



COURSE SYLLABUS
COURSE INFORMATION
Course Code: COMP220 Level: Undergraduate Credit: 3
Course Title: Algorithm & Data Structure
PREREQUISITE
N/A
COURSE OVERVIEW
<p>This course provides students with the opportunity to understand the essential data structures and algorithms. It covers fundamental data structures, algorithm analysis and design techniques required to address real-world programming challenges. It deepens students' understanding of the design and analysis of memory and time-efficient data structures and problem-solving strategies used in various complex applications. The course covers topics including</p> <ul style="list-style-type: none">•Asymptotic complexity analysis•Basic data structures (arrays, lists, trees, graphs, and hash tables)•General algorithm design patterns (recursion, dynamic programming)•Sorting algorithms•Basic graph algorithms (traversal, topological sorting, connected component)•Advanced graph algorithms (MST, Shortest-path, Matching)
LEARNING OUTCOME
<p>Upon successful completion of this course, the students should have basic expertise in the following areas:</p> <ol style="list-style-type: none">1. Understand the internal workings of fundamental data structures and algorithms2. Determine the running time and memory space usage of common algorithms.3. Adapt or invent new algorithms and data structures for software engineering problems.4. Analyse the performance of algorithms built on fundamental data structures and algorithms.5. Select and justify appropriate combinations of data structures and algorithms to solve software engineering problems.
CLASS HOURS
Lecture: Monday to Friday, 180 minutes each day Discussion Section: One hour each week
LEARNING RESOURCES
Required Textbook
[CLRS] Cormen, T., Leiserson, C.E., Rivest, R.L., Stein, C. <i>Introduction to Algorithms</i> . 3rd edition. MIT Press. [MGM] Dinneen, M.J., Gimelfarb G., Wilson, M.C. <i>An Introduction to Algorithms and Data Structures</i> , 4th edition, Pearson Education New Zealand.
Reference Books & Online Resources
N/A
Suggested Textbook
N/A
Other Teaching Methods
N/A



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WEEKLY SCHEDULE			
Week	Day	Topic	Reading
1	1	Analysis of Algorithms • Programming Basics • Big-O and Other Notations • Asymptotic Analysis • Recursion	[CLRS] Chapters 2, 3 [MGM] Chapter 1
WEEKLY SCHEDULE			
Week	Day	Topic	Reading
1	2	Linked Lists, Stacks, Queues • Singly Linked List • Doubly Linked List • Stacks • Queues	[CLRS] Chapter 10 [MGM] Chapter 3
	3	Trees: • Tree traversal • Binary search tree • Advanced trees (Splay tree, AVL or Red-black tree, B-tree)	[CLRS] Chapters 12, 13 [MGM] Chapter 3
	4	Priority Queues • Priority Queues and Heaps • Adaptive Priority Queues Quiz 1	[CLRS] Chapter 19
	5	Sorting • Bubble Sort • Merge Sort • Quick Sort Assignment 1 Due	[CLRS] Chapter 7 [MGM] Chapter 2
2	1	Mid-Term Exam	
	2	Sorting • Bucket Sort • Radix Sort • Sorting Lower Bounds	[CLRS] Chapter 8 [MGM] Chapter 2
	3	Maps and Dictionaries • Maps • Hash tables • Skip lists Quiz 2	[CLRS] Chapter 11 [MGM] Chapter 3



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2	4	Graph • Graph types • Graph representations: Adjacency matrix and adjacency list	[CLRS] Chapter 22 [MGM] Chapter 4
	5	Graph • Graph traversal • Connected component • Topological sort	[1] Chapter 22 [2] Chapter 5
WEEKLY SCHEDULE			
Week	Day	Topic	Reading
3	1	Graph • Cycles, girth, graph colouring. • Bipartite graphs • Graph matching Assignment 2 Due	[CLRS] Chapter 22 [MGM] Chapter 5
	2	Graph • Minimum Spanning Tree • Dijkstra's algorithm	[CLRS] Chapter 23 [MGM] Chapter 5
	3	Graph • Dijkstra's Algorithm • Bellman-Ford Algorithm	[CLRS] Chapter 24 [MGM] Chapter
	4	Revision	Review
	5	Final Exam	
ASSESSMENT			
Assessment Task		Percent (%)	
Attendance/Participation		10%	
Quiz 1		5%	
Quiz 2		5%	
Assignment 1		10%	
Assignment 2		10%	
Mid-Term Exam		20%	
Final Exam		40%	
Total		100%	



