and regulation</li> <li>▪ monopsony</li> <li>▪ price discrimination (perfect discrimination, market segmentation, example of second-degree price discrimination)</li> </ul>	9-10	8	4	12	P&R Chs. 10-11, 14.3-14.4 V. Chs.24-25

6	<p>Strategic interactions</p> <ul style="list-style-type: none"> <li>▪ basic concepts of game theory (dominant strategies, Nash equilibrium, dynamic games and subgame perfect Nash equilibrium)</li> <li>▪ simultaneous quantity competition (Cournot model)</li> <li>▪ first-mover advantage in Stackelberg model</li> <li>▪ price competition (Bertrand model)</li> </ul>	11-12	10	4	14	P&R Chs. 12-13 V. Chs.27-29
7	<p>Externalities and public goods</p> <ul style="list-style-type: none"> <li>▪ externalities and efficiency loss</li> <li>▪ regulation (direct regulation, taxes/subsidies, tradable permits; internalization, property rights and Coase theorem)</li> <li>▪ common property resources</li> <li>▪ public goods and efficiency</li> <li>▪ free riding problem</li> </ul>	13-14	6	4	10	P&R Ch. 18 V. Chs. 34, 36
8	<p>Asymmetric information</p> <ul style="list-style-type: none"> <li>▪ hidden characteristics and adverse selection</li> <li>▪ private and government response</li> <li>▪ hidden action and moral hazard problem</li> </ul>	15-16	6	2	8	P&R Ch. 17 V. Ch. 37 Akerlof G., The market for lemons: Quality uncertainty and the market mechanism, QJE, 89, 488-500, 1970
	Part II: Spring term					
9	<p>Consumer choice and demand theory:</p> <ul style="list-style-type: none"> <li>▪ preferences and utility, existence of utility function</li> <li>▪ utility maximization, expenditure minimization and duality in consumer theory</li> <li>▪ integrability problem</li> <li>▪ welfare evaluation of price changes</li> <li>▪ aggregation</li> </ul>	1-2	6	3	10	MWG Chs. 2-4  Chipman J. and J. Moore, Compensating variation, consumer's surplus and welfare, AER, 70, 933-948, 1980.

10	<p>Production:</p> <ul style="list-style-type: none"> <li>▪ production sets</li> <li>▪ profit maximization and cost minimization</li> <li>▪ duality in production</li> <li>▪ aggregation</li> </ul>	2-3	6	3	10	MWG Ch. 4
11	<p>General equilibrium</p> <ul style="list-style-type: none"> <li>▪ exchange economy</li> <li>▪ production economy</li> <li>▪ existence of general equilibrium</li> <li>▪ welfare theorems</li> <li>▪ foundations for competitive equilibrium: core</li> </ul>	4-5	8	4	12	MWG Chs. 15-18
12	<p>Choice and general equilibrium under uncertainty</p> <ul style="list-style-type: none"> <li>▪ preferences over lotteries, independence axiom and expected utility function</li> <li>▪ risk aversion and Pratt's theorem</li> <li>▪ comparative statics of optimal portfolio</li> <li>▪ contingent commodities</li> <li>▪ Arrow-Debreu equilibrium</li> <li>▪ Sequential trade and Radner equilibrium</li> </ul>	6-8	10	5	12	<p>MWG Chs. 6, 19</p> <p>Rothschild M., Stiglitz J., Increasing risk I: A definition, Journal of Economic Theory, 2, 225-243, 1970.</p>
13	<p>Game theory</p> <ul style="list-style-type: none"> <li>▪ Static games with complete information: dominance, preferences and utility, budget constraint, consumer choice</li> <li>▪ Extensive Form Games with Perfect Information: subgame perfect Nash equilibrium</li> <li>▪ Static games with imperfect information: Bayesian Nash equilibrium</li> <li>▪ Extensive Form Games with imperfect/incomplete information: perfect Bayesian and sequential equilibria</li> </ul>	8-10	10	5	12	<p>MWG Chs. 7-9</p> <p>Osborn M.J., An Introduction to Game Theory, Oxford University Press, 2009</p>

