Institute Of Business & Information Technology
University of the Punjab
Quaid-e-Azam Campus, Lahore

Spring Term 2019

Basic Information:

Course Title:	*Analysis of Algorithms*	**Course Code**	*IT-0467*
Program:	*BBIT- IT Specialization*	**Credit Hours:**	*3*
Total Sessions:	*Thirty Two, 32(max)*	**Pre Requisite:**	*Data Structures & Algorithms*

Course Description:

Algorithms are precisely stated, general problem solving methods suitable for computer implementation. Data Structures are methods of organizing data involved in computation. Algorithms and data structures are central objects of study in computer science. Once appropriate algorithms and data structures are chosen, all that remains in most computer programs is routine coding. Moreover, algorithms and data structures go hand in hand: neither can be studied fruitfully without knowledge of the other. The course studies techniques for designing and analyzing algorithms and data structures. The course concentrates on techniques for evaluating the performance of algorithms. The relationship between inductive proof and creative evolution of algorithms is investigated.

Learning Outcomes:

The design and analysis of algorithms is the core subject matter of Computer Science. Given a problem, we want to

- ✓ find an algorithm to solve the problem,
- ✓ prove that the algorithm solves the problem correctly,
- ✓ prove that we cannot solve the problem any faster, and
- ✓ implement the algorithm.

Designing an algorithm for a computational problem involves knowledge of the problem domain, a thorough knowledge of the data structures that are available and suitable and no small measure of creativity. This course concentrates on the above problems, studying useful algorithmic design techniques, and methods for analyzing algorithms.

Teaching Learning Methodology:

The formal teaching component of this course consists of: active student participation in and contribution to all forms of teaching and learning i.e. lectures, discussions, research assignments and projects. Lectures will be twice a week of 90 min each.

Weekly Term Plan

Wk.	Lecture Topic	Activity
1.	*Introduction to Algorithms*	
2.	*Standard Notations and Formulae, Time & Space Complexity*	A-01
3.	*Recursive Algorithms, Recursion Trees and Time Expression*	Quiz 01
4.	*Growth Functions, Complexity Methods*	A-02
5.	*Non-Linear Sorting*	
6.	*Linear Time Sorting, Hash Tables*	
7.	*Hash Function, Open Hashing*	A-03, Quiz 02
8.	*Dynamic Programing; Assembly Line*	
9.	*Mid Term Examination*	
10.	*Matrix Chain Multiplication, Longest Common Subsequence*	
11.	*Greedy Algorithms, Huffman Coding, Task Scheduling Problem*	A-04
12.	*Graph, Introduction and Representation*	A-05, Quiz 03,
13.	*Breadth First Search, Depth First Search*	A06
14.	*Minimum Spanning Tree, Kruskal Algorithm, Prims Algorithms*	A-08, Quiz 04
15.	*Single Source Shortest*	
16.	*Final Term Examination*	

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No	Topic	Ch.	Page
1.	Introduction to Algorithms	01	05
2.	Standard Notations and Formulae, Time & Space Complexity		
3.	Iterative Algorithms and Complexity Expression		
4.	Recursive Algorithms, Recursion Trees and Time Expression		
5.	Growth Functions, Asymptotic Notations	03	42
6.	Substitution Method	04	63
7.	Recursion Tree Method	04	67
8.	Master Theorem Method	04	73
9.	Non-Linear Sorting; Bubble Sort, Selection Sort, Insertion Sort	02	05
10.	Merge Sort	02	29
11.	Quick Sort	06	145
12.	Heap Sort	06	128
13.	Linear Time Sorting; Counting Sort, Radix Sort, Bucket Sort	08	168, 170, 174
14.	Hash Tables; Direct Hash Tables	11	222
15.	Hash with Chaining, Hash Functions (Division, Multiplication)	11	224, 229
16.	Open Addressing, Linear and Quadratic Probing	11	237, 239, 240
17.	Dynamic Programing; Assembly Line	15	324
18.	Matrix Chain Multiplication	15	331
19.	Longest Common Subsequence	15	350
20.	Greedy Algorithms; Elements of Greedy Algorithm	16	370,379
21.	Huffman Coding	16	385
22.	Task Scheduling Problem	16	399
23.	Graph, Introduction and Representation	22	528
24.	Breadth First Search, Depth First Search	22	531, 540
25.	Topological Sort	22	549
26.	Strongly Connected Components	22	552
27.	Minimum Spanning Tree	23	562
28.	Kruskal Algorithm, Prims Algorithms	24	568, 570
29.	Single Source Shortest Path	24	580
30.	Bellman Ford Algorithm	24	588
31.	Dijkastra's Algorithm	24	595

Text & Recommended Readings

1. Introduction to the Algorithms
   Thomas H. Cormen
   3rd Edition
   Prentice Hall Publishers
2. Computer Algorithms: Introduction to Design and Analysis'
   Sara Baase
   Addison Wesley, 1988

Tools

1. Microsoft Word for Documentation

Headings	Arial 11pt Bold
Normal Text	Times New Roman 10pt
Header Footer	Times New Roman 8pt
Paragraph	Single Line Spacing First Line Indent 1.0 cm
Page Margins	2 cm from each side

2. Microsoft Visio 2007

Grading Policy:

Final Grade for this course will be the cumulated result of the following term work with relevant participation according to the quoted percentage.

Sessional	**25%**	***Mid Term***	**35%**
Assignments	10%	***Final Term***	**40%**
Quizzes	10%		
Presentation	05%		

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Contact Hour

Lectures				Counseling Hour		
Day	**Start**	**Finish**	**Venue**	**Day**	**Start**	**Finish**
Tuesday	0815Hr	0945Hr	Aud-07	*Wednesday*	1000hr	1100hr
Thursday	0815Hr	0945Hr	Aud-07	*Wednesday*	1200hr	1300hr

Grading System:

Letter Grade	Grade Point	Num. Equivalence
A	4.00	85 – 100 %
A-	3.70	80 – 84 %
B+	3.30	75 – 79%
B	3.00	70 – 74 %
B-	2.70	65 – 69 %
C+	2.30	61 – 64 %
C	2.00	58 – 60 %
C-	1.70	55 – 57 %
D	1.00	50 – 54 %
F	0.00	Below 50 %
I	Incomplete	*
W	Withdraw	*

Norms to Course:

- ✓ Submission Date and Time for the term instruments is always **UN-EXTENDABLE**.
- ✓ Re-sit in Mid & Final Term will cause you a loss of 2 & 3 grade marks respectively. (PU Policy)
- ✓ 7 Absentees in class will be result in forced withdrawal. (PU Policy)
- ✓ Printed Document shall be in accordance to the given format.
- ✓ After the submission date, No excuse will be entertained.
- ✓ Assignment is acceptable only in its *Entirety.*
- ✓ No make up for any assignment and quiz.
- ✓ Copied & Shared work will score Zero.
- ✓ Assignments are Individual.