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| Jjjj | nn | |
| 1 | Faculty | Faculty of Science and Engineering (FSE) |
| 2 | Department | CSE |
| 3 | Programme | B.Sc in CSE |
| **4** | **Name of Course** | Data Structures |
| **5** | **Course Code** | CSE 105 |
| **6** | **Trimester** | Summer 2022 |
| **7** | **Pre-requisites** | CSE 103 |
| **8** | **Status** | Core CSE Course |
| **9** | **Credit Hours** | 3 |
| **10** | **Section** | 213 D1, 213 D2, 213 D3, 213 D4, 213 EA, PC-213 DA, PC-213 DB, PC-213 E |
| **11** | **Class Hours** | | **Section** | **Class Day** | **Class Hours** | **Venue** | | --- | --- | --- | --- | | 213 D1 | Tuesday | 10:00 - 11:30 AM | **R-402** | | Thursday | 10:00 - 11:30 AM | **R-402** | | 213 D2 | Tuesday | 11:30 - 1:00 PM | **R-401** | | Thursday | 11:30 - 1:00 PM | **R-401** | | 213 D3 | Monday | 10:00 - 11:30 AM | B-412 | | Wednesday | 10:00 - 11:30 AM | B-412 | | 213 D4 | Monday | 1:30 pm - 3:00 pm | **R-401** | | Wednesday | 1:30 pm - 3:00 pm | **R-401** | | 213 EA | Friday | 10:30 am - 1:00 pm | B-412 | | PC-213 DA | Monday | 2:00 - 3:30PM | PCR-404 | | Wednesday | 2:00 - 3:30PM | PCR-601 | | PC-213 DB | Monday | 3:00 - 5:00 PM | PCR-605 | | Wednesday | 9:00 - 10:30 AM | PCR-601 | | PC-213 E | Friday | 2.15 PM - 4.45 PM | PCR - 506 | |
| **12** | **Class Location** | Offline (Given in section 11(Class Hours)) |
| **13** | **Course website** | **Google Classroom Link (Section)**  **213 D1 :** [**https://classroom.google.com/c/NTMyNjI4OTA5OTM0**](https://classroom.google.com/c/NTMyNjI4OTA5OTM0)  **213 D2:** [**https://classroom.google.com/c/NTMyNjI4OTA5ODA3**](https://classroom.google.com/c/NTMyNjI4OTA5ODA3)  **213 D3: https://classroom.google.com/u/0/c/NDk2MTE2MDczNzI0**  **213 D4:** [**https://classroom.google.com/u/0/c/NDk1OTg0MDg3OTU4**](https://classroom.google.com/u/0/c/NDk1OTg0MDg3OTU4)  **213 EA: https://classroom.google.com/u/0/c/NDk2MTE1NTQyMDM3**  **PC-213DA:** [**https://classroom.google.com/c/NDk2MDkzNzcwNjI1?cjc=tu4cpei**](https://classroom.google.com/c/NDk2MDkzNzcwNjI1?cjc=tu4cpei)  **PC-213DB:** [**https://classroom.google.com/c/NDk2MDkzNzcxMjQz?cjc=hcp2m2v**](https://classroom.google.com/c/NDk2MDkzNzcxMjQz?cjc=hcp2m2v)  **PC-213 E:** [**https://classroom.google.com/c/NDk2MDAwNzAwMTEx?cjc=reamocq**](https://classroom.google.com/c/NDk2MDAwNzAwMTEx?cjc=reamocq) |
| **14** | **Instructor** | Dr. Md. Mostafijur Rahman  Tamim Al Mahmud  Ahmed Iqbal Pritom  Dr. Faiz Al Faisal  Md. Fazle Rasul |
| **15** | **Contact** | **Email (Section)**  [**mostafijur@cse.green.edu.bd**](mailto:mostafijur@cse.green.edu.bd)  [**tamim@cse.green.edu.bd**](mailto:tamim@cse.green.edu.bd)  [**iqbal@cse.green.edu.bd**](mailto:iqbal@cse.green.edu.bd)  [**faisal@cse.green.edu.bd**](mailto:faisal@cse.green.edu.bd)  [**fazle@cse.green.edu.bd**](mailto:fazle@cse.green.edu.bd) |
| **16** | **Office** | (Same as the counseling venue) |
| **17** | **Counseling Hours** | | **Section** | **Day** | **Counseling Hours** | **Venue** | | --- | --- | --- | --- | | 213 D1 | Wednesday | 4:30 - 6:00 PM | B-517 | | 213 D2 | Wednesday | 4:30 - 6:00 PM | B-517 | | 213 D3 | Tuesday | 3:00 - 6:00 PM | A-212 | | 213 D4 | Wednesday | 4:30 - 6:00 PM | B-502 | | 213 EA | Thursday | 3:00 - 6:00 PM | A-212 | | PC-213DA | Wednesday | 10:30 - 12:00 PM | **PCR-505** | | PC-213DB | Wednesday | 12:00 - 1:30 PM | **PCR-505** | | PC-213 E | Saturday | 10.30AM - 12.00 PM | **PCR-402** | |
| **18** | **Text Book** | 1. Mehlhorn, K. (2013). Data structures and algorithms 1: Sorting and searching (Vol. 1). Springer Science & Business Media. |
| **19** | **Reference** | 1. Chang, S. K. (Ed.). (2003). Data structures and algorithms (Vol. 13). World Scientific. 2. Cormen, T. H. (2009). Introduction to algorithms. MIT press 3. Goodrich, M. T., & Tamassia, R. (2008). Data structures and algorithms in Java. John Wiley & Sons. 4. <https://www.tutorialspoint.com/data_structures_algorithms/index.htm> 5. https://www.javatpoint.com/data-structure-tutorial |
