



Princess Sumaya جامعة
University الأميرة سميرة
for Technology للتكنولوجيا

**Princess Sumaya University for Technology
The King Hussein School for Computing Sciences
Computer Science Department**

**ABET Course Syllabus – Spring Semester 2023/2024
CS11313 Algorithm Analysis and Design**

1. Course Information

Catalog Description	This course presents fundamental techniques for designing and analyzing computer algorithms. Students learn how to write efficient algorithms to solve various problems and how to estimate their running times before running them. Students also do programming projects in which they implement different algorithms and compare their actual running times with the theoretical estimates. The course covers general problem solving techniques including divide-and-conquer, greedy, dynamic programming, brute-force, branch-and-bound and backtracking. These techniques are applied to set of problems such as sorting, knapsack, matrix chain multiplication, longest common subsequence, activity selection, graph problems, etc. The course also gives an introduction to the theory of NP-Completeness.
Credit Hours	3
Prerequisite	Data Structures and Introduction to Algorithms (11212)
Course Type	Lecture
Required/Elective	Required
Textbook	Introduction to Algorithms, by Thomas Cormen, Charles Leiserson, Ronald Rivest and Clifford Stein, Third Edition, MIT Press
References	<ul style="list-style-type: none">Algorithms, by Jeff Erickson 2019, http://algorithms.wtfIntroduction to the design and analysis of algorithms, by Anany Levitin, 3rd Edition, Pearson Education.Principles of Algorithmic Problem Solving by Johan Sannemo 2018, https://www.csc.kth.se/~jsannemo/slask/main.pdfCompetitive Programmer's Handbook By Antti Laaksonen 2018, https://cses.fi/book/book.pdf
Instructor	Dr. Ibrahim Albluwi Email: i.albluwi@psut.edu.jo
Class Schedule	Section # 5: 11:00-12:30 Mo/We Room 207
Office Hours	11:00 - 12:30 (Sundays, Tuesdays and Thursdays) 9:30 - 11:00 (Mondays and Wednesdays)
Teaching Assistant	TBA

2. Course Topics

Topic(s)	Teaching Hours	Reference in Text
Introduction to Algorithms	1	
Asymptotic Complexity and Growth of Functions	4	Chapter 1,3
Divide and Conquer: Efficient Sorting	4	Chapter 6-9
Recurrence Equations	5	Chapter 4
Greedy Algorithms	3	Chapter 16
Dynamic Programming	6	Chapter 15
Backtracking + Branch & Bound	4	Notes
Graph Algorithms	10	Chapter 22, 23, 24
NP-Completeness	3	Chapter 34

* Book chapters are provided for reference only. You are responsible for the material taught in class.

3. Detailed Schedule*

Week	Topic(s)	Dates	Notes
1	- [1hr] Course Introduction - [2hr] Algorithm Analysis	18/2 - 22/2	
2	- [2hr] Algorithm Analysis - [1hr] Sorting Algorithms	25/2 - 29/2	Quiz 1 (Analysis)
3	- [3hr] Sorting Algorithms	3/3 - 7/3	Release of HW1
4	- [3hr] Recurrence Equations	10/3 - 14/3	
5	- [2hr] Recurrence Equations	17/3 - 21/3	Deadline for HW1 Quiz 2 (Recurrences)
6	- [3hr] Dynamic Programming	24/3 - 28/3	
7	- [3hr] Dynamic Programming	31/3 - 4/4	Release of HW2
8	- [1hr] Greedy Algorithms	7/4 - 11/4	Quiz 3 (DP) Eid AL Fitr
9	- [2hr] Greedy Algorithms	14/4 - 18/4	Midterm Exam
10	- [3hr] Elementary Graph Algorithms	21/4 - 25/4	Deadline for HW2 Quiz 4 (Graph Concepts)
11	- [2hr] Elementary Graph Algorithms	28/4 - 2/5	Labor Day
12	- [3hr] Elementary Graph Algorithms	5/5 - 9/5	
13	- [2hr] Elementary Graph Algorithms - [1hr] Backtracking + Branch & Bound	12/5 - 16/5	Release of HW3 Quiz 5 (Advanced Graph)
14	- [3hr] Backtracking + Branch & Bound	19/5 - 23/5	
15	- [3hr] NP complete	26/5 - 30/5	Deadline for HW3
16	- Review Week	2/6 - 6/6	

*This schedule might change slightly based on the midterm exam dates, public holidays, and any unforeseen circumstances.