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DETAILS ON GRADE COMPONENTS		
<p>Attendance and Participation</p> <p>Students are required to attend all classes and participate actively. Students should treat their classroom obligations as they would treat any serious professional engagement. Your participation grade will be based on the instructor's assessment of how well you contribute to classroom dynamics relative to your class peers.</p> <p>In case of an absence, the student is responsible for the materials and assignments for that class; it is the student's responsibility to inform the instructor regarding absences and assignments that are missed.</p> <p>Unexcused absence from three or more scheduled class sessions will be grounds for failure in this course. If you do have to miss class due to a personal emergency, please let the instructor know as soon as possible. Such emergencies will be dealt with on a case-by-case basis.</p>		
DETAILS ON GRADE COMPONENTS		
<p>Participation grades will be based on quality (in-class performance that reflects intellectual depth, insightfulness, and contribution to class learning) and quantity (consistency and regularity of performance). Accordingly, you are expected to read the related chapters before participating the class. Be prepared to be called upon to "open" a class discussion by presenting your full analysis and thoughts on the assigned topic at the start of class, or to be asked through a "cold call" for comment during the discussion.</p> <p>The grading of class participation is necessarily a subjective exercise. However, high- quality comments have one or more of the following characteristics: (1) insightfulness, (2) appropriate application of course concepts, and (3) advancement of the in-class discussion at hand.</p> <p>Quizzes</p> <p>Quizzes will happen on the first and second weeks to review and reinforce what has been learned in the previous classes.</p> <p>Assignments</p> <p>To enhance the learning process, students have to submit two assignments. Each assignment weighs 10% of the total marks.</p> <p>Assignment 1 covers Divide-and-conquer, Dynamic programming and Greedy algorithm. It is due on Friday of the first week.</p> <p>Assignment 2 covers graph theories and graph algorithms. It is due on Monday of the third week.</p> <p>Mid-semester Examination</p> <p>The mid-semester examination will be held on Monday of the second week. It will cover the contents of the first week including but not limited to Divide-and-conquer, Randomised algorithms, Dynamic programming and Greedy algorithms.</p> <p>Final Examination</p> <p>An in-class final examination will be administered at the end of the course on Friday of the third week. Details of contents, exam format, etc. will be announced in class well before the examination dates.</p>		



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COURSE GRADING														
Upon completion of this course, you receive a final grade. The final grade is a letter grade that carries with it a numerical value, as outlined below.														
<table border="1"><thead><tr><th>Grade</th><th>Percentage %</th></tr></thead><tbody><tr><td>A</td><td>80-100</td></tr><tr><td>B</td><td>70-79</td></tr><tr><td>C</td><td>60-69</td></tr><tr><td>D</td><td>50-59</td></tr><tr><td>E</td><td>0-49</td></tr></tbody></table>			Grade	Percentage %	A	80-100	B	70-79	C	60-69	D	50-59	E	0-49
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A	80-100													
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D	50-59													
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For Post-Graduate Students														
To pass this subject, students are required to obtain Grade B or above in order to satisfy all the intended learning outcomes.														
COURSE GRADING														
For Undergraduate Students														
To pass the subject, students are required to obtain Grade C or above in order to satisfy all the intended learning outcomes.														
ACADEMIC INTEGRITY & ACCOMMODATION														
Classroom Protocol														
Students are expected to attend class regularly, arrive promptly, have completed the required readings for the session before coming to class, and participate thoughtfully in all in-class activities. Cell phones must be turned off and stowed at all times. Lecture notes and/or PowerPoint slides are available on Canvas. Class materials should be downloaded from the course website and brought to class either as a hard copy or on your laptop. Laptops and tablets are permitted in the class for class-related purposes ONLY, and their use will be closely supervised by the instructor. If any student is found to be using a laptop or tablet for non-class purposes, the student will be prohibited from using the device(s) in class for the remainder of the semester. Please make a sincere attempt to arrive on time. If you arrive late, please enter the classroom quietly. It is difficult to educate fellow classmates with constant interruptions at the door. If you miss a class, given the size of this class, it is your responsibility to catch up.														



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UNIVERSITY POLICIES		
General Expectations, Rights and Responsibilities of the Student As members of the academic community, students accept both the rights and responsibilities incumbent upon all members of the institution. Students are encouraged to familiarize themselves with the university's policies and practices pertaining to the procedures to follow if and when questions or concerns about a class arises. In general, it is recommended that students begin by seeking clarification or discussing concerns with their instructor. If such conversation is not possible, or if it does not serve to address the issue, it is recommended that the student contact the program administrator as a next step.		
Academic Integrity Your commitment, as a student, to learning is evidenced by your enrollment at the university. You are expected to be honest in all your academic course work. Faculty members are required to report all infractions to the program administrator. Using the ideas, data, or language of another without specific or proper acknowledgement is dishonest. We will not accept work that includes copied and pasted information; all information or ideas included in your assignments must be in your own words. If you use ideas of others, whether they are "experts" writing for websites, friends from class, or other individuals, you must provide proper citations and references in the assignment.		
UNIVERSITY POLICIES		
Campus Policy on Disabilities If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please notify the instructor or program administrator as soon as possible, in order to make the appropriate accommodation.		
Accommodation to Students' Religious Holidays It is the responsibility of the student to inform the instructor, in writing, about such holidays before the add deadline at the start of each semester. If such holidays occur before the add deadline, the student must notify the instructor, in writing, at least three (3) days before the date that he/she will be absent. It is the responsibility of the instructor to make every reasonable effort to honor the student request without penalty, and of the student to make up the work missed.		