1.	Course title	Special topics	
2.	Course number	1901494	
3.	Credit hours (theory, practical)	3 Theory per Week	
	Contact hours (theory, practical)	3 Theory per Week	
4.	Prerequisites/corequisites	Theory of algorithms	
5.	Program title	Undergraduate Computer Science	
6.	Year of study and semester (s)	Second and Third Years – first Semester	
7.	Final Qualification	--	
8.	Other department (s) involved in teaching the course	--	
9.	Language of Instruction	English	
10.	Date of production/revision	Feb/ 2023	
11.	Required/ Elective	Elective	

12. Course Coordinator:

Dr. Basima Elshqeirat
Office Location: *KASIT First Floor – CS Department*
Office Phone Number: *06-5355000 ext. 22592*
Office Hours: *Monday& Wednesday 8:00-9:30AM*
E-mail: *b.shoqurat@ju.edu.jo*

13. Other instructors:

None

14. Course Description:

This course covers different important techniques that used in designing and analyzing efficient
Algorithms such as: dynamic programming, greedy algorithms, and Genetic algorithm.

In addition, in this course, we describe the idea of different optimization problem and explain how to design the advance algorithms to find the optimal solution. This course describes a variety of heuristic search methods including dynamically dimensioned search, genetic algorithms, greedy algorithm.

15. Course aims and outcomes:

A- Aims:

Upon successful completion of this course:

A1. Students will be prepared to start graduate study in optimization algorithms using different advance algorithms, while students will be prepared to undertake advanced study in optimization problems and heuristic methods aimed toward original research.

A2. Students not specializing in optimization algorithms will nevertheless be prepared to follow applications of heuristic methods such as dynamic programming , greedy algorithms, and Genetic algorithm to other disciplines—especially in computer science and operations research, but also in social science and mathematical biology.

A3. Students will have a solid overview of the questions addressed by optimization problems and heuristic methods and will have been exposed to current areas of research.

B-Intended Learning Outcomes (ILOs):

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

B1. Write precise and accurate mathematical definitions of the optimization problems.

B2. Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples using different Heuristic methods such as : dynamic programming , greedy algorithms, and Genetic algorithm.

B3. Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in optimization problems and its applications.

B4. Write about optimization problems and its solution in a coherent and technically accurate manner.

B5. Formulate related problems in the language of heuristic methods.

B6. Analyze the optimization problems.

B7. Master the basic techniques of heuristic and Meta-heuristic methods.

B8. Consider unsolved problems and to find new problems for future studies.

16. Topic Outline and Schedule:

Topic	Week	ILOs	Program SOs[1]	TLA (teaching, learning and Assessment)
• **Introduction to Advanced Design and Analysis Techniques** • **Introduction to Search Methods and Computational Complexity** • **Introduction to optimization problems and heuristic methods**	1-3	A3,B1, B2, B3	1,2,3	T: Lecture & Discussion L: Reading lecture notes A: In class questions
• **Introduction to DP Programming Approach (DP)** • **How to formulate DP** • **Memoization** • **DP Examples (forward approach and backward approach)**	4-5	A1, B2, B7	1,2,4	T: Lecture & Presentation L: Reading lecture notes A: Mid exam
• **Rod cutting problem** • **Matrix-chain multiplication problem** • **Longest common subsequence problem** • **Longest common substring problem** • **Longest increasing subsequence** • **Knapsack problem** • **Weighted job scheduling**	6-9	B1,B4,B5, B6	1,2	T: Lecture & Presentation L: Reading lecture notes A: Quiz-2

[1] The ABET outcomes

problem				
• **Introduction to Genetic Algorithm** • **How to formulate GA** • **GA Examples**	10-12	B1,B2, B3,B4	1,2,3	T: Lecture & Presentation L: Reading lecture notes A: In class questions
• **Applications of Heuristic Optimization in a Range of Areas** • **Graph coloring problem** • **Bin packing problem** • **Hamiltonian cycle problem** • **Minimum cost path problem** • **Egg dropping problem** • **Text justification problem** • **Projects presentation**	13-16	A2,B4,B5, B6,B7,B8	1,2,3,4	T: Lecture & Presentation L: Reading lecture notes A: Final Exam in all lecture notes covered in class

