
COURSE SYLLABUS

FOR FULL-TIME UNDERGRADUATE PROGRAMS

(Issued under Decision No.1380/QĐ-ĐHKTQĐ on 15/8/2016 by the University President)

1. COURSE NAME: MATHEMATICAL ECONOMIC MODELING 1

Code: TOKT1104

Number of Credit: 3

2. DEPARTMENT IN CHARGE OF INSTRUCTION:

Office: *Location

Office Hours: *Times & Days

Office Telephone: *Phone Number

3. PRE-REQUISITE:

Advance Mathematics 2, Microeconomics 1, Macroeconomics 1, Theory of Finance and Monetary 1

4. COURSE DESCRIPTION:

Subjects of research in economics are diverse and complex in terms of both scales and relationships. Methods of mathematical modeling, with logical arguments, are widely used in economic research to realize and analyze economic research goals.

The complex economic relationship is described in modeling methods with the use of mathematical language in an appropriate way. The mathematical economic models and methods are increasingly useful, especially with the support of other sciences such as mathematics, management science, and information technology.

Based on mathematical economic models we can build scenarios and analyze the situation with the advantage of mathematical reasoning, which help to propose policies.

Using the experimental data we would estimate the parameters of models. In economic management, estimated parameters help find the answer to support decision making.

Mathematical economic models are varied and plentiful, resulting in a range of classification criteria. Based on the structural features of the model as well as the tools this subject divides the model into layers corresponding to sections and chapters.

5. COURSE OBJECTIVES:

- Equip knowledge about modeling, established skills and technical analysis of economic issues through the use of mathematical economic models.
- Formalize the basics of microeconomics, macroeconomics by mathematical economic models, which assists qualified students in acquiring modern knowledge in economics.
- Create premise basis for econometric models, data analysis and knowledge to prepare for higher education.

6. COURSE CONTENTS:

TENTATIVE SCHEDULE

<i>No</i>	<i>Contents</i>	<i>Total hours</i>	<i>In details</i>		<i>Notes</i>
			<i>Theory</i>	<i>Practice, Discussion, Exams</i>	
1	Chapter 1	10	8	2	
2	Chapter 2	8	6	2	
	Chapter 3	12	8	4	
	Chapter 4	15	10	3+2	
	Total	45	32	13	

CHAPTER 1 - MATHEMATICAL ECONOMIC MODEL METHOD

Chapter 1 introduces the basic knowledge of modeling in economics, including overview of concepts, methodologies, tools, basic mathematics, and methods of application of models

1.1 Structure of mathematical economic models

1.1.1 Concepts and classification of mathematical economic models

1.1.2 Economic variables and relationships

1.2 Model solving

1.2.1 Concept

1.2.2 Presentation of model solution

1.3 Static analysis of mathematical economic model

1.3.1 Absolute effect analysis

1.3.2 Relative effect analysis

1.3.3 other analysis

1.4 Process of model using

1.4.1 Modelization process

1.4.2 Estimation and simulation models

Textbooks

1. Hoang Dinh Tuan, Bui Duong Hai, Cao Xuan Hoa, and Hoang Bich Phuong, 2014, *Theory of Mathematical Economic Modeling*, NEU publisher, Chapter 1.
2. Lancaster K. (1984), *Mathematics in Economics*, NXB KHKT.
3. Allen R.D (1959), *Mathematical Economics*, Martin's Press INC, New York.
4. Chiang A.C (2010), *Fundamental Methods of Mathematical Economics*, McGraw Hill.
5. Chris Birchenhall, Paul Groot (1984), *Mathematics for Modern Economics*, Philip Allan.

CHAPTER 2 - OVERVIEW OF STATIC OPTIMAL MODELS IN ECONOMICS

The first important model class is the static optimal model, in which the factors are considered relatively stable over time. This chapter introduces basic concepts and representation of the economic optimum model. The concept of agent, choice, representation and modeling solution method will be researched, preparing for models in Chapters 3 and 4.

2.1. Elements of the static optimal model

2.1.1 Economic agents and the optimal choice

2.1.2 Structure of static optimal model: variable, preference, objective function

2.2. Presentation of the static optimal model

2.2.1 Common functions and properties

2.2.2 Planning problem - The basic assumption

2.3. Model solution

2.3.1 Solution for one-target model

2.3.2 Solution of multi-target model: Pareto optimum

2.4. Static analysis

2.4.1 The effect of parameter to solution

2.4.2 Particular cases

Textbooks

1. Hoang Dinh Tuan, Bui Duong Hai, Cao Xuan Hoa, and Hoang Bich Phuong, 2014, *Theory of Mathematical Economic Modeling*, NEU publisher, Chapter 2.
2. Arrow K., Hahn F. (1971). *General Competitive Analysis*, San Francisco Holden Day.
3. Arrow K., Enthoven A.C. (1961). *Quasi-concave Programming*, Econometrica, Oct.
4. Chiang A.C (2010). *Fundamental Methods of Mathematical Economics*, McGraw-Hill.

