Course Syllabus

1	**Course title**	Problem Solving Lab
2	**Course number**	1901381
3	**Credit hours**	1
	Contact hours (theory, practical)	3 practical
4	**Prerequisites/corequisites**	Algorithms (1901341) Data Structures-2 Lab (1901236)
5	**Program title**	Computer Science
6	**Program code**	01
7	**Awarding institution**	The University of Jordan
8	**School**	King Abdullah II School of Information Technology
9	**Department**	Computer Science
10	**Course level**	3
11	**Year of study and semester (s)**	Third year or later
١٢	**Other department (s) involved in teaching the course**	-
١٣	**Main teaching language**	English
١٤	**Delivery method**	☒Face to face learning ☐Blended ☐Fully online
١٥	**Online platforms(s)**	☒Moodle ☒Microsoft Teams ☐Skype ☐Zoom ☐Others……
١٦	**Issuing/Revision Date**	10/2022

١٧ Course Coordinator:

Name: Dr. Heba Saadeh Contact hours:
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١٨ Other instructors:

Name: /
Office number: /
Phone number: /
Email: /
Contact hours: /

١٩ Course Description:

The course enables the students to solve problems using basic and advance methods with traditional and special programming techniques. The students will be introduced to the theoretical concepts and set of practical problems will be discussed and implemented. The goal is to train students how to deal with problems and provide solution with different techniques and methods such as: what are the inputs and how to process them to solve a problem and produce the outputs. Introduce the students to different problem-solving approaches, such as: sequential, iterative, recursive, brute force, divide-and-conquer, greedy, dynamic, genetic, branching, and backtracking with their data structure implementation and analysis. Understand and use some of the advanced data structures and their implementation, like: Binary index tree, segment tree, disjoint sets. Understand and use some of the graph algorithms and their implementation, like: BFS, DFS, topological sorting, minimum spanning trees and shortest path and connected components. Implementation of common problems. Students will be asked to solve practical programming assignments and homework on each subject, and the solution will be discussed.

٢٠ Course aims and outcomes:

A- Aims:
The goal is to train students how to deal with problems and provide solution with different techniques and methods

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to …

A Knowledge and understanding: Students should

A1) Understand the steps in problem solving and critical thinking.

A2) Understand the concepts of different problem-solving techniques/paradigms and their implementation, like: sequential, iterative, recursive, brute force, divide-and-conquer, greedy, dynamic, genetic, branching, and backtracking.

A3) Understand the concepts of advanced data structures and their implementation, like: Binary index tree, segment tree, disjoint sets and Fibonacci heaps.

A4) Understand graphs with their implantations and how to use them to solve problems

A5) Understand the concepts of common problems like: traveling sales man, knapsack and road cutting.

B Intellectual skills: with the ability to

Comparison between the different algorithms in terms of the time and storage complexity.

C Subject specific skills: with ability to

C1) Build and write complete C++/Java programs to solve problems in different problem-solving approaches
C2) Implement Binary index trees, segment trees, disjoint sets, Fibonacci heaps and solve problems that apply these concepts
C3) Represent graphs to solve problems with their implantations
C4) Implement solution to common problems, like: traveling sales man, knapsack, road cutting

D Transferable skills: with ability to

Work in a group in order to implement specific problems using C++/Java programming language and be able to discuss them.

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٢١. Topic Outline and Schedule:

Week	Lecture	Topic	SO	Teaching Methods*/platform	Evaluation Methods**	References
1	1.1	**General Introduction to codeforces**	1,2,6	Face to face lecturing /meeting	in class questions + assignment + contest	Codeforces.com
2 - 3	2.1 – 3.1	**Basic Techniques and Simple Math** **Basic STL "Vectors, Pairs, Sets, Maps, Queues**	1,2,6	Face to face lecturing /meeting	in class questions + assignment + contest	USACO: Ch 1-4
4 - 5	4.1 – 5.1	**Prefix Sum and Partial Sum**	1,2,6	Face to face lecturing /meeting	in class questions + assignment + contest	USACO: Ch 11
6 - 7	6.1 – 7.1	**Binary Search**	1,2,6	Face to face lecturing /meeting	in class questions + assignment + contest	USACO: Ch 12
8 - 10	8.1– 10.1	**Two Pointers and Sorting**	1,2,6	Face to face lecturing /meeting	in class questions + assignment + contest	USACO: Ch 14
11 - 12	11.1- 12.1	**Undirected and Unweighted Graphs**	1,2,6	Face to face lecturing /meeting	in class questions + assignment + contest	USACO: Ch 10
13	13.1	**Review**	1,2,6	Face to face lecturing /meeting	in class questions + assignment + contest	/
14	14.1	**Final Exam**	1,2,6			/

