CMPE- 231 DATA STRUCTURES

Department: Computer Engineering

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Wednesdays 08:30-10:20, CMPE033
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Program Name: Computer Engineering	**Program Code:** 25

Course Number:	**Credits:**	**Year/Semester:**
CMPE231	4 Cr	2019-2020 Spring

☒ Required Course ☐ Elective Course ☐ Service Course

Prerequisite(s):
CMPE112

Catalog Description:
Introduction to Data Structures: Primitive data structures. Binary and Decimal Integers, Real numbers, Character strings, Memory representation of information.
Arrays and Memory allocation (storage) of arrays. Character string operations. Two and multi-dimensional arrays.
Structures: Arrays of structures. Self-referential structures. Structures and Functions. Dynamic memory allocation.
The Stack : Stack as an Abstract Data Type. Primitive operations. Representing the stack in C. Infix, Postfix, and Prefix notations; Infix-to-Postfix conversion.
Recursion : Recursive definition. Examples: Factorial function. Fibonacci sequence. Binary search. The Towers of Hanoi problem. Recursion versus Iteration.
Queues : The Queue as an Abstract Data Type. C implementation of Queues.
Linked Lists: Inserting and Removing Nodes from a List. Linked implementation of Stacks and Queues. Linked Lists using Dynamic Variables. Queues as Lists in C. Circular Lists (Stack as a Circular List, Queues as a Circular List)**,** Doubly Linked Lists.
Trees: Operations on Binary Trees. Binary Tree Representations. Binary Tree Traversals. Creating a binary tree.
Sorting : Efficiency of Sorting. The O notation. Bubble Sort. Quick Sort.
Searching : Sequential Search. Binary Search. Binary Search Trees.

Course Web Page:
https://staff.emu.edu.tr/zekibayram/en/teaching/cmpe231

Textbook(s):
Langsam Y., Augenstein M., Tenenbaum A.
Data Structures Using C and C++, 2nd edition, Prentice Hall Int., 1996
(ISBN 013-529322-7) Publisher: Prentice Hall/Engineering

Reference Book(s):
Data Structures In C by Noel Kalicharan
Publisher: CreateSpace Independent Publishing Platform; 1. edition (August 11, 2008)
ISBN-10: 1438253273
ISBN-13: 978-1438253275

Topics Covered and Class Schedule:

WEEK	TOPICS
1	Introduction.
2	Binary and decimal integers, real numbers, character strings, memory representation of information, pointers
3	Arrays and memory allocation (storage) of arrays. Character string operations. Multi-dimensional arrays.
4	Structures**.** Arrays of structures. Self-referential structures. Structures and functions. Dynamic memory allocation.
5	Stack as an abstract data type. Primitive operations. Representing stacks in C.
6	Infix, postfix, and prefix notations. Infix-to-postfix conversion.
7	Recursive definitions. Factorial function. Fibonacci sequence. Binary search. The Towers of Hanoi problem. Recursion versus iteration.
	Midterm Exam (cancelled)
8	The queue as an abstract data type. C implementation of queues. Circular queue representation.
9	Linked Lists**.** Representation of linked list structures. Main operations using linked list structures. Type of linked list structures.
10	Representation of stacks and queues using linked list. Linked lists using dynamic variable Queues as lists in C.
11	Circular lists. Stack as a circular List. Queue as a circular List. Doubly linked lists.
12	Trees. Tree representation. Binary tree representations. Operations on binary trees. Binary tree traversals.
13	Binary search trees. Creating a binary tree. Deleting nodes from a binary search tree.
14	Sorting and searching. Efficiency of Sorting. The O notation. Bubble Sort. Quick Sort. Review
	Final Exam

Course Learning Outcomes

On successful completion of the course, the student is expected to be able to:

- Use the C programming language in the implementation of data structures
- Develop recursive algorithms and functions
- Implement and use the stack abstract data type
- Implement and use the queue abstract data type
- Implement and/or use the linear linked list abstract data type
- Implement and/or use the circular linked list abstract data type
- Implement and/or use binary search trees
- Implement and/or trace the execution of sort algorithms
- Implement and/or trace the execution of the binary search algorithm
- Perform ordered traversals of trees (in-order, pre-order, post-order)
- Perform infix-postfix conversion of arithmetic expressions

	Method	**How many**	**Percentage**
Assessment	Project	1	10%
	Final Examination	1	50%
	Attendance	1	4%
	Labs	6	36%

Lab work will be done in common with the CMSE231 course, so students should check the **CMSE231 course web site** for the laboratory experiments and assignments.

NG grade will only be given if a student does not have any exam grade.

Policy on makeup exams:

- If a student misses any examination, **S/He MUST submit a written medical report** to the instructor stating his/her excuse, within 3 days of that examination in order to be eligible for the makeup exam.
- If you miss both midterm and final exams and do not submit any written report, you will get the "NG" grade.

Policy on labs:

- There will be NO makeup for the missed lab experiments.
- There are no exemptions for labs (e.g. if you are taking the course for the second time, you still need to attend the labs)

Policy on cheating and plagiarism: Plagiarism (presenting somebody else's work as your own) and cheating are disciplinary offences and will be dealt with accordingly.

Relationship of the course to ABET Student Outcomes

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Prepared by: Assoc. Prof. Dr. Zeki Bayram	**Date Updated:** 20 April 2020