(Please mention instructors per topic if the course topics are being taught by more than one instructor)

17. Evaluation Methods and Course Requirements (Optional):

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Exams: The format for the exams is generally (but NOT always) as follows: General Definitions, Multiple-Choice, True/False, Analyze a Problem, Short Essay Questions, Solving Problems etc.

Quizzes: The instructor may give quizzes or assignments or both; usually it is left up to the instructor. Usually 4 quizzes are given in semester; it is left up to the instructor. Each Quiz is out of 10. No makeup quizzes.

Evaluation Type	Expected Due Date	Weight
Midterm Exam	25/4/2023	30%
Final Exam	TBA	40%
Quizzes/or projects	TBA	30%

18. Course Policies:

Cheating	• Cheating or copying on exam or quiz is an illegal and unethical activity. • Standard University of Jordan policy will be applied. • All graded assignments must be your own work (your own words).
Attendance	• Excellent attendance is expected. • The University of Jordan policy requires the faculty member to assign ZERO grade (F) if a student misses 10% of the classes that are not excused. • Sign-in sheets will be circulated. • If you miss class, it is your responsibility to find out about any announcements or assignments you may have missed.
Workload	• Average work-load student should expect to spend 6 hours per week.
Participation	• Participation in and contribution to class discussions will affect your final grade positively. Raise your hand if you have any question. • Making any kind of disruption and (side talks) in the class will affect you negatively.
Concerns or Complaints	• Concerns or complaints should be expressed in the first instance to the module lecturer; if no resolution is forthcoming, then the issue should be brought to the attention of the module coordinator (for multiple sections) who will take the concerns to the module representative meeting. Thereafter, problems are dealt with by the Department Chair and if still unresolved the Dean and then ultimately the Vice President. For final complaints, there will be a committee to review grading the final exam.
University Regulations	• For more details on University regulations please visit: http://www.ju.edu.jo/rules/index.htm

19. Required equipment:

No equipment required except for a desk top computer, which has MS-Office and Adobe Reader, which are available in KASIT Labs.

20. References:

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

Title: *Introduction to Algorithms*
Author(s): *Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, & Clifford Stein*
Publisher: *The MIT Press*
Edition & Year: *Third Edition 2009 or Second Edition 2001*
Book Website: *http://mitpress.mit.edu/algorithms/*
http://highered.mcgraw-hill.com/sites/0070131511/student_view0/

Recommended books, materials, and media:

- *Jeffrey J. McConnell, "Analysis of Algorithms: An Active Learning Approach", Second Edition, Jones & Bartlett, 2008.*
- *Richard Neopolitan and Kumarss Naimipour, "Foundations of Algorithms", Fourth Edition, Jones & Bartlett, 2011.*
- *Richard Johnsonbaugh and Marcus Schaefer, "Algorithms", Pearson/Prentice Hall, 2004.*
- *Sara Baase and Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Third Edition, Addison-Wesley, 2000.*

Horowitz Ellis, Sahni Sartaj & Rajasekaran Sanguthevar, "Fundamentals of Computer Algorithms", 2008.

21. Additional information:

Course Website:	http://elearning.ju.edu.jo

Date: ------25/2/2023----------

Name of Course Coordinator: -Dr.Basima Elshqeirat----------Signature: --BASIMA---

---

Head of curriculum committee/Department: ---------- Signature: ----------

Head of Department: ---------- Signature: ----------

Head of curriculum committee/Faculty: ---------- Signature: ----------

Dean: ---------- -Signature: ----------

Copy to:
Head of Department
Assistant Dean for Quality Assurance
Course File