جامعة الزيتونة الأردنية

Al-Zaytoonah University of Jordan

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Linear Programming & Game Theory

Course Number: 0101376

General Course Information:

Course Title	**Linear Programming & Game Theory**
Course Number	**0101376**
Credit Hours	3 credit hours
Education Type	Blended learning
Prerequisites/Co-requisites	**Linear Algebra (1)**
Academic Program	Bachelor of Mathematics
Program Code	0101
Faculty	Faculty of Science and Information Technology
Department	Mathematics
Level of Course	3
Academic Year /Semester	2023/2024 1st Semester
Awarded Qualification	BS'c
Other Department(s) Involved in Teaching the Course	-
Language of Instruction	English
Date of Production	2021-2022
Date of Revision	October 2023

Course Coordinator:

Coordinator's Name	Dr. Tareq Hamadneh
Office No.	229
Office Phone Extension Number	
Office Hours	10-11, 13-14 Sunday, Tuesday 11-12:30 Monday, Wednesday
E-mail	t.hamadneh@zuj.edu.jo

Other Instructors:

Instructor Name	NA
Office No.	
Office Phone Extension Number	
Office Hours	
Email	

Course Description *(English/Arabic)*:

English	In this course introduces the linear optimization theory and its applications, modelling of real world problems as linear programs, Basic theory of linear programming, Simplex algorithm, Two phase method, Duality, Dual simplex method, Post optimality analysis, Transportation and assignment problems, Simple network models, Linear integer programming, Basic game theory, 2-player games, Mini-max solutions, Zero sum games Nash equilibrium.
Arabic	سيتم في هذا المساق اللتعريف بنظرية التحسين الخطي وتطبيقاتها، نمذجة مشاكل العالم الحقيقي كبرامج خطية، النظرية الأساسية للبرمجة الخطية، خوارزمية Simplex، طريقة الطورين، الازدواجية، طريقة Dual simplex، تحليل ما بعد الأمثلية، مشاكل النقل والتخصيص، نماذج الشبكات البسيطة، برمجة الأعداد الصحيحة الخطية، نظرية الألعاب الأساسية، الألعاب الثنائية، حلول الميني ماكس، ألعاب المجموع الصفري و توازن ناش.

Textbook: ***Author(s), Title, Publisher, Edition, Year, Book website.***

An Introduction to Linear Programming and Game Theory, by Paul R. Thie & G. E. Keough, 3rd Ed., 2008.

References: *Author(s), Title, Publisher, Edition, Year, Book website.*

1- Linear Programming, K.G. Murty, John Wiley. 2- Game Theory, by Maschler, M., E. Solan, & S. Zamir, Cambridge University Press, 2013. 3- Linear Programming, G. Hadley, Addison Wesley.

Course Educational Objectives (CEOs):

CEO1	Designing different types of models by using numerical modelling
CEO2	Minimizing and maximizing solutions of linear systems
CEO3	Analysing systems by different methods of optimization
CEO4	Introducing the main concepts of game theory

Intended Learning Outcomes (ILO's):

Intended learning outcomes (ILOs)		**Relationship to CEOs**	**Contribution to PLOs**	**Bloom Taxonomy Levels***	**JNQF Descriptors****
K	Knowledge and Understanding				
ILO1-k	Recognition of the numerous applications of linear programming	CEO1	PLO1-k	Remembering	K
ILO2-k	Learn basic concepts in game theory	CEO4	PLO2-k	Understanding	K
ILO3-k	Learn basic concepts in game theory	CEO4	PLO3-k	Remembering	K
ILO4-k	Know how to interpret the solutions in terms of the original problems.	CEO2	PLO4-k	Understanding	K
S	Intellectual skills				
ILO5-s	Have the ability to apply linear programming techniques for solving and modeling some fundamental decision-making problems arising in the daily business life.	CEO3	PLO7-s	Understanding	S
ILO6-s	Formulate real-world problems in mathematical terms.	CEO1	PLO8-s	Analyzing	S
C	Subject specific skills				
ILO7-c	Describe duality and its implications for the solutions of linear programs.	CEO2	PLO12-c	Applying	C
D	Transferable skills:				

*Bloom Taxonomy Levels:

Level #	1	2	3	4	5	6
Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

** Descriptor (National Qualification Framework Descriptors): K: Knowledge, S: Skill, C: Competency.

Program Learning Outcome (PLOs):

