Course Specifications

General Information

Course name	Data Structures
Course number	ITCS2307
Faculty	
Department	
Course type	College Needs
Course level	2
Credit hours (theoretical)	3
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

1 - Assess how the choice of data structures design methods impacts the performance of programs

2 - Choose the appropriate data structure design method for a specified application

3 - Write programs using object-oriented design principles

4 - Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, tournament trees, binary search trees, and graphs and writing programs for these solutions

Intended Learning Outcomes

Knowledge and Understanding	* a1. Identify the differences between basic principles, main features and operations of abstract data types, in particular of lists, stacks, queues, trees, heaps, hash tables and graphs * a2. State fundamental algorithms associated with different data types * a3. Outline the fundamentals of programming and the construction of computer-based systems * a4. Outline the fundamentals of data structures and algorithms * a5. Identify and demonstrate usage of tools, practices and methodologies used in the specification, design, implementation and critical evaluation of computer software systems
Intellectual Skills	* b1. Differentiate specifications of abstract data types from particular implementation techniques * b2. Identify efficient data structures and algorithms that use them * b3. Compare data structures as fundamental tools of program design * b4. Identify traditional and nontraditional problems, set goals towards solving them, and observe results * b5. Perform classifications of (data, results, methods, techniques, algorithms, etc.) * b6. Perform comparisons between (algorithms, methods, techniques, etc.)
Professional Skills	* c1. Design data abstraction and interfaces * c2. Solve problems using different data structures and writing programs for these solutions * c3. Use appropriate programming languages and design methodologies * c4. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem * c5. Apply tools and techniques for the design and development of applications
General Skill	* d1. Communicate effectively by oral, written and visual means * d2. Work effectively as an individual and as a member of a team * d3. Lead and motivate individuals * d4. Manage tasks and resources * d5. Work in stressful environment and within constraints

Course Contents

1 - Descriptive and analytic presentation of data structures and algorithms such as lists, tables, queues, linked lists, arrays, hashing, trees, and graphs
2 - Performance evaluation involving worst case, average and expected case, and amortized analysis

Teaching and Learning Methods

1 - Lectures
2 - Practical Exercises
3 - Projects

Students Assessment

Assessment Method	TIME	MARKS
Mid-Term Exam I	6th week	20
Projects	12th week	20
Class Work	During the 16 weeks	10
Final Exam	16th week	50

Books and References

Course note	Adel Ahmed, Lecture Notes
Essential books	Thomas A. Standish T. Data Structures in Java, Addison Wesley ,1998
	Iain T. Adamson, Data Structure and Algorithms A First Course, Springer, 1996

Knowledge and Skills Matrix

Main Course Contents	Study Week	Knowledge and Understanding	Intellectual Skills	Professional Skills	General Skill
Descriptive and analytic presentation of data structures and algorithms such as lists, tables, queues, linked lists, arrays, hashing, trees, and graphs	1-11	a1-a5	b1-b4	c1-c3	d1-d5
Performance evaluation involving worst case, average and expected case, and amortized analysis	12-15	a3, a4	b5, b6	c4, c5	d1-d5