٢٢ 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
Ungraded Sheets	/	• Basic Techniques and Simple Math • Basic STL "Vectors, Pairs, Sets, Maps, Queues • Prefix Sum and Partial Sum • Binary Search • Two Pointers & Sorting	1,2,6	Every other week	Codeforces.com + e-learning
Graded Sheets (Contests)	40				
Semi-Final (Practical)	35	Undirected and Unweighted Graphs	1,2,6	12	V.Studio
Final	40	All	1,2,6	14	Paper-based

٢٣ Course Requirements

students should have a

- Computer
- Internet connection
- Account on MS Teams, Moodle
- MS Visual Studio (C++), or online compiler

٢٤ Course Policies:

A- Attendance policies:
Maximum allowable absence 15% of number of lectures per semester.

B- Absences from exams and handing in assignments on time:
Students are expected are expected to completely adhere to the assignments strict deadlines, absolutely no exceptions are given.

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It's student's responsibility to inform his instructor about his absence from any exam during period not exceeding 3 days.
If you miss the midterm, then a makeup exam will not be provided unless you submit a valid absence excuse, within three days from the midterm, to your lecturer. This excuse must be signed and stamped from the UJ hospital in order to be valid. If your lecturer accepts the excuse then you will be able to take the makeup. You need to follow up the departmental announcements regarding the makeup date and time. Please note that the lecturer may either accept or reject your excuse based on UJ regulations.

C- Health and safety procedures:
Full safety of the computer labs.

D- Honesty policy regarding cheating, plagiarism, misbehavior:
Students' cheating, plagiarism and misbehavior will be transformed to special committee.

E- Grading policy + Weighting (i.e. weight assigned to exams as well as other student work)
Intended grading scale

0 – 40	**F**
41-49	**D-**
50-53	**D**
54-57	**D+**
58-61	**C-**
62-66	**C**
67-70	**C+**
71-75	**B-**
76-79	**B**
80-84	**B+**
85-89	**A-**
90-100	**A**

F- Available university services that support achievement in the course:
Equipped Computer labs.

G- Statement on Students with disabilities

Students with Disabilities: Students with disabilities who need special accommodations for this class are encouraged to meet with the instructor and/or their academic advisor as soon as possible. In order to receive accommodations for academic work in this course, students must inform the course instructor and/or their academic advisor, preferably in a written format, about their needs no later than the 4th week of classes.

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٢٥ References:

A- Required book (s), assigned reading and audio-visuals:
- **AN INTRODUCTION TO THE USA COMPUTING OLYMPIAD**
- **Codeforces.com**

B- Recommended books, materials, and media:
- **Introduction to Algorithms, 3rd Edition, Cormen, 2009**
- **Competitive Programming (CP), 3rd Edition: Steven Halim, 2013, ASIN: B00FG8MNN8**
- **https://www.geeksforgeeks.org**

٢٦ Additional information:

ملاحظة١: في حالة التغيب عن امتحان الـ Mid Term لن يكون هناك امتحان تعويضي إلا في حالة وجود عذر وحالة طارئة من المستشفى. على الطالب إبراز العذر لمدرس المادة في فتره لا تتجاوز الثلاثة أيام من تاريخ الامتحان, وللمدرس الحق في قبول أو رفض العذر , وحسب التعليمات.

ملاحظة٢: لتفادي المشاكل والأخطاء التي تنتج, لا يجوز إجراء النقل الداخلي بأي حال من الأحوال.

For more details on University regulations please visit http://www.ju.edu.jo/rules/index.htm

Moodle:

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

Name of Course Coordinator: Dr. Heba Saadeh Signature: ---------- Date: 11 / 2022

Head of Curriculum Committee/Department: ---------- Signature: ----------

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

Head of Curriculum Committee/Faculty: ---------- Signature: ----------

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