	(PLOs)	JNQF Descriptors**		
		K	S	C
1.	Knowledge of the main concepts in pure mathematics.	√		
2.	Knowledge of the main concepts in applied mathematics.	√		
3.	Explain concepts, principles and theories in the fields of probability and statistics.	√		
4.	Possession of technological culture related to the fields of mathematics and its applications.	√		
5.	Making use of mathematical logic in practical life.		√	
6.	Engaging scientific methodology as a way of thinking and as a tool in facing problems.		√	
7.	Applying mathematical software packages in problem solving.		√	
8.	Being capable of data analysis.		√	
9.	Capability of teaching according to modern educational techniques.		√	
10.	Develop creative and innovative methods of teaching mathematics.		√	
11.	Showing the ability to work under ethical and professional standards within teams.			√
12.	Gaining critical thinking and scientific research skills.			√

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

- ☐ Face to Face (F2F)
- ☒ **Hybrid** *(One – To - One)*
- ☐ Online

Schedule of Simultaneous and their Topics:

Week	First Lecture (F2F)	Second Lecture	ILOs	PLOs	JNQF Descriptors*
1	Introduction to Linear Programming: The linear programming problem LPP, feasible solutions set.	Activity: Video 1 for Background and basics	ILO1-k	PLO1-k	Remembering
2	Optimal solutions, unboundedness, transforming to standard form.	Solving exercises	ILO2-k	PLO2-k	Understanding
3	The simplex method: Initialization, detecting optimality	Home work1	ILO3-k	PLO3-k	Understanding
4	Initial BFS, improving current BFS, artificial	Quiz 1	ILO4-k	PLO4-k	Understanding

	variables				
5	Unboundedness, degeneracy	Assignment 1: On MatlabOperations	ILO5-s	PLO5-k	Applying
6	Introduction to duality.	Video 2: Exercises	ILO5-s	PLO6-k	Remembering
7	Duality theorems and their interpretations, Complementary slackness theorem	Home work 2 On the subjects studied in weeks 4,5 and 6	ILO7-c	PLO7-s	Understanding
Midterm Exam (30%)					
9	Post optimality analysis: the cases of change in the cost coefficients.	Assignment 2: On Plotting of functions	ILO5-s	PLO8-s	Applying
10	Special LPPs: The transportation programming problem	Self-reading	ILO6-s	PLO9-s	Applying
11	Some network flow problems.	Video3 Solving exercises	ILO6-s	PLO9-s	Understanding
12	Game Theory: Introduction to game theory, some principles of decision making in game theory.	Home work 3: On the subjects studied after the Mid-Exam	ILO6-s	PLO10-s	Understanding
13	Non-cooperative and cooperative games, Matrix games	Quiz 2	ILO5-s	PLO11-c	Applying
14	Saddle points, mixed strategies, the fundamental theorem	Video 4 Revision of all the course	ILO7-c	PLO12-c	Analyzing
15	**Projects Discussion**				
16	**Final Exam**				

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- Lecture.
- Zoom and Videos
- learning through projects.
- learning through problem solving.
- participatory learning

Course Policies:

A- Attendance policies:
The maximum allowed absences is 15% of the lectures.
B- Absences from exams and handing in assignments on time:
Midterm exam can be retaken based on approval of excuse by the instructor's discretion.
Not handing assignment on time will incur penalties.
C- Academic Health and safety procedures
D- Honesty policy regarding cheating, plagiarism, and misbehaviour:
Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.
E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20%**
- Midterm 30**%**
- Final Exam 50**%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required Equipment:

- PC / Laptop with webcam and mic
- Internet Connection
- Access to the ZUJ E-Learning Platform at https://exams.zuj.edu.jo/
- E-learning plan
- Satisfaction questionnaires for online and face-to-face learning
- Training

Assessment Tools Implemented in the Course:

- Final Exam
- Midterm Exam
- Quizzes
- Homework
- Discussion Forums
- Periodic reports for learning assessment
- Improvement plans for online or face-to-face teaching.

Responsible Persons and their Signatures:

Course Coordinator	Dr. Tareq Hamadneh	**Completed Date**	**17/10/2023**
		Signature	

Received by (Department Head)		**Received Date**	/ /
		Signature	