



University of Management *and* Technology

EC638 OPTIMIZATION TECHNIQUES

Resource Person:	
Email:	
Contact Hours:	
Office Address:	
Programme:	
Section:	
Semester:	
Course Pre-requisites:	
Credit Hours:	
Course Type:	
Venue/Day/Time:	
Course URL (if any):	

Course Description:

The main objective of this course is to provide deep understanding of economics theory and its applications. The use of Optimization techniques help the students to understand the working of the economic theory in different stages.

Learning Objective

Upon successful completion of this course the participants will be able to

- Get familiar with simple optimization approach.
- Get accustomed with the advanced optimization approaches
- Get familiar with the concept of convexity and concavity used in optimizations techniques.

Learning Outcome

- Participants will be able to use the acquired knowledge in economic applications related to advanced topics
- Students will get familiar with the advanced topic that can be used in optimization of complex problems.
- Participant will learn the use of Simultaneous differential equations in dynamic stability of the model.

Course Teaching Methodology:

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Lecture and Discussion
 Problem solving techniques
 Numerical Examples
 Interactive Classes
 In Class activities
 Project/Term paper
 Presentation

Programme Educational Objectives (POs):

PO-1	Students will get familiar with the use of the concept of Derivatives and Integration in economic models.
PO-2	Students will learn about integration techniques in solving in Economic Models
PO-3	Students will learn the use of differential equations in economic model.
PO-4	Participants will be able to use the acquired knowledge in economic applications related to advanced economic topics
PO-5	Participants will observe and analyze the concepts of convexity and concavity in details through economic applications

Programme Learning Outcomes (PLOs):

After completing this degree programme, students shall be able to:

		Mapping the PLOs with POs
PLO-1	Getting familiar with simple optimization approach.	PO-1
PLO-2	Getting familiar with the use of advanced optimizations techniques through differential equations.	PO-3
PLO-3	Use of advanced tools in microeconomic analysis	PO-5
PLO-4	Getting familiar with the use of advanced topics in optimization.	PO-1 & PO-2
PLO-5	Participants will observe and analyze the concepts of convexity and concavity in details through economic applications.	PO-5

Course Objectives (COs)

CO-1	This course is related to the use of optimization techniques in utility maximization and the participants will become familiar with the skills to deal with different agents in the economy, like buyer, seller and government in different market conditions in order to have a sustainable flow of benefits.
CO-2	Based on underpinning complex theories of consumer, students will be able to devise how to make optimal decisions.
CO-3	Studying the market environment will equip scholars to make decisions of their own regarding pricing and production in order to optimize the profits.

Course Learning Objectives (CLs)

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CLO-1	Student can use differentiation techniques in optimizing economic functions.	PLO-1 & PLO-03
CLO-2	Participants will learn about the use of advanced techniques in economics.	PLO-4
CLO-3	The students will be able to handle the complex problems in economics.	PLO-5

Assurance of Learning and Assessment Items:

Specify Assessment Items that will assure student learning through application and achieve objectives of specific PLOs / COs / CLOs

Assessment Item	Application/ Objectives PLO / CO / CLO
Quizzes	All
Assignments	All
Class Activities (Presentations, Take home problems set, short projects and case study)	All
Mid-term exam	All
Final exam	All

Assessment Structure and Grading Policy*:

Assessment Item	Weight (%)	Execution Plan
Quizzes	10%	Four-time assessment
Assignments	10%	Four-time assessment
Take home problems set	10%	weekly assessment
In Class Activities/Exercises	10%	weekly assessment
Term Paper	10%	weekly assessment
Mid-term exam	20%	One-time assessment
Final exam	30%	One-time assessment
Total	100	

Notes – Norms and Important Class Policies:

(such as submission guidelines, academic honesty, make-up policy, code of conduct)

- **Be On Time**
You need to be at class at the assigned time. After 10 minutes past the assigned time, you will be marked absent
- **Mobile Policy**
TURN OFF YOUR MOBILE PHONE! It is unprofessional to be texting or otherwise
- **Email Policy**
READ YOUR EMAILS! You are responsible if you miss a deadline because you did not read your email. Participants should regularly check their university emails accounts regularly and respond accordingly.
- **Class Attendance Policy**

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A minimum of 80% attendance is required for a participant to be eligible to sit in the final examination. Being sick and going to weddings are absences and will not be counted as present. You have the opportunity to use 6 absences out of 30 classes. Participants with less than 80% of attendance in a course will be given grade 'F' (Fail) and will not be allowed to take end term exams. International students who will be leaving for visa during semester should not use any days off except for visa trip. Otherwise, they could reach short attendance.

- **Withdraw Policy**

Students may withdraw from a course till the end of the 12th week of the semester. Consequently, grade W will be awarded to the student which shall have no impact on the calculation of the GPA of the student. A Student withdrawing after the 12th week shall be automatically awarded "F" grade which shall count in the GPA.

