East West University
Department of Computer Science & Engineering
Course Outline -- CSE 207 : Data Structures

Course Information

Course Code: CSE 207
Course Title: Data Structures
Credit: 4 Credits
Pre-requisite : CSE 205 Discrete Mathematics

Lecture: <u>Section 3: 03:10pm – 04:40pm (ST), Room: S-107, T-530</u>
                  <u>Section 4: 11:50am – 1:20pm (ST), Room: 224</u>

Lab: <u>Section 3: 04:50pm – 06:50pm (M), Room: 529</u>
                  <u>Section 4: 04:50pm – 06:50pm (W), Room:534</u>

Instructor/Other Information

Instructor: Md. Shamsujjoha

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 Dhaka-1000 Bangladesh
Senior Lecturer, Department of Computer Science and Engineering, &
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Course Files: http://groups.yahoo.com/group/cse_msj/files
               ❖ CSE-207
Teaching Assistant: Al-Muttakin, Rifat Mehreen Amin
Office Hour

Day	Time
Sunday	01:30pm – 03:00pm
Monday	01:30pm – 03:00pm
Tuesday	01:30pm – 03:00pm
Wednesday	01:30pm – 03:00pm
Thursday	10:10am – 11:40am, 11:50am – 01:20pm, 01:30pm – 03:00pm, 03:10pm – 04:40pm

Course Outcome (CO)

The objective of this course is to make the students of Computer Science and Engineering familiar with the basic and advanced data structures, and to teach them how to choose appropriate data structure for improving the performance of a program. At the end of the course, students are able:

1. To understand Abstract Data Types, motivations behind it and the basic concepts. In addition, they also able to understand the behavior of basic data structures such as lists, stacks, queues, trees (binary trees and tree traversals, height-balanced trees), graphs, hash tables etc.
2. To analyze any problem and determine the appropriate data structure for the problem.
3. To recoznise the importance of data modeling and data structures in advanced programming.
4. To understand and analyze elementary algorithms such as searching, sorting and hashing. In addition, the student are also able to evalaute and compare different data strcuture for these problems (and algorithms) mentioned earlier.

Course Contents and Teaching Schedule:

Week	Lecture/lab/assignment topic	References/teaching materials/equipment
1	**Lecture:** Introduction to data structures, basic data types, abstract data types (ADT), properties and operations of language-independent ADTs etc.	Text: Forouzan chap. 1 ref.: Lec. Notes 1.
2	**Lecture:** Review of array, minimal element sort, stack, queue, double ended queue, circular queue and application of these data structures. **Lab:** Array insertion, deletion, searching and sorting.	Text: Forouzan chap. 3 & 4; ref.: Lec. Notes 2, 3.
3	**Lecture:** Linked list, operations on linked list *i.e.*, insert, delete, traverse, size, find etc. Linked list types and sorting with linked list. **Lab:** Stack and Queue with array	Text: Forouzan chap. 5; ref.: Lec. Notes 4, 5; *.exe. File 1; Assignment 1: Reverses the items in a stack and Queue.
4	**Lecture:** Modification of linked list to implement stack, queue, double ended queue, circular queue. Prefix, postfix, infix notation and their conversion algorithm using stack. **Lab:** Linked List	Text: Forouzan chap. 3 & 5; ref.; Lec. Notes 6, 7.
5	**Lecture:** Evaluation the postfix expression in terms of algorithm and data structures, and its enhancement to solve real world problems. Review of recursions. **Lab:** Sorted Linked List	Text: Forouzan chap. 2 & 5; ref.: Lec. Notes 8, 9.
6	**Lecture:** Tree. Tree terminology, intuitive representation of tree, tree traversal and Euler tour. Types of tree and their properties. Implementation of tree. **Lab:** Stack and Queue using Linked List	Text: Forouzan chap. 6; ref.: Lec. Notes 10.
7	**Lecture:** Detail discussion on binary search trees, balance binary trees such as AVL tree, red-black tree, digital search tree, m-way search tree. Application of these trees. **Lab:** Binary Search Tree	Text: Forouzan chap. 6, 7 & 8; ref.: Lec. Notes 11, 12; Assignment 2: AVL Tree, Modification of BST.
8	**Lecture:** Details on Heaps: characteristic, operations and implementation. Types of heaps, Heap algorithms. **Lab:** Complete binary tree and Heap	Text: Forouzan chap. 9; ref.: Lec. Notes 11, 12.
9	**Lecture:** Indexing, hash table, hash function, hashing techniques *i.e.*, separate chaining, linear probing, quadrate probing, double hashing, non-numeric hashing (string). **Lab:** Hashing	Text: Cormen chap. 11; Lec. Notes 13, 14.
10	**Lecture:** Spanning tree and its applications. Minimal spanning tree (MST), prim's and kruskal's algorithms. Properties of these algorithms. **Lab:** Graph using array and Prim's algorithm	Text: Cormen chap. 23; Lec. Notes 15; Assignment 3: Determine correct algorithm for MST and justification.
11	**Lecture:** Review of recursions, its applications. Graphs and their properties. Application of graph. Working procedure of computer network in terms of graph. **Lab:** Factorial, Fibonacci, Tower of Hanoi	Text: Forouzan chap. 2 & Cormen chap. 22; Lec. Notes 16, 17 and 18.
12	**Lecture:** Augmenting data structures and review **Lab:** Final Lab Exam/Augmenting data structures	Text: Cormen chap. 14; Lec. Notes 19, 20.

