
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: OPTIMIZATION 2

Code: TOKT1113

Number of Credit: 02

2. DEPARTMENT IN CHARGE OF INSTRUCTION:

Office: *Location

Office Hours: *Times & Days

Office Telephone: *Phone Number

3. PRE-REQUISITE:

Optimization 1

4. COURSE DESCRIPTION:

This course involves the following topics: Basics about nonlinear optimization problems; Algorithms for solving convex programming problems; Concepts in Dynamic programming problems; and Bellman algorithm for solving dynamic programming problems.

5. COURSE OBJECTIVES:

This course provides methods to approach and solve classes of nonlinear optimization problems and dynamic programming models. Using specialized softwares for classes of nonlinear optimization problems, dynamic optimization and well-known solution methods.

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	7	3	
2	Chapter 2	10	6	4	
3	Chapter 3	10	6	4	
	Total	30	19	11	

CHAPTER 1– PRELIMINARIES OF NONLINEAR PROGRAMMING PROBLEMS

The purpose of this chapter is to present important results in nonlinear programming and provide an overview of nonlinear programming problems. The most principal result in this chapter is the Kuhn–Tucker condition.

This chapter also presents an important class of nonlinear programming problems – convex programming, which is widely applied in the study of economics. In this class of problem, Kuhn-Tucker condition is necessary and under some additional assumptions it is also sufficient condition for optimal solution of convex programming problems. Therefore, Kuhn-Tucker condition is considered as a fundamental theory of convex programming problems.

- 1.1. General mathematical programming problems
- 1.2. Kuhn-Tucker theorem
- 1.3. Regularity conditions
- 1.4. Kuhn-Tucker theorem for convex programming problems

References:

- 1- Ngo Van My, 2011, *Lecture notes in Optimization for Mathematical Economics and Financial Mathematics*, Chapter 1.
- 2 - Vu Thieu, 1999, *Nonlinear Programming and Dynamic Programming*.
- 3 - Tran Tuc, 1990, *Linear programming*.
- 4 - Nguyen Thi Bach Kim, 2008, *Optimization Methods, Theory and Algorithms*, Encyclopedia,, Hanoi, Chapter 2.
- 5 - Chiang Alpha.C, 2006, *Fundamental Methods of Mathematical Economics*, 4th edition, McGraw-Hill, Chapter 21.
- 6 - Hoàng Tụy, 1978, *Convex Analysis*, Vietnam Education Publishing House.

CHAPTER 2– SOME METHODS FOR SOLVING CONVEX PROGRAMMING PROBLEMS

This chapter, presents some algorithms to solve convex programming problems. For different classes of problems, we provide different algorithms. More precisely, in this chapter, Frank-Wolfe algorithm is used to solve convex programming problems with bounded polyhedral constraint sets; General convex programming algorithm is used to solve a convex programming problems; Beale algorithm is used for convex quadratic programming problems.

- 2.1. Introduction on geometrical method and feasible direction method
- 2.2. Frank-Wolfe algorithm
- 2.3. Algorithm to solve general convex programming problems
- 2.4. Beale algorithm for convex quadratic programming.

References:

- 1- Ngo Van My,2011, *Lecture notes in Optimization for Mathematical Economics and Financial Mathematics*, Chapter 1.
- 2 - Vu Thieu, 1999, *Nonlinear Programming and Dynamic Programming*.
- 3 - Nguyen Thi Bach Kim, 2008, *Optimization Methods, Theory and Algorithms*, Encyclopedia,,Hanoi, Chapter 2.

CHAPTER 3– DYNAMIC PROGRAMMING PROBLEMS

This chapter presents general concepts of dynamic programming problems; Bellman's principle of optimality to optimize long-term developed system of controlled processé and to apply Bellman algorithm to solve some dynamic programming problems.

- 3.1. Introduction to dynamic programming
- 3.2. R. Bellman's principle of optimality
- 3.3. Dynamic programming with diagram forms
- 3.4. Knapsack problems
- 3.5. Inventory problems

References:

- 1- Ngo Van My,2011, *Lecture notes in Optimization for Mathematical Economics and Financial Mathematics*, Chapter 1.
- 2 - Vu Thieu, 1999, *Nonlinear Programming and Dynamic Programming*.
- 3 - T.V. Thieu, B.T. Tam, 1998, *Optimization Methods*, Transport Publishing House, Chapter 5.

7. REQUIRED TEXTBOOKS & COURSE MATERIALS

Ngo Van My, 2011, *Lecture notes in Optimization for Mathematical Economics and Financial Mathematics*.

8. RECOMMENDED TEXTS & OTHER READINGS

1 - Vu Thieu, 1999, *Nonlinear Programming and Dynamic Programming*.

2 - Tran Tuc, 1990, *Linear programming*.

3 - Tran Tuc, 2000, *Linear Programming Exercises*, Science and Technics Publishing House.

4 - Hoang Tuy, 1978, *Convex Analysis*, Vietnam Education Publishing House.

5 - Nguyen Thi Bach Kim, 2008, *Optimization Methods, Theory and Algorithms*, Bách Khoa Publishing House- Hà Nội.

6 - T.V. Thieu, B.T. Tam, 1998, *Optimization Methods*, Transport Publishing House.

7 - Chiang Alpha. C, 2006, *Fundamental Methods of Mathematical Economics*, 4th edition, McGraw-Hill.

9. ASSESSMENT & GRADING POLICY:

- Grading scale: 10 scale

- Grading measure:

+ Teachers' qualification: 10%

+ Test: 20%

+ Final exam: 70%

Conditions of attending the final exam

+ Attending at least 80% of the course

+ Having taken the test

Hanoi, 2016

HEAD OF DEPARTMENT

PRESIDENT

(signed)

(signed)

PhD. Nguyen Manh The

Prof.Dr. Tran Tho Dat