

# Debre Tabor University



## Gafat institute of technology

### Department of Electrical and computer engineering

**Program:** BSC in ECE.

**Semester :**3

**Course name:** Algorithm analysis and design

**ECTS:** 5

**Course code:** ECEg4032

**Prerequisite:** ECEg4031: Data Structures

**Target year:** 4

#### **Prepared by:**

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# Course contents

Chapters	Time	Contents	Assessment
<b>CH- 1</b>	<b>Week 1</b>	<b>Introduction to algorithm</b>	
		1. Algorithm design <ul style="list-style-type: none"> <li>• Problem development steps</li> <li>• How to write algorithm</li> </ul> 2. Characteristics of algorithm 3. Performance of algorithm 4. Difference of algorithm & pseudocode	Quiz 1 (5)
<b>CH- 2</b>	<b>Week 2</b>	<b>Analysis of Algorithm</b>	
		1. The need of analysis 2. Algorithm design goal 3. Classification of algorithm 4. Complexity of algorithm <ul style="list-style-type: none"> <li>• Time complexity</li> <li>• Time complexity</li> </ul> 5. Rate of growth	Quiz2 (5%)
<b>CH- 3</b>	<b>Week 3,4,5</b>	<b>Sorting &amp; Searching Algorithm</b>	
		1. Sorting Algorithm <ul style="list-style-type: none"> <li>• Bubble sort</li> <li>• Insertion sort</li> <li>• Merge sort</li> <li>• Shell sort</li> <li>• Heap sort</li> <li>• Quick sort</li> <li>• Radix sort</li> </ul> 2. Searching Algorithm <ul style="list-style-type: none"> <li>• Linear search</li> <li>• Binary search</li> <li>• Interpolation search</li> <li>• Jump search</li> <li>• exponential search</li> <li>• Fibonacci search</li> <li>• Hash table</li> </ul>	<ul style="list-style-type: none"> <li>• Assignment (10%)</li> <li>• Test (20) CH 1, 2 &amp; 3</li> </ul>
<b>CH- 4</b>	<b>Week 6</b>	<b>Methodology of algorithm analysis</b>	
		1. Asymptotic analysis <ul style="list-style-type: none"> <li>• Asymptotic notation</li> </ul> 2. Analysing algorithm <ul style="list-style-type: none"> <li>• Numerical comparison of different algorithm</li> <li>• The rule of sums</li> </ul>	

		<ul style="list-style-type: none"> <li>• The running time of a program</li> <li>• Rules of using big O</li> <li>• Calculating the running time of a program</li> </ul> <ol style="list-style-type: none"> <li>3. Solving recurrence equation</li> <li>4. Master's theorem</li> <li>5. Amortized analysis</li> </ol>	
CH -5	Week 7,8,9	<p>Algorithm design technique</p> <ol style="list-style-type: none"> <li>1. Divide and concur algorithm <ul style="list-style-type: none"> <li>• Divide/break</li> <li>• Max -min problem</li> <li>• Merge sort algorithm</li> </ul> </li> <li>2. Greedy algorithm <ul style="list-style-type: none"> <li>• Components of greedy algorithm</li> <li>• Area of application</li> <li>• Travelling salesman approach</li> <li>• Kruskal's minimal spanning tree</li> <li>• Dijkstra's shortest path algorithm</li> <li>• Map coloring algorithm</li> </ul> </li> <li>3. Dynamic programming <ul style="list-style-type: none"> <li>• Steps of dynamic programming approach</li> <li>• Matrix chain multiplication algorithm</li> <li>• Floyd warshall algorithm</li> <li>• 0-1 Knapsack algorithm (problem)</li> </ul> </li> <li>4. Randomized Algorithm <ul style="list-style-type: none"> <li>Randomized quick sort algorithm</li> <li>Karge's minimum cut algorithm</li> <li>Fisher-Yats shuffle algorithm</li> </ul> </li> </ol>	Assignment (10%)
CH- 5	Week 10	<b>Algorithms for fundamental Graph problem</b>	
		<ol style="list-style-type: none"> <li>1. Depth first traversal.</li> <li>2. Breadth first traversal.</li> <li>3. Tree traversal.</li> <li>4. Binary tree search.</li> </ol>	Final exam (50%) – CH 4, 5 & 6
<b>References</b>		Design and analysis of algorithms. <a href="https://academics.ethioptec.com">https://academics.ethioptec.com</a>	
		Lecture notes on design and analysis of algorithms. Visit. <a href="https://academics.ethioptec.com">https://academics.ethioptec.com</a>	