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| Jjjj | **COURSE OUTLINE**  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** |  |
| **7** | **Pre-requisites** | CSE 103 |
| **8** | **Status** | Core CSE Course |
| **9** | **Credit Hours** | 3 |
| **10** | **Section** |  |
| **11** | **Class Hours** | |  |  |  |  | | --- | --- | --- | --- | | **Section** | **Class Day** | **Class Hours** | **Venue** | |  |  |  |  | |  |  |  | |
| **12** | **Class Location** |  |
| **13** | **Course website** |  |
| **14** | **Instructor** | Ahmed Iqbal Pritom |
| **15** | **Contact** | iqbal@cse.green.edu.bd |
| **16** | **Office** | Room No: B-1002 |
| **17** | **Counselling Hours** | |  |  |  | | --- | --- | --- | | **Day** | **Counseling Hours** | **Venue** | |  |  |  | |  |  |  | |
| **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. Goodrich, M. T., &Tamassia, R. (2008). Data structures and algorithms in Java. John Wiley & Sons. 3. Cormen, T. H. (2009). Introduction to algorithms. MIT press. |
| **20** | **Equipment & Aids** | Bring your own materials *(calculator,pen, paper, etc.)* to participate effectively in classroom activities. |
| **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:** Apply fundamental knowledge of data structure to solve analytical problems within the fields related to computer programming.  **CO2:** Formulate solutions with analysis of complex problems related to various types of data.  **CO3:** Develop efficient solutions with proper design to complex data management and computer programming related problem solving. |
| **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 board will be used for 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)** | **Outcome** | |  | | | | | | (1) | Socialization and Introduction to the course | - | - |  | |  | | | | | | (2) | Over view | Note | R-4.1-4.39  C-4.1-C-4.27  P-4.1-4.4 | CO1  CO2  CO3 | | Analysis Functions | 4.1 | | Analysis of Algorithms | 4.2 | |  |  |  |  |  | |  | | | | | | (3-5) | Arrays | 3.1 | R- 3.1-3.17  C-3.1-3.23  P-3.1-3.8 | CO1  CO2  CO3 | | Singly Linked Lists | 3.2 | | Doubly Linked Lists | 3.3 | | Circular Linked List and List Reversal | 3.4 | |  | Recursion | 3.5 |  |  | |  | | | | | | (6-8) | Stacks | 5.1 | R-5.1-5.12  C-5.1-5.11  P-5.1-5.12 | CO1  CO2  CO3 | |  | Queues | 5.2 | |  | Double-Ended Queues | 5.3 | |  | | | | | | (9-10) | Vectors | 6.1 | R-6.1-6.20  C-6.1-6.22  P-6.1-6.6 | CO1  CO2  CO3 | | Lists | 6.2 | | Sequences | 6.3 | | Bubble Sort on Sequences | 6.4 | |  | | | | | | (11-12) | General Tress | 7.1 | R-7.1-7.27  C-7.1-7.36  P-7.1-7.11 | CO1  CO2  CO3 | | Tree Traversal Algorithms | 7.2 | | Binary Trees | 7.3 | |  | | | | | | (13-14) | Priority Queues | 8.1 | R-8.1-8.26  C-8.1-8.23  P-8.1-8.7 | CO1  CO2  CO3 | | Heaps | 8.3 | |  | | | | | | (15-18) | Maps | 9.1 | R-9.1-9.19  C-9.1-9.15  P-9.1-9.11 | CO1  CO2  CO3 | | Hash Tables | 9.2 | | Ordered Maps | 9.2 | | Skip Lists | 9.4 | | Dictionaries | 9.5 | |  | | | | | | (19-20) | Merge Sort | 11.1 | R-11.1-11.26  C-11.1-11.32  P-11.1-11.10 | CO1  CO2  CO3 | | Quick Sort | 11.2 | | Insertion Sort | note | | Selection Sort | note | | Bucket and Radix Sort | 11.3 | |  | | | | | | (21-24) | Graphs | 13.1 | R-3.1-3.33  C-13.1-13.28  P-13.1-13.14 | CO1  CO2  CO3 | | Graph Traversals | 13.3 | | Directed Graphs | 13.4 | | Shortest Paths | 13.5 | | Minimum Spanning Trees | 13.6 | |  | | | | | | |
| **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:   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **Assessment** | | | | | | | | | **COs** | **CT1** | **CT2** | **CT3** | **CT4** | **MT** | **FE** | **Assignment** | **Presentation** | | **CO1** | **√** | **√** |  |  | **√** | **√** |  | **√** | | **CO2** | **√** | **√** |  |  | **√** | **√** | **√** | **√** | | **CO3** |  | **√** | **√** |  | **√** | **√** | **√** |  | |
| **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 Spring 2021: 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. |