

**Jerash University**

**Faculty of Computer Science and Information Technology**

**Computer Sciences Department**

**Semester**: Fall Semester 2018/2019

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| **Course symbol and number:** 1001320 | **Course Name:** Operation Research |
| **Teaching Language:** English | **Prerequisites:** 1001119. |
| **Credits:** 3 hours**.** | **Course Level:** 300 |

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| **Course Description** This course is an introduction to the principles and practice of Operations Research, and its role in human decision making. In particular, the course focuses on mathematical programming techniques such as linear programming (the Simplex Method, concepts of duality and sensitivity analysis), network optimization (including transportation and assignment problems) and nonlinear programming. |

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| **Course Objectives**  |
| The main objectives of this course are to: 1. To give the central facts and ideas of Operations Research, and show how they are used in various models which arise in applied and theoretical investigation.
2. To show the importance of structured models by formulating and analyzing the models in many context.
3. To employ the proper computational techniques to solve these problems.
4. To provide student with an impressive illustration of how simple mathematics can be used to solve difficult problems which arise in real situations and to give them tools which will prove useful in their professional work.
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| **Learning Outcomes**  |
| Upon completion of this course, students should be able to: * Be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
* Be able to build and solve Transportation Models and Assignment Models.
* Be able to build and solve network Models and Maximal Flow Models
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|  | **Text Book(s)**  |
| **Title**  | Operations Research: An Introduction  |
| **Author(s)**  | Taha, Hamdy  |
| **Publisher**  | Pearson Education |
| **Year**  | 2016 |
| **Edition**  | 10th edition |

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|  | **References** |
| **Books**  | Taha, Hamdy, Operations Research: An Introduction, International edition, 9th edition, Pearson, 2011. ISBN: 0131391992. |
| **Internet links**  | http://www.jpu.edu.jo/lms |
| **Course link**  | [Click here](http://www.jpu.edu.jo/lms) |

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|  | **Instructors**  |
| **Instructor**  |  Dr. Ahmad Abu Al Aish |
| **Office Location**  | الطابق السابع 711 |
| **Office Phone**  |  |
| **E-mail**  | Ahmad.abualaish@gmail,com |

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| **Week** | **Topics** | **Topic Details** | **Reference (chapter)** |
| **1** | **Overview of Operations Research** | * What is Operations Research?
* Development of Operations Research.
* Phases of an Operations Research study.
* Problem Solving Process.
 | Ch. 1 |
| **2, 3** | **Linear Programming** | * Linear Programming Problem.
* Graphical Solution.
* Generating Extreme-Point Solutions.
 | Ch. 2 |
| **4, 5** | **The Simplex Method and Sensitivity Analysis** | * Development of a Minimum Feasible Solution.
* Iterative nature of the Simplex method.
* Computational Procedure.
* Artificial starting solution.
* Degeneracy and the Convergence of the Simplex Algorithm.
* Two Phase Simplex Method.
* Unrestricted-In-Sign Variables.
* Sensitivity Analysis.
 | Ch. 3 |
| **6, 7** | **Duality and Post-Optimal Analysis** | * Definition of Dual Problem.
* Primal-Dual Relationships.
* LINDO/AMPL/TORA Computer Package.
* Matrix Generators.
* LINGO and Scaling of LPs.
* Solving LPs with Spreadsheets (e.g. Excel).
* Additional Simplex Algorithms.
* Post-Optimal analysis.
 | Ch. 4 |
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| **8, 9** | **Transportation Model and its variants** | * Definition of transportation model.
* Transportations Algorithm.
* The transshipment model.
 | Ch. 5 |
| **10, 11** | **Network Models** | * Definition of network models.
* Minimal Spanning Tree Algorithm.
* Shortest-Rout Problem.
* Maximal Flow Model.
* Minimum-Cost Capacitated Flow Problem.
 | Ch. 6 |
| **12, 13** | **Dynamic Programming** | * Recursive nature of computations in DP.
* Forward and backward recursions.
* Selected DP applications.
* Problem of Dimensionality.
 | Ch. 10 |
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| **14,15** | **Integer Programming** | * Illustrative applications.
* Integer programming algorithms.
* Traveling salesman problem.
 | Ch. 9 |
|  |  | **Final Exam (To be announced)** |  |

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|  | **Evaluation**  |  |
| **Assessment Tool**  | **Expected Due Date**  | **Weight**  |
| Programming assignments and LMS |  | 20 %  |
| First Exam  |  | 20 %  |
| Second Exam  |  | 20 %  |
| Final Exam  | According to the University final examination schedule  | 40 %  |

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|  | **Policy**  |
| **Attendance**  | Attendance is very important for the course. In accordance with university policy, students missing more than the allowed absence rate of total classes are subject to failure. Penalties may be assessed without regard to the student's performance. Attendance will be recorded at the beginning or end of each class.  |
| **Exams**  | All exams will be CLOSE-BOOK; necessary algorithms/equations/relations will be supplied as convenient. |

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| **Class Schedule & Room**  |

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| **Office Hours**  |
|  Sun: 8 - 9  Mon: 8 - 9:30  Tues: 11- 12  Wed: 11 – 12:30 |
|  | \* Or by an appointment through email |  |

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|  | **Teaching Assistant**  |
| To announced later on.  |  |

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|  | **Prerequisites**  |
| **Prerequisites by course** | 1001119 |