UNIVERSITY OF HARGEISA

COLLAGE OF ENGINEERING, COMPUTING AND IT

COURSE OUTLINE

Course Title		**Design and Analysis of Algorithm**
Course Code		~~**CS401**~~
Degree Program		Faculty of Computing and IT
Course Instructor Name		Suleiman M. A. Gargaare
Instructor's contact information		Phone: + 252 63 4127539 E-mail: suleiman.gargaare@yahoo.com
Contact Hours (per week)		3
Course Objectives		Upon completing this course, students will be able to: **1.** Understand and Apply Algorithmic Techniques: Explain and implement key algorithm design paradigms such as divide-and-conquer, greedy algorithms, dynamic programming, backtracking, and branch and bound. **2.** Analyze Algorithm Performance: Evaluate and compare the efficiency of algorithms using time and space complexity analysis (Big O, Big Ω, Big Θ notations). **3.** Design Efficient Algorithms: Design optimal or near-optimal algorithms for solving computational problems and justify their correctness and efficiency. **4.** Solve Real-World Problems: Apply algorithmic thinking to model and solve real-world problems in areas such as searching, sorting, graph theory, string matching, and optimization.

		5. Work with Graph Algorithms: Understand and apply algorithms for graphs such as BFS, DFS, shortest path (Dijkstra, Bellman-Ford), and minimum spanning tree (Prim's and Kruskal's). 6. Communicate Algorithmic Solutions: Clearly present algorithmic solutions using pseudocode, flowcharts, and complexity analysis, suitable for both academic and practical settings.
Course Description		This course provides a comprehensive foundation in the design, implementation, and analysis of algorithms. It equips students with essential tools and techniques for solving computational problems efficiently. The course covers fundamental algorithmic paradigms such as divide-and-conquer, greedy algorithms, dynamic programming, backtracking, and graph algorithms. Emphasis is placed on formal methods of algorithm analysis, including time and space complexity, as well as on algorithm correctness and optimization.
Pre-requisites		Programming Fundamentals and Data Structure and Algorithms

Schedule

Week	Date	Topics and sub-topics	Activity
1 - 2		Chapter 1. Introduction to Algorithms	**Discussion**
3 - 4		Chapter 2. Growth of Functions	
5 - 6		Chapter 3. Analysis of Searching Algorithms	
7 - 8		Chapter 4. Analysis of Sorting Algorithms	**Quiz I**
MID EXAM			
9 - 10		Chapter 5. Divide and Conquer	

11 - 12		Chapter 6. Greedy Algorithms	**Quiz II**
12 - 13		Chapter 7. Dynamic Programming	
14 - 15		Chapter 8. Graphs	**Group Assignment**
STUDY WEEK			
FINAL EXAM			
Assessment	**Continues assessment** Midterm …….…….....20% Attendance…..…….…….....5% Quiz…….…….....5% Group Assignment…….....10% Final exam……...…….....…60% Total…….....100%		
Reference Books	1. Algorithms, Robert Sedgewick, Edition 2nd, 2. Compared to What? An Introduction to the Analysis of Algorithms, by G.J.E Rawlins 3. The Design and Analysis of Computer Algorithms, by Alfred V. Aho		
Text Book	1. T. H. Cormen, C. E. Leiserson, and R. L. Rivest (2009), Introduction to Algorithms, (3rd Ed.) MIT Press, McGraw-Hill, New York.		