**University of Management and Technology**

**Course Outline**

Course code: EE210 Course title: Data Structures and Algorithms

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| Program | BSEE |
| Credit Hours | 3 |
| Duration | Semester (15 Weeks) |
| Prerequisites | CS 141 Programming Fundamentals |
| Resource Person | Usman Ali |
| Counseling Timing  (Office # 3-510-SEN ) | Mon & Wed (12:30 – 4:00)  Tue (11:00 – 5:00) Thu (11:00 – 12:00) |
| Contact | Ext: 3661  [usman.ali@umt.edu.pk](mailto:usman.ali@umt.edu.pk) |

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

Data structures are the building blocks of computer software. This course is designed to teach students some of the basic data structures, abstract data types (ADTs), and algorithms. Students will learn the fundamental techniques of data representation, organization, storage, searching, sorting, retrieval, and manipulation. Students will also be introduced to the notions of time and space complexities and practical performance evaluation of algorithms and data structures. So that the students can appreciate the time and space tradeoffs, the basic concepts, implementations, performance, and applications of the various data structures and algorithms will be integrated throughout the course. Students shall gain hands-on experience through several programming exercises. Programming language: C and C++

In accordance with HEC curriculum outcomes a, b, d, e, g, h & i, students at the end of the course should be able to demonstrate

* Good analytical skills and systematic program solving capabilities
* Inquisitive mind to undertake research for solving engineering problems
* Scientific skills to manage the human and technological resources optimally
* Effective decision making skills

**Learning Methodology:**

* Lectures-combining facts, principles, concepts and generalizations
* Interactive learning activity
* Audio and visual aids (ppt slides etc)
* Employing humor related to concepts
* Providing motivational cues
* Emphasizing on important issues related to subject
* Reinforcing learning and clarifying misconceptions

**Grade Evaluation Criteria**

Following is the criteria for the distribution of marks to evaluate final grade in a semester.

**Marks Evaluation Marks in percentage**

Quizzes 15%

Assignments 10%

Mid Term 25%

Attendance & Class Participation Nil

Term Project Part of Assignments

Presentations Part of Assignments

Final exam 50%

Total 100

**Recommended Text Book:**

*Data Structures and Algorithm Analysis in C* [M. A. Weiss, Pearson Education, 2nd Edition.]

**Reference Books:**

Any good C programming book such as Kernighan and Ritchie’s *The C Programming Language*, Deitel and Deitel’s *C How to Program* or Herbert Schildt’s *C The Complete Reference* will be helpful for the programming assignments.

**Calendar of Course contents to be covered during semester**

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| --- | --- | --- | --- |
| **Week** | **Course Contents** | | **Reference Chapter(s)** |
| 1 | * Introduction * Data types and abstract data types (ADTs) | | Chapter 1, Chapter 2 |
| 2 | * Data types and abstract data types (ADTs) * Introduction to recursion | | Chapter 2 |
| 3 | * Lists | | Chapter 2 |
| 4 | * Lists | | Chapter 3 |
| 5 | * Stacks * Queues | | Chapter 3 |
| 6 | * Queues * Trees | | Chapter 3 |
| 7 | * Trees * Binary search trees (BSTs) | | Chapter 4 |
| 8 | * Binary search trees (BSTs) * Height-balanced BSTs | | Chapter 4 |
| 9 | * AVL trees | | Chapter 4 |
| 10 | | * AVL trees | Chapter 4 |
| 11 | | * Hashing: open hashing * Hashing (continued): closed hashing, rehashing, extendible hashing | Chapter 5 |
| 12 | | * Hashing (continued): closed hashing, rehashing, extendible hashing * Priority Queue (Heaps) | Chapter 5 , Chapter 6 |
| 13 | | * Internal Sorting * Bubble sort, insertion sort, selection sort, Merge sort | Chapter 7 |
| 14 | | * Heap sort, Quick sort * Graphs: preliminaries and representations * Topological sorting | Chapter 7, Chapter 9 |
| 15 | | * Shortest-path algorithms * Network flow problems * spanning trees * Spanning trees (continued) * Wrap-up and course summary | Chapter 9 |