14	Externalities and Public goods <ul style="list-style-type: none"> <li>▪ Market failures</li> <li>▪ Regulatory responses to market failures</li> <li>▪ Private provision of public goods</li> <li>▪ Lindahl equilibrium</li> <li>▪ Political mechanisms and dilemmas of public goods provision</li> </ul>	12-15	16	8	20	MWG Ch. 11
15	Asymmetric information <ul style="list-style-type: none"> <li>▪ Market equilibria with adverse selection</li> <li>▪ Asymmetric information and market signaling</li> <li>▪ Persistent disequilibrium on labor and credit markets</li> <li>▪ Market screening</li> </ul>	16-19	16	8	20	MWG Chs. 13-14
16	Mechanism Design <ul style="list-style-type: none"> <li>▪ Mechanism design problem</li> <li>▪ Implementation in dominant strategies</li> <li>▪ Bayesian implementation</li> <li>▪ Groves-Clarke mechanisms</li> <li>▪ Auctions and bilateral trade</li> </ul>	20-21	8	4	12	MWG Ch. 23
	Total		144	72	202	

### Description of course methodology and forms of assessment to be used

While teaching the course the following teaching methods and forms of study and control are used:

- ⇒ lectures (4 hours a week);
- ⇒ classes (2 hours a week);
- ⇒ written home assignments;
- ⇒ written in-class quizzes;
- ⇒ self-study;
- ⇒ teachers' consultations;
- ⇒ written tests

### Assessment and grade determination for the fall term:

- Average mark for quizzes [25%]
- Test 1 [30%]
- Test 2 [45%]

### Assessment and grade determination for the Spring term:

- Average mark for home assignments [30%]
- Midterm test [10%]
- Closed-book exam [60%]

**Final course grade** coincides with the Spring term grade.

### Section 4. Texts, readings and other informational resources

#### 1. Required readings:

Varian Hal R., *Intermediate Microeconomics: A Modern Approach*, W. W. Norton & Company; Eighth Edition edition, 2009 [V]

Pindyck Robert S., Daniel L. Rubinfeld, *Microeconomics*, 8th Edition, Pearson Series in Economics, 2013 [P&R]

Mas-Colell A., M.D. Whinston, J.R. Green, *Microeconomic Theory*, New York, Oxford University Press, 1995 [MWG]

#### 2. Additional readings

Varian H., *Microeconomic Analysis*, 3rd edition, W.W. Norton & Company, New York, London, 1992.

Osborn M.J., *An Introduction to Game Theory*, Oxford University Press, 2009.

Academic papers are recommended by the lecturer during the course.

### Section 5. Examination/Evaluation

#### Fall term sample test questions

##### 1. Short questions

(a) "Risk-loving person always gambles." True or false? (Provide a proof if you think that the statement is correct and propose a counterexample otherwise)

(b) Consider a firm with the following cost function  $C(Q) = Q^2 + 3Q + 25$ . Find the long-run supply and the short-run supply of the firm, under the assumptions that the total cost function is the same in the long and in the short run, but the fixed cost is sunk in the short run.

(c) Consider a perfectly competitive industry. Is it true that a per unit subsidy increases economic efficiency?

(d) A person responds to increase in the rate of interest by first increasing his saving and then (with further increases in the interest rate) reducing his saving. Is he necessarily irrational? Explain.

(e) If insurance companies cannot observe the type (riskiness) of potential insurance policyholders, the usual competitive market supply logic of selling more insurance packages at a higher price does not always hold. Is this

true or false? Explain your answer.

(f) With an external cost in production, is society clearly better-off under perfect competition than under a monopoly in that industry?

2. Consider an industry with inverse market demand  $P(Q) = 22 - Q$ . There are two firms: firm A has cost function  $C_A(q_A) = 2q_A$  and firm B has cost function  $C_B(q_B) = 6q_B$ .

(a) Find the Cournot equilibrium. Illustrate graphically.