Learning Outcomes

- ❖ **Knowledge and understanding**
  - ➢ Understand the importance of Data Structures, Abstract Data Types, Data Modeling
  - ➢ Understand the mathematical preliminaries of fundamental and advanced data structures.
  - ➢ Understand the use of different types of Data Structures and their uses.

- ❖ **Cognitive skills (thinking and analysis)**
  - ➢ Be able to develop and design efficient data structure.
  - ➢ Be able to evaluate the data structure for the different and difficult problems.
  - ➢ Be able to analyze any data structure and calculate its effectiveness in different environments.

- ❖ **Communication skills (personal and academic)**
  - ➢ Two individual assignments involve writing effective reports and designing documentation, making effective presentations, and giving and receiving clear instructions.
  - ➢ A group assignment and a group presentation (to be done in a group) - where students will be assessed in terms of their effectiveness as individual or leader in a team.

- ❖ **Practical and subject specific skills (Transferable Skills)**
  - ➢ Be able to implement any data structure to build the depth programming skills, designing skills and problem solving skills.

Teaching Materials/ Online Resources/ Equipments

Main Reference (Text book)

[1] Data Structures: A Pseudocode Approach With C (2nd or later edition) - Richard F. Gilberg, Behrouz A. Forouzan (Main text).

[2] Introduction to Algorithms (3rd or later Edition) by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Cliff Stein, PHI Press. (ref. text 1).

[4] Data Structures and Algorithms in C++ by Michael T. Goodrich, Roberto Tamassia, and David M. Mount Wiley Publications (ref. text 2).

Data Structures Course link of renowned universities:

- ❖ CS 61B: University of Berkeley (http://www.cs.berkeley.edu/~jrs/61b/)
- ❖ CS226: Princeton University (http://www.cs.princeton.edu/courses/archive /spr07/cos226/info.html)
- ❖ CS210a: University of Western Ontario (http://www.csd.uwo.ca/courses/CS210a/)
- ❖ CS 161: Stanford University (http://www.stanford.edu/class/cs161/)
- ❖ CS 308: University of Nevada Reno (http://www.cse.unr.edu/~bebis/CS308/)
- ❖ DSS T26: University of Ottawa (http://webdocs.cs.ualberta.ca/~holte/T26/ top.realTop.html)
- ❖ CMSC 420: University of Maryland (http://www.cs.umd.edu/~mount/420)
- ❖ COP 3530: University of Florida (http://www.cise.ufl.edu/~sahni/cop3530/)
- ❖ CS 2005: University of Aberdeen (http://www.csd.abdn.ac.uk/~jmasthof/teaching/CS2005)
- ❖ CIS 680: Ohio-State University (http://www.cse.ohio-state.edu/~gurari/course/ cis680/cis680.html)
- ❖ CS261: Oregon State University (http://web.engr.oregonstate.edu/~minoura/ cs261/index.html)

Books and Outlines:

- ❖ http://courses.cs.vt.edu/~csonline/DataStructures/Lessons/index.html
- ❖ http://www.cs.auckland.ac.nz/software/AlgAnim/ds_ToC.html
- ❖ http://cpp.datastructures.net/index.html
- ❖ http://mitpress.mit.edu/algorithms/
- ❖ http://www.brpreiss.com/books/opus4/
- ❖ http://www8.cs.umu.se/kurser/TDBAfl/VT06/algorithms/INDEX.HTM

Data Structures Animations and Visualizations:

❖ http://nova.umuc.edu/~jarc/idsv/
❖ http://www.facweb.iitkgp.ernet.in/~pds/notes/swf/

Teaching Materials: Lecture Notes*, Lab Exercises/Notes*, Reference Book, and Computer &Software C[#].
Teaching-Learning Method: Lecture Notes*, PDF Documents, Lab Exercises*, Assignments.