4. Course Outcomes

1. Apply advanced techniques for complexity analysis of algorithms using mathematical tools such as recurrences (@1)
2. Solve algorithmic problems with advanced techniques including divide-and-conquer, greedy, dynamic programming, graph algorithms, backtracking and enumeration (@2)
3. Select and apply the right combination of algorithmic methods and data structures for solving a problem based on complexity analysis (@2)
4. Implement various algorithms and measure their actual running times (@1)

5. Assessment Policy

Assessment Tool	Weight	Date	Description/Notes
Midterm Exam	30%	Week 9	Exact date and time to be set by the university
Programming Assignments	14%	Weeks 3, 7 and 13	Three assignments worth 4.667% each. Lateness policy: <ul style="list-style-type: none">- 1 – 23 hours late: -5%- 24 – 47 hours late: -10%- 48 – 71 hours late: -15%- 72 hours late or more: -100%
Quizzes 4/5 No makeup quizzes drop lowest	16%	Weeks 2,5,8,10, and 13	Four out of five quizzes will be considered. Each quiz is worth 4%.
Final Exam	40 %	Week 16	Exact date and time to be set by the university

6. Contribution of the Course to the Professional Component

Computer Science Topics	100%
General Education	10%
Mathematics & Basic Sciences	30%

7. Expected level of proficiency from students entering the course

Mathematics	Some
Physics	Not applicable
Technical writing	Some
Computer programming	Strong

8. Material available to students, instructors, TAs, and department at end of course

	Students	Department	Instructors	TA
Course objectives and outcomes form	X	X	X	
Lecture notes, homework assignments, and solutions	X	X	X	
Samples of homework solutions from 3 students		X	x	
Samples of lab reports of 3 students			x	
Samples of exam solutions from 3 students		X	x	
Course performance form from student surveys		X	X	
End-of-course instructor survey		X	X	

9. Academic Integrity

- **Collaboration Policy:** This course permits and encourages many forms of collaboration. However, you must be careful to collaborate using the following rules:
 1. **No Visible Code:** When discussing ideas with other students, you are not allowed to show your code to the student you are discussing with and you are not allowed to look at code written by them.
 2. **Hands in Pockets:** When discussing ideas with others, you are not allowed to write code (or pseudocode-like steps) on your machine, on paper or any other medium for yourself or for the student you are discussing with.
 3. You must also acknowledge any collaboration you have had with anyone while working on the assignment. Yet, you are not allowed to share or copy solutions with other students or other parties like websites that offer assignments and/or exam solutions, or other individuals who may provide you with solutions.
 4. Collaboration with students, other individuals, or websites that offer solutions are prohibited on this course quizzes and exams, any act that violates this rule will be subject to penalties per PSUT regulations.

The following is a summary of what is allowed on **assignments**:

Activity	course staff	class-mates	others
discuss concepts with ...	✓	✓	✓
Acknowledge collaboration with ...	✓	✓	✓
show solutions to ...	✓	no	no
view solutions from ...	no	no	no

- **Outside sources.**
 - Copying or adapting code that is not yours (e.g. from the internet) is permitted only if it comes from the course materials (i.e., textbook or class notes).
 - Using the internet to look-up technical information is fine (example: The meaning of an error message, youtube video explaining how quicksort works, a tutorial on dynamic programming, a stack overflow post on a C++ feature, etc.)
 - Using the internet to look for code similar to what is required in the assignments is **not** allowed. Simply looking at such code is a violation of the course policy.
- **Penalties.**
 - If we detect a plagiarism case on any assignment *or part of an assignment*, we will report the case to the Deanship of King Hussein's College of Computing Sciences. The penalty is determined by the Dean and can vary from one case to another. The typical penalty for plagiarism cases on assignments is an **F (fail) in the course**.
 - Penalties apply not only for plagiarism but also for abetting plagiarism (i.e. helping others plagiarize).
 - For the quizzes, if you attempt to take the quiz from outside the classroom, the penalty for this violation is typically failing the course.
- **Regret clause.** If you plagiarize code on an assignment in this course, you may send an email to your instructor informing them about the case. If you do so, you will receive a 0 on the assignment but none of the other penalties will apply.
- **Missed Midterm Exam.** According to the university regulations, you are entitled to a make-up exam if you miss the midterm exam provided that:
 - You provide a valid excuse. A valid excuse is a medical report from a doctor (approved by the medical center of the university) or a note from a Dean justifying your absence.
 - You inform your instructor within three days of the exam (or within three days of the date of your medical report).
- **Missed Quizzes.** We do not do make-up quizzes. If you miss a quiz, we will automatically consider the grades of the other 4 quizzes.
- **Generative AI Tools.** You are expected to compose your solutions for the programming assignments on your own. Therefore:
 - Using GitHub Copilot and other similar tools that generate code in an IDE is not allowed.
 - Using ChatGPT and similar chatbots for understanding concepts is allowed. Using it to compose assignment solutions or debug assignment solutions is not allowed. To be on the safe side:
 - Do not prompt the chatbot to solve an assignment problem (e.g. by copying and pasting the problem statement into ChatGPT, or by explaining to the chatbot what the problem requires)
 - Do not copy and paste your code into the chatbot (e.g. to ask ChatGPT to find a bug in your code).

Violating this policy can lead to sanctions that range from 0 on an assignment to 0 in all the coursework.