5. Chris Birchenhall, Paul Grout (1984). *Mathematics for Modern Economics*, Philip Allan.
6. Dixit A.K (1991). *Optimization in Economic Theory*, Oxford University Press.
7. Varian H.R (1992). *Microeconomic Analysis*, Norton Company New York.

CHAPTER 3 - MODEL OF HOUSEHOLD BEHAVIOR

Households is a key agent (subject) of the economy. This chapter refers to the behavior of household consumers to optimize purposes. Household behavior is considered in terms of two main problems: maximizing utility subject to restricted budget and minimizing spending. It also refers to the duality of these two problems, which could help to recover behavior functions based on synthesis functions.

- 3.1. Modeling consumer behavior of households
 - 3.1.1 Modeling consumer preferences
 - 3.1.2 Common utility functions
- 3.2. Maximize utility model
 - 3.2.1 Models
 - 3.2.2 Indirect utility function and Marshallian demand function
- 3.3. Minimize spending model
 - 3.2.1 Models
 - 3.2.2 Expenditure function and Hicksian demand function
- 3.4. Analysis of result function
 - 3.4.1 The relationship between the result function
 - 3.4.2 Analysis Marshallian demand
 - 3.4.3 Slutsky's equation and matrix
- 3.5. Duality and recoverability of the model

Textbooks

1. Hoang Dinh Tuan, Bui Duong Hai, Cao Xuan Hoa, and Hoang Bich Phuong, 2014, *Theory of Mathematical Economic Modeling*, NEU publisher, Chapter 3.
2. Arrow K., Hahn F. (1971). *General Competitive Analysis*, San Francisco Holden Day.
3. Chiang A.C (2010). *Fundamental Methods of Mathematical Economics*, McGraw-Hill.
4. Daniel McFadden, Melvyn Fuss (1978). *Contributions to Economic Analysis*, North-Holland Publishing Company.
5. Dixit A.K (1991). *Optimization in Economic Theory*, Oxford University Press.
6. Geoffrey Jehle, Philip Reny (2011). *Advanced Microeconomics Theory*, Third Edition, Prentice Hall.

7. T. Atkinson, J. Stiglitz (1980). *Lectures on Public Economics*, McGraw Hill.
8. Varian H.R (1992). *Microeconomic Analysis*, Norton & Company New York.

CHAPTER 4 - MODEL OF FIRM BEHAVIOR

Chapter 4 refers to the behavior of firms in the economy. Firm behavior is presented by two optimal models: minimizing costs and maximizing profit. The cost minimizing model results in the cost functions of firm. The profit maximizing model results in supply functions. The profit maximization model is divided into two cases: perfect competition and monopoly.

4.1. Modeling firm behavior

4.1.1 Presentation of firm behavior

4.1.2 Modeling technology - Production function

4.2. Common production functions

4.3. Cost analysis model

4.3.1 Minimize costs model

4.3.2 Derivative functions

4.4. Duality and recoverability of the model

4.4.1 Duality in production behavior

4.4.2 Theorems of duality and recoverability

4.5. Profit maximization model in perfectly competitive

4.5.1 Models

4.5.2 Profit and supply functions

4.6. Profit maximization model in monopoly

4.6.1 Market demand

4.6.2 Models

4.6.3 Comparison and measurement of monopoly

4.6.4 Price and advertising strategies

Textbooks

1. Hoang Dinh Tuan, Bui Duong Hai, Cao Xuan Hoa, and Hoang Bich Phuong, 2014, *Theory of Mathematical Economic Modeling*, NEU publisher, Chapter 4.
2. Arrow K., Hahn F. (1971). *General Competitive Analysis*, San Francisco Holden Day.
3. Chiang A.C (2010). *Fundamental Methods of Mathematical Economics*, McGraw-Hill.
4. Daniel McFadden, Melvyn Fuss (1978). *Contributions to Economic Analysis*, North-Holland Publishing Company.
5. Dixit A.K (1991). *Optimization in Economic Theory*, Oxford University Press.

6. Geoffrey Jehle, Philip Reny (2011). *Advanced Microeconomics Theory*, Third Edition, Prentice Hall.
7. T. Atkinson, J. Stiglitz (1980). *Lectures on Public Economics*, McGraw Hill.
8. Varian H.R (1992). *Microeconomic Analysis*, Norton & Company New York.

7. REQUIRED TEXTBOOKS & COURSE MATERIALS

Hoang Dinh Tuan, Bui Duong Hai, Cao Xuan Hoa, and Hoang Bich Phuong, 2014, *Theory of Mathematical Economic Modeling*, NEU publisher, Chapter 4.

8. RECOMMENDED TEXTS & OTHER READINGS:

By chapter

9. ASSESSMENT & GRADING POLICY:

- Band score: 10/10 and 4/4
- In which:
 - + Class participation: 10%
 - + Midterm test: 30%
 - + Final Exam: 60%
- Conditions for taking the final test:
 - + attend at least 80% of scheduled course hours
 - + take the midterm test.

Hanoi, 2016

HEAD OF DEPARTMENT

PRESIDENT

(signed)

(signed)

PhD. Nguyen Manh The

Prof.Dr. Tran Tho Dat