| **20** | **Equipment & Aids** | Bring your own materials *(calculator, pen, paper, etc.)* to participate effectively in classroom activities. **You are not allowed to borrow from others inside the classroom during class activities.**  ***Note: Besides class note, Please keep at least one blank A4 size paper per class with you.*** |
| **21** | **Course Rationale** | Development of application systems and software that use underlying architecture of machines efficiently and effectively requires the ability to use and manipulate various types of Data Structures and other constructs. The course focuses on the common structures used to store data and the standard algorithms for manipulating them. Standard data structures include lists, stacks, queues, trees, heaps, hash tables, and graphs. Standard algorithms include searching, sorting, and traversals. Along with implementation details, students will learn to analyze the time and space efficiency of algorithms and how to select appropriate data structures and algorithms for a specific application. In homework’s, labs and programming projects, students will implement their own data structures and make use of existing libraries to solve a variety of computational problems. |
| **22** | **Course Description** | Internal data representation; Abstract data types; Elementary data structures: arrays, linked lists, stacks, queues, trees and graphs; basic data structures operations: traversal, insertion, deletion, searching, merging, sorting, Tree; Tree traversal and graph traversal; Recursion and recursive algorithm, Pattern matching; Advanced data structures: heaps, Fibonacci heaps; Search trees: Binary search trees, AVL trees, multi-way search trees; sorting, hashing. |
| **23** | **Course Outcomes (CO)** | After completing this course students will be able to :-  **CO1**: Explain fundamental knowledge and basic operations of both linear and non-linear data structures. [Cognitive]  **CO2**: Analyze the performances and explain the processes of inserting, deleting, searching, sorting and merging operations on different data structures used in solving complex computing problems. [Cognitive]  **CO3**: Demonstrate skills and abilities of coordination in a group of people to solve real-life problems using advanced data structures. [Psychomotor] |
| **24** | **Teaching Methods** | Maximum topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Some class notes will be uploaded on the web. White boards will be used most of the time. For some cases, multimedia projector will be used for the convenience of the students. Students must participate in classroom discussions for case studies, problems solving and project developments. |
| **25** | **Topic Outline**  All topics and problems are from the main text if not specified otherwise. | |
|  | | **Lecture** | **Selected Topics** | **Article**  **(Text)** | **Suggested Problems.**  **(Text)** | | --- | --- | --- | --- | | (1) | Socialization and Introduction to the course | - | - | | Overview |  |  | | (2) | Array Basic | 1.1, 1.2 |  | | Arrays-insertion, deletion | 2.6 | | (3-4) | linear search, binary search, bubble sort | 4.2,4.6,4.7 | Ex: 4.1-4.3, 4.5-4.9, 5.1, 5.2, 6.22-6.24,  S: 4.1-4.5, 5.1-5.3, 6.4-6.12, 6.8 | | 4.12,4.15 | | (5-6) | Sorting- insertion sort, selection sort, Counting Sort | 4.9,9.6,9.8 | |  |  | | (7-8) | Singly Linked Lists-traverse, insertion, deletion | 5.2,5.17,5.24 | | Doubly Linked Lists- traverse, insertion, deletion | 5.35 | | Circular Linked List and List Reversal | note | | (9-10) | Recursion-Tower of Hanoi | 6.18, 6.22 | | Merge Sort | 9.11,9.14 | | (11-12) | Quicksort  Stacks, Application