The University of Jordan

Faculty of Engineering and Technology

Computer Engineering Department

Fall Semester 2020/2021

Course

Advanced Algorithms – 0907744 (3 Cr. – Core Course)

Catalog Description

Asymptotic notation, algorithms analysis, stacks, queues, elementary sort, merge sort, quick sort, heap sort, priority queues, binary search trees, hash tables, directed graphs, undirected graphs, breadth-first search, depth-first search, Dijkstra's algorithm, Bellman-Ford algorithm, minimum spanning trees, NP-completeness, approximation algorithms, linear programming, Intractibility.

Prerequisites by Course

None

Prerequisites by Topic

Students are assumed to have had sufficient knowledge pertaining to

1. Understanding of basic data structures: arrays, lists, stacks, queues, and trees
2. Execution analysis of algorithms using asymptotic notations
3. Writing programs in C++ or Java

Textbook

Robert Sedgewick and Kevin Wayne, **Algorithms, 4th Edition**, Addison-Wesley Professional, 2011

References

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, MIT press, 2009.
2. Garey and Johnson, Computers and Intractability, A Guide to the Theory of NP-Completeness, Freeman, 1979

Website

Microsoft Teams

Schedule & Duration

16 Weeks, 16 lectures, 3 hours each (including exams)

Student Material

Text book, class handouts, lecture notes, and any additional reading assigned by the instructor

College Facilities

Classroom with whiteboard and projection display facilities, library, and computer laboratory.

Course Objectives

The objectives of this course is to help students to:

1. Understand the fundamental concepts of commonly used algorithms in search, sort, and graphs.
2. Understand basic and advanced data structures algorithms.
3. Understand Intractability and learn how to cope with NP-completeness.
4. Demonstrate an ability in using algorithms to solve practical problems in programming assignments.

Course Outcomes and Relation to ABET Program Outcomes

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

1. Design and implement algorithms to solve problems under time and memory constraints [1,7].
2. Use linear programming to create mathematical formulation for optimization problems [1].

Course Topics

1. Stacks, queues, algorithms analysis
2. Elementary sorts, merge sort, quick sort
3. Priority queues, binary heaps, heap sort
4. Symbol tables, binary search trees, hash tables
5. Undirected graphs, undirected graphs,
6. Directed Graphs, Minimum spanning trees
7. Shortest paths
8. Intractability, P vs NP, NP-completeness
9. Linear programming

Computer Usage

Practical aspects of the course will be covered by programming assignments

Policies

- Attendance is required. Class attendance will be taken every class and the university's polices will be enforced in this regard.
- All submitted work must be yours
- Cheating will not be tolerated
- Join the facebook group of this course
- Check department announcements at: http://www.facebook.com/pages/Computer-Engineering-Department/369639656466107 for general department announcements.

Grading policy

Programming assignments	30%
Midterm Exam	30%
Final Exam	40%

Instructors

Dr. Fahed Jubair, f.jubair@ju.edu.jo
Room: CPE 417
Office Hours: Sun, Tue: 12:30 – 1:30, Mon: 1:00 – 2:00

Class Time and Location

Section 1: Sunday: 4:00–7:30, Class Room: CPE 001