(b) Now consider a three-stage game, where firm A moves first, then at second stage firm B observes the output of firm A and chooses its own output, finally at stage 3 firm A can change its mind about how much to produce and makes a final output decision. Find equilibrium. Compare the resulting profits with part (a) and explain the difference. Provide graphical solution using diagram from (a).

(c) Calculate the value of deadweight loss in (a) and (b). Compare and explain the reasons for inefficiency.

3. A firm that specializes in import of used cars decided to insure its cargo. At present the assets of the firm are valued at \$1 million (you may think that the wealth of the firm's owner is equal to the value of the firm's assets). The value of the cargo is \$100 thousands. Suppose that utility function of the firm's owner is  $u(w) = -e^{-bw}$ , where  $b > 0$  and  $w$  stands for his wealth.

(a) It was observed that the firm purchased full insurance against the losses of its cargo and \$5000 was paid for this insurance contract. How does this firm assess the probability of an accident?

(b) Suppose that probability of an accident is 1. Assume that insurance company is risk neutral and has zero operation cost. Suppose that insurance contract specifies the insurance coverage denoted by  $X$  and the price of the contract  $P$  (the sum paid by the cargo owner to the insurance company). Illustrate all mutually beneficial contracts in contingent commodities space.

Denote by  $I$  if the insurance market is monopolized and monopolist proposes a

(c) Suppose that the insurance company considered in (b) is the only company that is willing to insure this cargo. Find the optimal insurance contract offered by this monopolist. Provide both graphical and analytical solutions. Explain the result intuitively.

### Spring term sample test and exam problems

1. Consider a perfectly competitive firm with production function  $f(z_1, \dots, z_{N-1})$  increasing in each factor of production. Suppose that due to financial crises this firm faces binding liquidity constraint and as a result its objective is total revenue (rather than profit) maximization subject to fixed budget  $C$ . Is it true that firm's total revenue function  $TR(p, w, C)$  is:

(a) quasiconvex with respect to factor prices  $w$ ?

(b) increasing in  $C$ ?

2. Consider an exchange economy with two agents (A and B). Agent A has a financial asset that can either bring \$3 or nothing with equal probabilities. Agent B has another financial asset that brings either \$3 with probability 0.5 or nothing. The returns of the two assets are independent. These assets are infinitely divisible and agents can freely trade with each other. Both agents have preferences represented by EUF with elementary utility  $u^A(w) = w$  and  $u^B(w) = \ln(1 + w)$ , respectively, where  $w$  is wealth in \$.

- (a) Find interior equilibrium.
- (b) Show that by combining their assets the individuals can achieve a Pareto improvement over the equilibrium allocation from part (a).
- (c) Explain, why equilibrium in this model is not Pareto efficient. How the conditions of the trade should be modified to guarantee efficiency of equilibrium allocation?

3. Consider continuum of individuals with identical elementary utility functions  $u(x)$  such that  $u(0) = 0$ ,  $u'(x) > 0, u''(x) < 0$  for all  $x > 0$ . Each individual has initial wealth  $w$ ; but it can be lost with probability  $p$ , which is distributed across these individuals with distribution function  $F(p)$ . Each agent knows his probability of accident. Suppose that insurance market is perfectly competitive and insurance companies are risk-neutral and offer only full insurance contracts.

- (a) Describe the insurance market equilibrium under symmetric information, i.e. when probability of accident is known by both individuals and insurance companies.
- (b) Describe the equilibrium under asymmetric information, when each individual knows his probability but insurance companies have information about distribution function  $F(p)$  only. Under what condition this equilibrium will result in Pareto-efficient allocation of risk between individuals and insurance companies?
- (c) Let  $F(p_L) = \pi, F(p_H) = 1 - \pi$  under some  $p_L, p_H \in [0,1], p_L \leq p_H, \pi \in [0,1]$ . Describe the asymmetric information equilibrium for any possible values of  $p_L, p_H, \pi$ , assuming  $u(x) = \sqrt{x}$ .