of stack | 6.2, 6.14 | Ex: 6.1-6.4, 6.7-6.10, 6.12-6.18 S:6.1-6.3,6.13-6.18,6.21,6.22, | | (13-14) | Queues-circular, priority, Double-Ended Queues | 6.32, 6.40, 6.39 | | (15-18) | Graphs | 8.1 | Ex: 8.1-8.9  S: 8.1-8.10 | | Graph Traversals | 8.21 | | Shortest Paths | note | | Minimum Spanning Trees | note | | Topological Sorting | note | | (19) | Binary Trees- memory representation  Tree Traversing | 7.1, 7.5, 7.9 | Ex: 7.1-7.5,7.7-7.12  S: 7.1-7.6,7.9- 7.14 | | (20-22) | Binary Search Tree- insertion, deletion  Heap-Heapsort, Huffman’s algorithm | 7.24, 7.25, 7.30, 7.55, 7.65 | |  | | (23-24) | AVL Tree , Radix Sort | note | note | | Hash Tables | note | | |
| **26** | **Assessment and Marks Distribution:** | Students will be assessed on the basis of their overall performance in all the exams, quizzes, and class participation. Final numeric reward will be the compilation of (tentative):   * Class Tests (15%) * Group Assignment (5%) * Individual Presentation (5%) * Class Attendance and Performance (5%) * Mid-Term Test (30%) * Final Exam (40%) |
| **27** | **Assessment Methods of COs** | Assessment methods of COs are given below:   |  | **Course Outcomes** | | | | --- | --- | --- | --- | | **Assessment Methods** | **CO1** | **CO2** | **CO3** | | Class Test | 15% |  |  | | Group Assignment, Individual Presentation, Attendance |  | 5% | 10% | | Mid-Term Exam | 10% | 20% |  | | Final Exam | 20% | 20% |  | | **Total (100%)** | **45%** | **45%** | **10%** | |
| **28** | **Mapping of COs with POs** | Mapping of COs with program outcomes (POs) are given below:   | **Program Outcomes (POs)** | | | | | | | | | | | | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | | **CO1** | **√** |  |  |  |  |  |  |  |  |  |  |  | | **CO2** |  | **√** |  |  |  |  |  |  |  |  |  |  | | **CO3** |  |  |  |  |  |  |  |  | **√** |  |  |  | |
| **29** | **Grading Policy** | The following chart will be followed for grading. This has been customized from the guideline provided by the School of Engineering and Computer Science.   | **A+** | **A** | **A-** | **B+** | **B** | **B-** | **C+** | **C** | **D** | **F** | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **80 and above** | **75-<80** | **70-<75** | **65-<70** | **60-<65** | **55-<60** | **50-<55** | **45-<50** | **40-<45** | **<40** | |
| **29** | **Additional Course Policies** | | Assignments | There will be four assignments. Average marks of the assignments will be counted. No late homework will be accepted. Two or more copied assignments will carry zero mark in all assignments. Solutions to assignment problems will be provided through web and on hand. | | --- | --- | | Class Test | There will be at least three CTs, best of two will be counted. A CT can be taken with an announcement in prior or without any announcement. | | Exams | Mid-term and final exam will be closed book, closed notes. Mobile is strictly prohibited in exam hall. Please bring your own watch and synchronize time during exam hours. | | Test Policy: | If you are absent from a test, and you have not spoken to the teacher personally beforehand, your grade for the test will be zero. No make-up for class test will be taken because it has alternative (three out of four). No make-up for mid will be entertained without presence and recommendation of guardian and written permission of the department. Make-up test of mid will be much harder than the regular test. | |
| **30** | **Additional Information** | 1. Academic Calendar Summer 2022: http://www.green.edu.bd/academics/academic-calendar. 2. Academic Information and Policies: http://www.green.edu.bd/academics/academic-rules-a-regulations. 3. Grading and Performance Evaluation: http://www.green.edu.bd/academics/academic-rules-a-regulations. 4. Proctorial Rules: http://www.green.edu.bd/administrator/proctors-office. |