University/Academy: Arab Academy for Science and Technology & Maritime Transport
Faculty/Institute: College of Computing and Information Technology
Program: Computer Science

Form No. (12)
Course Specification

1- Course Data

Course Code:	Course Title:	Academic Year/Level:
CS312	Computing Algorithms	Year 3 / Semester 6
Specialization: Computer science	**No. of Instructional Units:** 2 hrs lecture 2 hrs lab	**Lecture:**

2- Course Aim	This course introduces students to the analysis and design of computer algorithms. Topics covered include searching, sorting, selection, graph structures, traversal algorithms, P/NP complete problems, analysis of worst case running time of algorithms, basic properties of randomized algorithms, how to use the major algorithms, data structures and design paradigms, and introduction about the design of parallel algorithms.
3- Intended Learning Outcome:	
a- Knowledge and Understanding	**Students will be able to demonstrate knowledge of:** K13. Use high-level programming languages. K15. Interpret and analyzing data qualitatively and/or quantitatively. • Discuss the steps of problem solving. (K15) • Understand what is the complexity of an algorithm. (K15) • Understand asymptotic notations. (K15) • Understand what is upper and lower bounds of an algorithm. (K15) • Know the different types of problems. (K15) • Know the different problem solving techniques. (K15) • Understand what is a Brute force. (K13,K15) • Explain selection sort(K13,K15) • Explain bubble sort(K13,K15) • Explain sequential Search(K13, K15) • Explain CP & CH by Brute force (K15) • Understand what is Greedy method, why and when to use it(K15) • Explain the Knapsack problem(K13, K15) • Understand the minimum spanning tree problem(K13, K15) • Understand the divide and conquer technique(K15) • Understand the importance of dynamic programming(K13,K15) • Review Dijkstra's algorithm(K15) • Explain optimal binary search tree(K13,K15) • Explain the Knapsack problem(K15)

	• Explain string matching(K15) • Explain closest pair algorithm(K15) • Explain Convex Hull(K15) • Explain Depth-first search, strongly connected components(K15) • Explain Breadth-first search, Dijkstra's algorithm(K13, K15) • Explain Convex Hull(K15) • Explain Line segment intersection(K15) • Explain Polygon triangulation(K15) • Understand the backtracking algorithms(K13, K15) • Know the need for parallel computers(K15) • Learn models of computation(K13,K15) • Understand algorithms for searching a sorted sequence (EREW, CREW, CRCW) (K13, K15) • Understand algorithms for searching a random sequence (EREW, CREW, CRCW, Tree, Mesh) (K13,K15)
b- Intellectual Skills	**By the end of the course, the student acquires high skills and an ability to understand:** **I12** Perform classifications of (data, results, methods, techniques, algorithms.. etc.). **I17** Identify a range of solutions and critically evaluate and justify proposed design solutions. **I19.** Generate an innovative design to solve a problem containing a range of commercial and industrial constraints. • Analyze algorithms (I17) • Develop algorithms using the Brute force technique.(I17) • Develop algorithms using Greedy technique. (I17) • Compare different algorithms (I12,I17) • Develop methods for solving different DP problems (I19) • Solve a problem on a parallel machine or distributed system (I19) • Analyze parallel algorithms (I12, I17)

c- Professional Skills	**By the end of the course the student will have the ability to:** **P11.** Perform independent information acquisition and management, using the scientific literature and Web sources. **P14** Specify, design, and implement computer-based systems. **P15**. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem. **P19**. Deploy effectively the tools used for the construction and documentation of software, with particular emphasis on understanding the whole process involved in using computers to solve practical problems. • Implement programs for solving practical problems • Implement parallel algorithms
d- General Skills	**Students will be able to:** G1 Demonstrate the ability to make use of a range of learning resources and to manage one's own learning. G7 Show the use of general computing facilities. • Learn problem solving skills

	• Show use of computing facilities • Demonstrate the ability to make use of a range of learning resources and to manage one's own learning
4- Course Content	• Introduction to the design and analysis of algorithms. • Measuring the asymptotic growth of functions. Lower and upper bounds • Important problem Types • Brute force • The Greedy method • Divide and conquer • Dynamic programming • Graph algorithms • Computational geometry problems • Backtracking algorithms • Parallel Algorithms
5- Teaching and Learning Methods	Lectures, Labs, Projects, Individual study & self-learning.
6- Teaching and Learning Methods for Students with Special Needs	• Students with special needs are requested to contact the college representative for special needs (currently Dr Hoda Mamdouh in room C504) • Consulting with lecturer during office hours. • Consulting with teaching assistant during office hours. • Private Sessions for redelivering the lecture contents. • For handicapped accessibility, please refer to program specification.
7- Student Assessment:	
a- Procedures used:	Exams and Individual Projects
b- Schedule:	Week 7 exam 1 Projects through the semester Week 16Final exam
c- Weighing of Assessment:	7th week exam 30% Project 20% Lab Quiz 10 % Final exam 40%
8- List of References:	
a- Course Notes	From the Moodle on www.aast.edu
b- Required Books (Textbooks)	Levitin, Anany, *Introduction To The Design & Analysis Of Algorithms*, 2nd edition, Pearson, 2006

c- Recommended Books	Steven S. Skiena. The Algorithm Design Manual. Springer-Verlag, 1998
d- Periodicals, Web Sites, ..., etc.	

Course Instructor: **Head of Department:**

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