Mansoura University

Faculty of Computers and Information Sciences

Course Specifications of

Algorithm Analysis and Design –   – 2017/2018

University: Mansoura University   **Faculty**: Computer and Information Sciences

Program on which the course is given: General Program

Department offering the course: Department of Computer Science

Academic year/ Level: Third Year – First Semester– 2017-2018

Date of specification approval:

A- Basic Information

Title :   Algorithm Analysis and Design   **Code :**

Credit Hours :   3   **Lecture :**   2   **Tutorial :**   2   **Practical :**   0

B- Professional Information

1- Overall Aims of the Course

This course aims to:

Upon completing this course, the student should understand the solid theoretical background in analyzing and designing computer algorithms. The student should be able to use critical thinking in applying suitable algorithms design techniques to solve problems encountered either in some real problems in different domains or in advanced level courses. Also, the student will able to analyze the time and space complexities of those various problems.

2- Intended Learning Outcomes of the course (ILOs)

By completing this course successfully, the student will be able to:

a- Knowledge and Understanding

a1   Essential facts, concepts, principles and theories relating to computing and information and computer applications as appropriate to the program of study.

a2   Modeling and design of computer-based systems bearing in mind the trade-offs.

a3   Tools, practices and methodologies used in the specification, design, implementation and evaluation of computer software systems.

a4   Criteria and specifications appropriate to specific problems, and plan strategies for their solution.

a14   Demonstrate basic knowledge and understanding of a core of analysis, algebra, applied mathematics and statistics.

b- Intellectual Skills

b1   Analyze computing problems and provide solutions related to the design and construction of computing systems.

b2   Realize the concepts, principles, theories and practices behind computing and information as an academic discipline.

b4   Analyze, propose and evaluate alternative computer systems and processes taking into account limitations, and quality constraints.

b10   Define traditional and nontraditional problems, set goals towards solving them, and observe results.

b11   Perform comparisons between (algorithms, methods, techniques...etc).

b12   Perform classifications of (data, results, methods, techniques, algorithms..etc.).

b15   Restrict solution methodologies upon their results.

b16   Establish criteria, and verify solutions.

b17   Identify a range of solutions and critically evaluate and justify proposed design solutions.

c- Professional and Practical Skills

c6   Design, implement, maintain, and manage software systems.

c15   Specify, design, and implement computer-based systems.

c16   Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem.
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d- General and Transferable Skills

d1.   Demonstrate the ability to make use of a range of learning resources and to manage one's own learning.

3- Contents

No	Course Content	Lecture	Tutorial	Total
1	**Introduction and Getting Started:** Algorithms, Life cycle of solving problems, Algorithms as technique, Insertion sort , Analyzing algorithms, Designing algorithms	4	4	8
2	**Growth of Functions:** Asymptotic notation, Standard notations and common functions	2	2	4

3	**Divide and Conquer:** Binary Search Algorithm, Merge Sort, The recursion-tree method for solving recurrences, Iteration method for solving recurrences, Matrix multiplication, Strassen's algorithm for matrix multiplication, The master method for solving recurrences – Some related Problems	6	6	12
4	**Heapsort:** Heaps, Maintaining the heap property, Building a heap, The heapsort algorithm, Priority queue **Quicksort:** Description of quicksort Performance of quicksort, A randomized version of quicksort Analysis of quicksort **Sorting in Linear Time:** Counting sort, Radix sort, Bucket sort **Medians and Order Statistics**	4	4	8
5	**Greedy algorithms:** Elements of the greedy strategy, Coin changing, 0-1 knapsack, Huffman codes, Minimum Spanning Trees: The algorithms of Kruskal and Prim **Introduction to Dynamic Programming:** Introduction to Shortest Path problem	7	7	14
6	**Representations of graphs:** Introduction to graphs, Some common graphs.	2	2	4
7	**Introduction to NP Completeness**	1	1	2
Total Hours		26	26	52

4- Assessment Schedule

Assessment Method	No.	Description	Week No.	Weight (%)
Assignment	1	Sheet no. 1	5	2.00 %
Written Exams	2	Midterm Exam	7	15.00 %
Assignment	3	Sheet no. 2	12	2.00 %
Quiz	4	Quiz	3, 10	2.00 %
Term project	5	Program Assignment	13	4.00 %
Written Exams	6	Final Exam	14	75.00%
Total				100

5- List of references

5.1 Course Notes
- Slides delivered to students at the end of some lectures.
5.2 Essential Books (Text Book)

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to Algorithms", 3rd Edition, MIT Press, 2009.

6- Facilities Required for Teaching and Learning
- Data show.
- Blackboard.

Course Content/ILO Matrix

Course Content	a1	a2	a3	a4	a14	b1	b2	b4	B10	b11	b12	b15	b16	b17	c6	c15	c16	d1
Introduction and Getting Started:	●																	
Growth of Functions	●		●		●		●	●	●	●			●			●		
Divide and Conquer: Solving recurrences	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Heapsort-Quicksort: - Sorting in Linear Time-Medians and Order Statistics		●		●	●		●											
Greedy algorithms - Introduction to Dynamic Programming		●	●	●	●	●	●	●	●		●	●		●	●	●		●
Representations of graphs.	●	●				●	●	●										
Introduction to NP Completeness	●		●						●		●	●	●					

Learning Method/ILO Matrix

Course Content	A1	a2	a3	a4	a14	b1	b2	b4	b10	b11	b12	b13	b15	b16	b17	c6	c15	c16	d1
Lectures	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●
Tutorials	●	●	●	●	●	●		●	●	●	●			●					●

Assessment Methods/ILO Matrix

Assessment	a1	a2	a3	a4	a14	b1	b2	b4	b10	b11	b12	b13	b15	b16	b17	c6	c15	c16	d1

Assignment	●			●	●	●		●	●	●	●		●	●				
Midterm Exam	●		●	●	●	●		●		●	●		●	●			●	
Quizzes	●				●					●								
Term project			●												●	●		●
Final Exam	●	●	●	●	●	●		●	●	●	●	●	●		●	●	●	●	●

Course Coordinator: Assistant Prof. Samir Elmougy
Head of Department: Assistant Prof. Samir Elmougy
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