UNITED INTERNATIONAL UNIVERSITY

Department of Computer Science and Engineering (CSE)

Course Syllabus

1	**Course Title**	Algorithms
2	**Course Code**	CSI 227
3	**Trimester and Year**	Spring 2018
4	**Pre-requisites**	CSI 217: Data Structures, CSI 219: Discrete Mathematics
5	**Credit Hours**	3.00
6	**Section**	B
7	**Class Hours**	Monday: 09:00 AM – 10:20 AM Wednesday: 09:00 AM – 10:20 AM
8	**Class Room**	R# 332
9	**Instructor's Name**	Arif Arman
10	**Email**	arman@cse.uiu.ac.bd
11	**Office**	####
12	**Counselling Hours**	Monday 10:20 AM – 11:50 AM Wednesday 10:20 AM – 11:50 AM
13	**Text Book**	Introduction to Algorithms (3rd edition) by Cormen, Leiserson, Rivest and Stein
14	**Reference**	http://www.shafaetsplanet.com/ [For Bengali resources] https://www.geeksforgeeks.org/ [Implementation resources]
15	**Course Contents (approved by UGC)**	Techniques for analysis of algorithms, Methods for the design of efficient algorithms: divide and conquer, greedy method, dynamic programming, back tracking, branch and bound, Basic search and traversal techniques, graph algorithms, Algebraic simplification and transformations, lower bound theory, NP-hard and NP-complete problems.
16	**Course Outcomes (COs)**	

COs	**Description**
CO1	Analyze worst-case running times of algorithms using asymptotic analysis.
CO2	Describe different algorithm paradigms and explain when algorithmic design situations call for them. Recite algorithms that employ these paradigms. Synthesize such algorithms. Derive and solve problems describing the performance of the algorithms.
CO3	Compare between different data structures. Pick an appropriate data structure for a design situation.
CO4	Explain what complexity classes are. Be familiar with the complexity classes and conversion, relation and reduction between them.

17	**Teaching Methods**	Lecture, Case Studies.
18	**CO with Assessment Methods**	

CO	Assessment Method	(%)
-	Attendance	5
-	Assignments	5
-	Class Tests	20
CO1, CO2	Midterm exam	30
CO1, CO2, CO3, CO4	Final exam	40

19 Mapping of COs and Program outcomes

COs	Program Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		C										
CO2			C									
CO3	C											
CO4	C											

20 Lecture Outline

Class	Topics/Assignments	COs	Reading Reference	Lecture Outcomes/Activities
1	Analyzing Algorithms: Worst-Case and Best-Case Analysis	1, 2	Lecture	Lecture, Assignment
2	Analyzing Algorithms: Worst-Case and Best-Case Analysis	1, 2	Lecture	Lecture, Assignment
3	Asymptotic Notation	2	3.1	Lecture, Assignment
4	Class Test; The Divide-and-Conquer Approach; Analyzing Divide-and-Conquer Algorithms	2, 3	2.3.1, 2.3.2	Lecture, Test
5	The Maximum-Subarray Problem; The Recursion-Tree Method for Solving Recurrences	2, 3	4.1, 4.4	Lecture, Assignment
6	The Recursion-Tree Method for Solving Recurrences	2	4.1, 4.4	Lecture, Assignment
7	An Activity-Selection Problem; Elements of the Greedy Strategy	2, 3, 4	16.1, 16.2	Lecture, Assignment
8	Class Test; Some Legacy Greedy Problems	2, 3, 4	Lecture	Lecture, Test
9	Fractional Knapsack Problem, Coin Change Problem	2, 3	Lecture	Lecture, Assignment
10	Dynamic Programming Basics, The Rod Cutting Problem	2, 3	15.1	Lecture, Assignment

		11	Coin Change Problem, Elements of Dynamic Programming	3, 4	15.3	Lecture, Assignment
		12	0/1 Knapsack Problem, Review	3	Lecture	Lecture, Assignment
			MIDTERM EXAM			
		13	Applications of BFS, DFS	2, 3, 4	Lecture	Lecture, Assignment
		14	Disjoint-Set Operations; Disjoint-Set Forests	2, 4	21.1, 21.3	Lecture, Assignment
		15	Growing a Minimum Spanning Tree	3	23.1	Lecture, Assignment
		16	Class Test; Kruskal's Algorithm	2, 3	23.2	Lecture, Test
		17	Single-Source Shortest Path Variants, Optimal Substructure of a Shortest Path, Negative-weight Edges, Cycles, Relaxation	3	24	Lecture, Assignment
		18	The Bellman-Ford Algorithm	2, 3	24.1	Lecture, Assignment
		19	Dijkstra's Algorithm	2, 3, 4	24.3	Lecture, Assignment
		20	Class Test; Direct-Address Tables, Hash Tables	4	11.1, 11.2	Lecture, Test
		21	Hash Functions; Open Addressing	4	11.3, 11.4	Lecture, Assignment
		22	The Nave String-Matching Algorithm; The Rabin-Karp Algorithm	2, 3	32.1, 32.2	Lecture, Assignment
		23	Class Test; Polynomial Time; Polynomial-Time Verification; NP-Completeness	5	34.1, 34.2, 34.3	Lecture, Test
		24	NP-Hard, Reducibility, Review	5	34.3	Lecture

Appendix 1: Assessment Methods

Assessment Types	Marks
Attendance	5%
Assignments	5%
Class Tests	20%
Mid Term	30%
Final Exam	40%

Appendix 2: Grading Policy

Letter Grade	Marks %	Grade Point	Letter Grade	Marks%	Grade Point
A (Plain)	90-100	4.00	C+ (Plus)	70-73	2.33
A- (Minus)	86-89	3.67	C (Plain)	66-69	2.00
B+ (Plus)	82-85	3.33	C- (Minus)	62-65	1.67
B (Plain)	78-81	3.00	D+ (Plus)	58-61	1.33
B- (Minus)	74-77	2.67	D (Plain)	55-57	1.00
			F (Fail)	<55	0.00

Appendix-3: Program outcomes

POs	Program Outcomes
PO1	An ability to apply knowledge of mathematics, science, and engineering
PO2	An ability to identify, formulate, and solve engineering problems
PO3	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
PO4	An ability to design and conduct experiments, as well as to analyze and interpret data
PO5	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
PO6	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
PO7	A knowledge of contemporary issues
PO8	An understanding of professional and ethical responsibility
PO9	An ability to function on multidisciplinary teams
PO10	An ability to communicate effectively
PO11	Project Management and Finance
PO12	A recognition of the need for, and an ability to engage in life-long learning