*Lecture and Lab Notes that are required for the course will be delivered during class.
[#] Software to compile C/C++ programs:

IDE	Platform	Console programs
Code::blocks	Windows/Linux/MacOS	Compile console programs using Code::blocks
Visual Studio Express	Windows	Compile console programs using VS Express 2013

Assessment Weightage (Evaluation and Grading Policy)

The relative contributions of exams, assignment, and lab work are as follows[†]:

❖ Class Participation   5%   ❖ Term I Exam   15%
❖ Assignments   5%   ❖ Term II Term Exam   15%
❖ Presentation   5%   ❖ Final Exam   20%
❖ Quiz (Average of best two)   10%   ❖ Labs   25%

[†]The above mark distribution can be change up to ±5% (for each field).

Student Learning Time (SLT)

Student Learning Time (SLT) can be divided into: Face to Face (36 hours), Guided Learning (24 hours), Independent Learning (93 hours) and Assessment (7 hours). The detailed breakdown is as follows:

No.	Teaching And Learning Activities	Student Learning Time (Slt)
1.	Lecture	36 hours (3 x 12 weeks)
2.	Lab	22 hours (2 x 11 weeks)
3.	Review lesson after lecture (includes preparation for final exams)	54 hours (36 hours x 1.5 hour study time)
4.	Student's preparation for lab including pre and post lab	33 hours (11 Lab x 3 hours preparation)
5	Carry out Assignment	7.5 hours (3 Assignments x 2.5 hours)
6.	Carry out Mid Term and Final Exams	4.5 hours
7.	Carry out Lab Tests and Quiz	3.0 hours
	TOTAL SLT	160 hours
	CREDIT = SLT/40	4.0

Details:

- ❖ Homework/Assignment: must be done in group not more than 3 (the same group as the lab works), **STRICTLY NO COPY-PASTING** from other groups.
- ❖ **Late assignments suffer a penalty rate of 20% per day, up to 5 days (weekends count towards the 5 days).** Assignments that are more than 5 days late are penalized by 100%.
- ❖ Submit the signed **Expectations of Originality form** with each homework assignment.
- ❖ **Failing Grade:** Plagiarism, absenteeism, lack of preparation, and lack of effort will result it.

Grading System:

Marks (%)	Letter Grade	Grade Point	Marks (%)	Letter Grade	Grade Point
97-100	A+	4.00	73-76	C+	2.30
90-96	A	4.00	70-72	C	2.00
87-89	A-	3.70	67-69	C-	1.70
83-86	B+	3.30	63-66	D+	1.30
80-82	B	3.00	60-62	D	1.00
77-79	B-	2.70	Below 60	F	0.00

Exam Dates:

Exam Name	Both Sections	Notes
Mid Term 1	16th October 2016	Monday, 17 October 2016 is earmarked for Mid Term I Exams for students who will have more than two exams on a single day.
Mid Term 2	13th November 2016	Monday, 14 November 2016 is earmarked for Mid Term II Exams for students who will have more than two exams on a single day.
Final	11th December 2016	Sunday, 18 December 2016 is earmarked for Final Exams for students who will have more than two exams on a single day.

Academic Code of Conduct

Academic Integrity

Any form of cheating, plagiarism, personation, falsification of a document as well as any other form of dishonest behaviour related to obtaining academic gain or the avoidance of evaluative exercises committed by a student is an academic offence under the Academic Code of Conduct and **may lead to severe penalties up to and including suspension and expulsion.**

Special Instructions

- ❖ Students **MUST WEAR dresses** in conformity with the **dress code of EWU** within the lecture/lab classes and examination hall.

- ❖ Class Lectures and Lab works are believed to be the most effective and reliable source of knowledge for this course. Therefore, students are strongly encouraged to participate in all the classes attentively.

- ❖ Students will not be allowed to enter into the classroom after 20 minutes of the starting time. Moreover, **You MUST have at least 80% class attendance to sit for the final exam**. All mobile phones MUST be turned to silent.

- ❖ There is zero tolerance for cheating at EWU. Students caught with cheat sheets in their possession, whether used or not used, &/or copying from cheat sheets, writing on the palm of hand, back of calculators, chairs or nearby walls, etc. would be treated as cheating in the exam hall. The only penalty for cheating is expulsion from EWU. **For plagiarism, the grade will be automatically become zero for that exam/assignment**.

- ❖ There will be **NO make-up examinations for Quiz & Lab Exam in any case**. Make up exam can only be considered for the midterms in case of emergency, you MUST either inform me or the department secretary within 24 hours of the exam time. Failure to do so will mean that you are trying to take UNFAIR advantage and you will be automatically disqualified.