Course Specifications

General Information

Course name	Algorithms
Course number	ITCS2312
Faculty	
Department	
Course type	Major Needs
Course level	2
Credit hours (theoretical)	3
Credit hours (practical)	0
Course Prerequisites	

Course Objectives

1 - Learning the main classic algorithms in various domains

2 - Learning techniques for designing efficient algorithms

3 - Applying the algorithms and design techniques to solve problems

4 - Having a sense of the complexities of various problems in different domains.

Intended Learning Outcomes

Knowledge and Understanding	* a1. Explain asymptotic notation of time analysis and complexity * a2. Discuss a variety of useful algorithms * a3. Identify the principles and techniques for algorithm design * a4. Define the essential mathematics relevant to algorithms * a5. Outline a core of analysis and applied mathematics
Intellectual Skills	* b1. Prove the correctness of simple algorithms * b2. Perform comparisons between (algorithms, methods, techniques, etc.) * b3. Perform classifications of (methods, techniques, algorithms, etc.) * b4. Identify components, patterns and main ideas of algorithm designs
Professional Skills	* c1. Use the divide-and-conquer, greedy, and dynamic programming paradigms to design algorithms * c2. Evaluate algorithms in terms of their time analysis within the given problem * c3. Specify and apply the main methodologies for designing algorithms * c4. Evaluate systems in terms of general quality attributes and possible tradeoffs presented within the given problem * c5. Deploy effectively the tools used for designing and analyzing the algorithms * c6. Specify, investigate, analyze, design and develop computer-based systems using appropriate tools and techniques * c7. Apply tools and techniques for the design and development of applications
General Skill	* d1. Manage tasks effectively * d2. Manage ones own learning and development, including time management * d3. Search for information and adopt life-long self-learning * d4. Communicate effectively by oral, written and visual means * d5. Work effectively as an individual and as a member of a team * d6. Develop strong problem-solving and decision-making skills, and will be able to apply those skills effectively in all aspects of their future lives

Course Contents

1 - Notion of an algorithm: big–oh, theta and omega notations. Space and time complexities of an algorithm
2 - Fundamental design paradigms: Sorting and searching, divide and conquer, AVL-tree, Spanning Tree, B-Tree ,B*-tree, dynamic programming, greedy methodsn
3 - Illustrative examples: graph theory, computational geometry, optimization, numerical analysis and data processing

Teaching and Learning Methods

1 - Lectures
2 - Tutorial Exercises
3 - Projects

Students Assessment

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

Books and References

Essential books	Thomas A. Standish, Data Structure 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
Notion of an algorithm: big–oh, theta and omega notations. Space and time complexities of an algorithm	1-3	a1, a4, a5	b1, b4	c2, c4-c6	d1-d5
Fundamental design paradigms: Sorting and searching, divide and conquer, AVL-tree, Spanning Tree, B-Tree ,B*-tree, dynamic programming, greedy methods	4-10	a2, a3, a5	b2-b4	c1, c3, c5, c6	d1-d6
Illustrative examples: graph theory, computational geometry, optimization, numerical analysis and data processing	11-15	a2, a3, a5	b2-b4	c3, c5-c7	d1-d6