4. Consider a perfectly competitive labour market with workers that differ in productivity  $\theta$ , where  $\theta \in [\underline{\theta}, \bar{\theta}]$  with distribution function  $F(\theta)$ ,  $f(\theta) \equiv F'(\theta) > 0, \forall \theta \in [\underline{\theta}, \bar{\theta}]$ . Type (productivity) is a private information of the worker. Every agent independently from others with probability  $p \in (0,1]$  gets a chance to reveal the type  $\theta$  to all other market participants.

- (a) Characterize the resulting equilibrium. What can you say about its existence and uniqueness?
- (b) How does the set of agents that signal their type change with the growth of  $p$ ?

5. Two risk-neutral entrepreneurs need \$1 loan each to finance his/her investment project. A loan contract specifies an amount  $r > 1$ , that is supposed to be repaid to the bank (interest payment is included). The first entrepreneur has full loan liability, i.e. in case of low return from the investment project he guarantees the payment from his own wealth. The second entrepreneur has limited liability as he has no own assets, as a result the bank gets the minimum of  $r$  and the gross return from investment project. Gross return from investment for each entrepreneur is given by  $2\xi\sqrt{e}$ , where  $e \geq 0$  is the monetary value of entrepreneur's efforts and  $\xi$  – random shock with distribution  $F(x)$  for  $x \in [0, \bar{\xi}]$ .

- (a) Assuming that loan is given before the resolution of uncertainty but the effort level is chosen after the resolution of uncertainty, what is the level of efforts for each realization of the shock  $\xi$ ?
- (b) Is the probability that gross return from investment will exceed the loan payment higher for the first or second entrepreneur?
- (c) Under what values of  $r$  the first entrepreneur will take the loan? Under what values of  $r$  the second entrepreneur will take the loan? Under what values of  $r$  the bank is willing to provide the loan to the first type entrepreneur? second type?
- (d) If the effort levels are chosen before the resolution of uncertainty, will the first entrepreneur choose lower or higher level than the second one?

## **Grading system and how both the course and final test will be graded**

Written tests and exam are graded out of 100 points. Then the results for the written test, home assignments/ quizzes are used to calculate the final mark using the weights specified in section 3 and the resulting mark is converted into 10-points scale.

## **Make-up policies and form of the make-up**

If a student didn't attend Test 1 in the Fall term and the medical document is provided to the study office in time then the weight of this test is transferred to the Test 2 so that the formula for the first semester (Fall term) in this case is

- Average mark for quizzes [25%]
- Test 2 [75%]

If a student didn't attend Test 2 in the Fall term and the medical document is provided to the study office in time then he can write Test 2 (a different version of the test) on other day (the same for all students missing Test 2). If a student didn't attend this Test for the second time he/she gets zero score for Test 2 (even if the medical document is provided). If a student doesn't attend the midterm test in the Spring term or doesn't attend a quiz or doesn't submit a home assignment in time then he/she gets zero score for the corresponding activity.

If the Fall term mark is below 4 out of 10 then the student can sit one written re-take exam (Commission) in the end of January/beginning of February set in accordance with the HSE's [Internal Regulations](#). This exam covers all the material studied in the Fall term.

If a student fails the Spring term (i.e. final mark in the Spring term is less than 4 out of 10) than the written retake exam takes place in September. This exam covers the material studied in the Spring term.

## **Policies on late work**

Late home assignments are marked but are not counted for the average mark for home assignments.

## **Section 6. Academic Integrity**

The Higher School of Economics strictly adheres to the principle of academic integrity and honesty. Accordingly, in this course there will be a zero-tolerance policy toward academic dishonesty. This includes, but is not limited to, cheating, plagiarism (including failure to properly cite sources), fabricating citations or information, tampering with other students' work, and presenting a part of or the entirety of another person's work as your own. HSE uses an automated plagiarism-detection system to ensure the originality of students' work. Students who violate university rules on academic honesty will face disciplinary consequences, which, depending on the severity of the offense, may include having points deducted on a specific assignment, receiving a failing grade for the course, being expelled from the university, or other measures specified in HSE's [Internal Regulations](#).