- **Moodle**

UMT –LMS (Moodle) is an Open-Source Course Management System (CMS), also known as a learning Management System (LMS). Participants should regularly visit the course website on MOODLE Course Management system, and fully benefit from its capabilities. If you are facing any problem using moodle, visit <http://oit.umt.edu.pk/moodle>. For further query send your queries to moodle@umt.edu.pk

- **Harassment Policy**

Sexual or any other harassment is prohibited and is constituted as punishable offence. Sexual or any other harassment of any participant will not be tolerated. All actions categorized as sexual or any other harassment when done physically or verbally would also be considered as sexual harassment when done using electronic media such as computers, mobiles, internet, emails etc.

- **Use of Unfair Means/Honesty Policy**

Any participant found using unfair means or assisting another participant during a class test/quiz, assignments or examination would be liable to disciplinary action.

- **Plagiarism Policy**

All students are required to attach a "Turnitin" report on every assignment, big or small. Any student who attempts to bypass "Turnitin" will receive "F" grade which will count towards the CGPA. The participants submit the plagiarism report to the resource person with every assignment, report, project, thesis etc. If student attempts to cheat "Turnitin", he/she will receive a second "F" that will count towards the CGPA. There are special rules on plagiarism for final reports etc. all outlined in your handbook.

- **Communication of Results**

The results of quizzes, midterms and assignments are communicated to the participants during the semester and answer books are returned to them. It is the responsibility of the course instructor to keep the participants informed about his/her progress during the semester. The course instructor will inform a participant at least one week before the final examination related to his or her performance in the course.

**Rubrics for all assessments (including mid and final exams) will be provided separately to the students.*

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Weekly Sessions Plan:			
Week	Topics / Contents	Activity	Application/Objectives PLO / CO / CLO
1	Introduction to optimization techniques concepts related to simple and multiple optimization. Recapitulation	In class exercises.	Getting familiar with simple optimization approach.
2	Integration: Indefinite integration, Definite integration and properties of definite integration Numerical Examples	In class exercises. Quiz 1 Take Home problem set 1	Getting accustomed with the advanced optimization approaches
3	Economic applications of Definite integrals, Domar growth model.	In class exercises, discussion Assignment 1	Getting accustomed with the advanced optimization approaches
4	Simple linear differential equations with constant coefficient and constant terms. Simple linear differential equations with variable coefficient and variable terms. Examples of both types of differential equations and solutions	In class exercises Take home problem set 2 Quiz 2	Getting familiar with the advanced optimizations techniques through differential equations
5	Economic application – Dynamics of market price model, its framework, time path and dynamic stability	In class exercises numerical examples	Use of advanced tools in microeconomic analysis
6	Exact differential equations and their solutions. Numerical examples. Concept of linear homogeneity and their use in economics	Assignment 2 In class exercises	Getting familiar with the use of advanced topics in optimization.
7	Concept of Quasi Concavity and Quasi Convexity. Their examples and use in economic optimization	Quiz 3 In class exercises Take home problem set 3	Getting familiar with the concept of convexity and concavity which is the root cause of optimization
8	Simultaneous differential equations. Their solutions and dynamic stability.	In class exercises Assignment 3	Understanding the advance topics of differential equations
9	MID TERM		
10	Linear programming – Maximization and minimization. Graphical methods.	Assignment 4 In class activity	Understanding the main part of optimization techniques

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11	Concept of primal and dual. Duality theorems. Solving primal via dual, Numerical examples	Quiz 4 In class exercises	Understanding the use of duality in optimization of economic functions
12	Kuhn Tucker conditions and their use in economics	In class activity Take home problem set 4	Getting familiar with the advance optimization techniques
13	Optimization of the functions of more than two variables in economics	Class discussion Quiz 5	Using advanced optimization techniques in solving complex economic problem.
14	Characteristics roots vector of a matrix. Orthogonality and normality of a matrix. Stability of a matrix	In Class activity Take home problem set 5	Getting familiar with the advanced mathematical topics and their use in economics
15	Gram Smidth method to construct an orthonormal set of vectors. Concept of optimal control theory.	In class activity Assignment 5/ Submission of final project / Term paper	Understanding the advanced topics of optimization techniques and their use in economic modeling
16	Final Term Examination		

Primary Text Book (s):

Fundamental Methods of Mathematical Economics by Alpha C. Chiang and Kavin Wainwright. 4th Edition McGraw Hill N.Y. USA.

Reference / Supplementary Reading (s):

Mathematics for Economics by Michael Hoy, John Livernois, Ray Rees & Thanasis Stengos (Latest Edition) Addison-Wesley Publishers Limited-USA.
Lambert P Advanced Mathematics for Economists, Static & Dynamic Optimization, (Latest Ed) Basil Black Well-USA

Useful Online / Web Resources:

- Will be provided in class