مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

The University of Jordan

Department of Mathematics

Course Syllabus

Course Name

Linear Programming

مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

Course Syllabus

1	**Course title**	Mathematical Programming
2	**Course number**	0301371
3	**Credit hours**	3
	Contact hours (theory, practical)	3
4	**Prerequisites/corequisites**	Linear Algebra I (0301241)
5	**Program title**	B.Sc. in Mathematics
6	**Program code**	
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Mathematics
10	**Course level**	Elective specialization requirement
11	**Year of study and semester (s)**	3th and 4th years, 1st and 2nd semesters
12	**Other department (s) involved in teaching the course**	None
13	**Main teaching language**	English
14	**Delivery method**	X Face to face learning ☐Blended ☐Fully online
15	**Online platforms(s)**	X Moodle ☐Microsoft Teams ☐Skype ☐Zoom ☐Others……
16	**Issuing/Revision date**	19/5/2023

17 Course Coordinator:

Name: Prof. Baha Alzalg	Contact hours: TBA
Office number: 204 Math Bldg	Phone number: +962 6-535-5000 Ext. 220879
Email: b.alzalg@ju.edu.jo	

18 Other Instructors:

Office numbers, office hours, phone numbers, and email addresses can be listed.

19 Course Description:

Formulation of linear problems, the simplex method, the geometry of the simplex method, duality in linear programming, the dual simplex method, sensitivity analysis, introduction to graphs, network flows.

20 Course Aims and Outcomes:

A- Aims:

1. Able to develop an optimization model from a problem description.
2. Provide a detailed treatment of the theory of linear optimization.
3. Learn the simplex algorithm solving for linear optimization.
4. Develop a fundamental understanding of duality theory.
5. Conduct sensitivity analysis for linear programming problems and interpret the results.
6. Learn combinatorial optimization algorithms for solving fundamental graph/network problems.

B- Students Learning Outcomes (SLOs):

Upon successful completion of this course, students will be able to:

SLOs / SLOs of the course	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)
1. To apply appropriate theories, principles and concepts relevant to linear optimization.		●						
2. To formulate linear programming models and apply the graphical method for solving two-dimensional problems.		●			●			
3. To learn about the geometry of linear programming, the duality in linear programming, and the simplex method.		●						
4. To study graphs and solve fundamental graph and network problems such as finding shortest paths, computing minimum spanning trees, and other combinatorial optimization problems.		●						
5. To be able to select a reasoned argument to the solution of familiar and unfamiliar problems relevant to mathematical optimization.		●			●			
6. To plan and design practical activities using techniques and procedures appropriate to mathematical programming.		●						

21. Topic Outline and Schedule:

Week	Lecture	Topic	Student Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Linear programming formulation and examples	1, 5	Face to Face	Moodle		Quiz	Textbook
	1.2			Face to Face	Moodle		Quiz	Textbook
	1.3			Face to Face	Moodle		Quiz	Textbook
2	2.1	The graphical method for 2D problems	1, 5	Face to Face	Moodle		Quiz	Textbook
	2.2			Face to Face	Moodle		Quiz	Textbook
	2.3			Face to Face	Moodle		Quiz	Textbook
3	3.1	Matrices, subspaces, and bases (review).	1	Face to Face	Moodle		Quiz	Textbook
	3.2			Face to Face	Moodle		Quiz	Textbook
	3.3	Convexity and polyhedral.		Face to Face	Moodle		Quiz	Textbook
4	4.1	Geometry of linear programming	1	Face to Face	Moodle		Quiz	Textbook
	4.2			Face to Face	Moodle		Quiz	Textbook
	4.3			Face to Face	Moodle		Quiz	Textbook
5	5.1	Geometry of linear programming (continue)	1	Face to Face	Moodle		Quiz	Textbook
	5.2			Face to Face	Moodle		Midterm	Textbook
	5.3			Face to Face	Moodle		Midterm	Textbook
6	6.1	The simplex method for linear programming.	2, 8	Face to Face	Moodle		Midterm	Textbook
	6.2			Face to Face	Moodle		Midterm	Textbook
	6.3			Face to Face	Moodle		Midterm	Textbook
7	7.1	The simplex method for linear programming (continue).	2, 8	Face to Face	Moodle		Midterm	Textbook
	7.2			Face to Face	Moodle		Midterm	Textbook
	7.3			Face to Face	Moodle		Midterm	Textbook
8	8.1	The simplex method for linear programming (continue).	2, 8	Face to Face	Moodle		Midterm	Textbook
	8.2			Face to Face	Moodle		Midterm	Textbook

