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This course explores structured problem solving, data abstraction, software engineering principles, and the comparative analysis of algorithms as fundamental tools of program design. The course is the second part of a two-part series on data structures and algorithms. The approach emphasizes the importance of both data structures and algorithms and reinforces the fact that data structures and algorithms are not independent.  This course covers advanced computing algorithms and data structures which includes recursion, trees, sets/maps, graphs, and graph and sorting algorithms. | | |  |  | | --- | --- | | **Outcome** |  | | Perform asymptotic analysis of problems on the basis of (possibly nested) loops and express the results in terms of the Big-O notation.  [a] Identify and analyze the performance issues associated with several major sorting algorithms.  A student will be able to realize that by default one is faced with O (n^2) behavior, and that judicious and highly non-trivial approaches are needed to obtain O (n\*log n) behavior.  [a, b, i, CS.j] Implement tree operations such as Huffman Tree encoding/decoding, a Heap using an array, or various types of binary/multi-way search trees with ease and confidence and use these search tree structures for storing and retrieving any type of ordered data.  [b, c, i, CS.j, CS.k] To study hash coding and implement hash tables to facilitate efficient search and retrieval. [a, b, c, i] To implement and apply graph and sorting algorithms to real world problems. [a, b, c, i, CS.j, CS.k] To function effectively in a group to accomplish a task. [d] To explain clearly scholarly work to a range of audience. [f] | | |  |  | | --- | --- | | **Schedule** |  | | |  |  | | --- | --- | | Week | Topics | | 1 | Binary Search Trees & Tree traversals | | 2 | Insert Operation | | 3 | Delete Operation | | 4 | Red-Black Trees | | 5 | Graph | | 6 | Breadth-First Search | | 7 | Depth First Search | | 8 | Midexam, Dijkstra抯 Algorithm | | 9 | Pathfinding Algorithm | | 10 | Dynamic Programming | | 11 | Kruskal's Algorithm | | 12 | Greedy Algorithms | | 13 | Prim's Algorithm | | 14 | Line Algorithm | | 15 | Multithreaded Algorithms | | 16 | Final | | | |  |  | | --- | --- | | **Prerequisite** |  | | CSCI-210 | | |  |  | | --- | --- | | **Evaluations** |  | | |  |  | | --- | --- | | Readings | 15% | | Exercise | 25% | | Class Quizzes | 20% | | Middle | 20% | | Final | 20% | | | |  |  | | --- | --- | | **Assessment** |  | | Assessment Instruments:    Exams, Quizzes, Exercises Assessment Meth:   Embedded questions and rubrics. | | |  |  | | --- | --- | | **Policy** |  | | Video Taping The courseware and delivery of lectures are intellectual property of the instructor. The instructor does not wish to be video taped, photographed, or have his likeness captured electronically. It is class policy that no video recording device be used to capture any portion of the lecture and no photographic device be used to capture images of the instructor. It is the instructor?s right and preference not to have his likeness video taped or photographed. Cell Phones and Laptops There are many opportunities before our class meetings and after our class meetings to use your cell phone and other electronic devices to your heart?s desire. During class meetings, it is considered a disruption. Cell phones and pagers must be switched off or put on silent alert during class lectures. Laptops and tablets are permitted but should be used for class activities only (e.g. taking notes, or interactive MATLAB only). Laptops, phones, and other electronic devices may not be used for unrelated activities such as web surfing, email, FaceBook, twitter, instant messaging/SMS during lectures, discussions, or office hours. When you disrupt the class, you are cheating your classmates out the education they are working hard to earn. Any student with an electronic device that disrupts the class or is used for anything other than class related activities will be kicked out of the class meeting. The instructor reserves the right to issue a 2% penalty deducted from your final grade for each disruptive incident. Note that when the instructor goes over MATLAB examples in class, it is not a tutoring session. The purpose of the MATLAB examples in class is to give you an example of the thought process and design process involved in prototyping concepts. Tardiness Policy As the classroom is fairly small, it is very disruptive when you arrive to class late. Come to class on time (i.e. before the class starts). The policy is simple. Come to class on time or do not come to class. The class time is when lecture starts, not when you arrive to the classroom. Manage your time appropriately to ensure you are always on time. Conversely, respecting your time, I will always end class on-time.  I will treat you as an adult and expect you to manage your time appropriately and be in class on time. The disruption to class is effectively stealing from the education for which all your peers in the class have invested a significant amount of energy, time, and money. I reserve the right to deduct 2% of your final grade for every instance of your absence or coming late to class. That means, for example, if you are late 5 times during the semester and your final grade is 90%, you get a total 10% deduction from your grade resulting in a total 10% deduction for a final grade of 80%. | |  |
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