QF01/0408-4.0E	Course Plan for Master program - Study Plan Development and Updating Procedures/ Mathematics Department

Study plan No.	2021/2022		**University Specialization**	**Master of Mathematics**	
Course No.	0101714		**Course name**	**Mathematical Programming**	
Credit Hours	3		**Prerequisite/ Co-requisite**		
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	Mandatory requirements / **Elective requirements**
Teaching style	☐ Full online learning		Blended learning		✓ **Traditional learning**
Teaching model	☐ 1 Synchronous: 1 asynchronous		1 face to face : 1 asynchronous		✓ **2 Traditional**

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
D. Tareq Hamadneh	Assistant professor	314	418	t.hamadneh@zuj.edu.jo	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**
1				Traditional	

Brief description

Topics are clearly developed with many numerical examples worked out in detail. Specific examples and concrete algorithms precede more abstract topics. With its focus on solving practical problems, the course features free programs to implement the major algorithms covered, including the two-phase simplex method, primal-dual simplex method, path-following interior-point method, and homogeneous self-dual methods. In addition, the course provides concepts that illustrate various pivot rules and variants of the simplex method, both for linear programming and optimization.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	**1.** Linear Programming: Foundations and Extensions, by Robert J. Vanderbei			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	2. An Introduction to Linear Programming and Game Theory, by Paul R. Thie & G. E. Keough, 3rd Ed., 2008. 3. Linear Programming, G. Hadley, Addison Wesley.			
Supporting websites	https://link.springer.com/book/10.1007/978-1-4614-7630-6#toc			
The physical environment for teaching	✓ **Class room**	☐ labs	☐ Virtual educational platform	☐ Others
Necessary equipment and software	Data Show			

QF01/0408-4.0E	Course Plan for Master program - Study Plan Development and Updating Procedures/ Mathematics Department

Supporting people with special needs	
For technical support	

Course learning outcomes (S= *Skills, C= Competences K= Knowledge,)*

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Producing most of the common optimization methods for solving problems with concentration on number of methods to handle the problems likely to be encountered in practice.	**MK 1**
K2	Illustrate how to use linear programming methods such as the simplex and graphical methods.	**MK 2**
K3	Practice mathematical optimization and bounding methods for the solution of mathematical problems.	**MK 3**
	Skills	
S1	Develop skills in linear programming by carrying out a variety of programming exercises and solutions.	**MS3**
S2	Transfer skills of optimization and analyzing problems	**MS4**
	Competences	
C1	Reaching the use of applied mathematics for solving real live problems	**MC1**

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	**30%**	40%	30%
Participation / practical applications	0	**0**	10%	30%
Asynchronous interactive activities	30%	**30%**	0	0
Final exam	40%	**40%**	50%	40%

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style	Reference
1	Introduction to Linear Programming: The linear programming problem LPP, feasible solutions set, solving a two-dimensional problem by the use of a graphical method.	Lecture	Ref 2 (10-30)
2	Optimal solutions, unboundedness, transforming to standard form, geometry of linear programming.	Lecture	Ref 2 (31-50)
3	Basic Theory: The Simplex Method and Duality	Lecture	Ref 1 (11-23)

4	Degeneracy	Lecture	Ref 1 (25-37)
5	Efficiency of the Simplex Method	Lecture	Ref 1 (39-52)
6	Duality Theory	Lecture	Ref 1 (53-79)
7	The Simplex Method in Matrix Notation	Lecture	Ref 1 (81-97)
8	Problems in General Form	Lecture	Ref 1 (133-140)
9	Convex Analysis	Lecture	Ref 1 (141-150)
10	**Midterm Exam**: Overview	Lecture	Ref 1 (230 -265)
11	Game Theory	Lecture	Ref 1 (151-163)
12	Regression	Lecture	Ref 1 (165-184)
13	Financial Applications	Lecture	Ref 1 (185-195)
14	Applications	Lecture	Ref 1 (225-239)
15	Structural Optimization	Lecture	Ref 1 (241-254)
16	**Final Exam**		

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Background	Ref 2	Self-reading and Discussion
2	Video 1 Solving exercises	Ref 2	Discussion in the class
3	Home work1: On the simplex method	Ref 2	Submit a pdf or word sheet
4	Quiz 1	Ref 2	Submitting on the E-learning
5	Assignment 1: simplex duality	Ref 2	Talk
6	Video 2	Ref 1	Discussion in the class
7	Homework 2 On the subjects studied in weeks 4,5 and 6	Ref 1+Ref 2	Submit a pdf or word sheet
8	Assignment 2: On the Simplex Method in Matrix Notation	Ref 1	Submitted in week 9
9	Self-reading	Ref 1+Ref 3	Talk
10	Video3 Solving exercises	Ref 1+Ref 3	Discussion in the class

11	Homework 3: On the subjects studied after the Mid-Exam	Ref 1+Ref 3	Submit a pdf or word sheet
12	Self-reading	Ref 1+Ref 3	Talk
13	Quiz 2	Ref 1+Ref 2	Submitting on the E-learning
14	Presentation of the subject: Regression and applications	Ref 1	Video presentation
15	Video 4 Revision of all the course	Ref 1+Ref2+Ref3	Self-reading and Discussion
16	**Final Exam**	-	-