	8.3			Face to Face	Moodle		Midterm	Textbook
9	9.1	The simplex method for linear programming (continue).	2, 8	Face to Face	Moodle		Midterm	Textbook
	9.2			Face to Face	Moodle		Midterm	Textbook
	9.3			Face to Face	Moodle		Midterm	Textbook
10	10.1	Duality in linear programming.	1, 7	Face to Face	Moodle		Midterm	Textbook
	10.2			Face to Face	Moodle		Midterm	Textbook
	10.3			Face to Face	Moodle		Midterm	Textbook
11	11.1	Duality in linear programming (continue).	1, 7	Face to Face	Moodle		Midterm	Textbook
	11.2			Face to Face	Moodle		Midterm	Textbook
	11.3			Face to Face	Moodle		Midterm	Textbook
12	12.1	Introduction to graphs.	1, 4	Face to Face	Moodle		Midterm	Textbook
	12.2			Face to Face	Moodle		Quiz	Textbook
	12.3			Face to Face	Moodle		Quiz	Textbook
13	13.1	Introduction to graphs (continue).	1, 4	Face to Face	Moodle		Quiz	Textbook
	13.2			Face to Face	Moodle		Quiz	Textbook
	13.3			Face to Face	Moodle		Quiz	Textbook
14	14.1	Breadth-first search for shortest paths.	2, 7	Face to Face	Moodle		Quiz	Textbook
	14.2			Face to Face	Moodle		Quiz	Textbook
	14.3			Face to Face	Moodle		Quiz	Textbook
15	15.1	Depth-first search for minimum spanning trees.	2, 7	Face to Face	Moodle		Exam	Text Book
	15.2			Face to Face	Moodle		Exam	Textbook
	15.3			Face to Face	Moodle		Exam	Textbook
16	16.1	Sensitivity analysis.	1	Face to Face	Moodle		Exam	Textbook
	16.2			Face to Face	Moodle		Exam	Textbook
	16.3			Face to Face	Moodle		Exam	Textbook

22 Evaluation Methods:

Opportunities to demonstrate achievement of the SLOs are provided through the following assessment

methods and requirements:

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
Midterm	30		1, 2, 5		On Campus
Quiz(s)	20		3, 4, 7, 8		On Campus
Final Exam	50		1, 2, 5		On Campus

23 Course Requirements

Each student must have: Account on Microsoft Teams

24 Course Policies:

1. Attendance is absolutely essential to succeed in this course. You are expected to attend every class; please notify your instructor if you know you are going to be absent. All exams must be taken at the scheduled time. Exceptions will be made only in extreme circumstances, by prior arrangement with the instructor.
2. If a student is absent for more than 10% of lectures without an excuse of sickness or due to other insurmountable difficulty, then he/she shall be barred from the final examination also he/she will get a failing grade in this course.
3. Medical certificates shall be given to the University Physician to be authorized by him. They should be presented to the Dean of the Faculty within two weeks of the student's ceasing to attend classes.
4. Test papers shall be returned to students after correction. His/her mark is considered final after a lapse of one week following their return.
5. Cheating is prohibited. The University of Jordan regulations on cheating will be applied to any student who cheats in exams or on home works.

25 References:

A- Required book (s), assigned reading and audio-visuals:

1. Combinatorial and Algorithmic Mathematics: From Foundation to Optimization. By Baha Alzalg. John Wiley & Sons. ISBN: 978-1394235940

B- Recommended books, materials, and media:

2. Introduction to Linear Optimization. By D. Bertsimas and J. Tsitsiklis. Athena Scientific Series in Optimization and Neural Computation.

3. Introduction to Mathematical Programming. By W.L. Winston and M. Venkataramanan. 4th edition. Thomson Brooks/Cole.

4. Optimization in Operations Research. By Ronald L. Rardin. Prentice Hall, 1998.

26 Additional Information:

Name of Course Coordinator: Prof. Baha Alzalg Signature: ---------- Date: 20/6/2023
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------