ASSUMPTION UNIVERSITY
FACULTY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTLINE
CS3201, CSX3009 ALGORITHM DESIGN

Course Status : Major Required
Pre-requisite : Mathematics Foundation for Computer Science or equivalent
Semester : 1 / 2022
Instructor : Asst. Prof. Dr. Thitipong Tanprasert (Sec 541)
Thursday 9:00 – 12:00
Room VMS 805

Office
VMS 608, VMS. Building 6th floor
Email : thitipong@scitech.au.edu
Office Hours : 12:00 – 13:00 Wednesday
8:00 – 9:00 Thursday

References:
1. *Introduction to Algorithms* by Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, The MIT Press, 3rd Edition (2nd Edition is applicable)
2. *Algorithms* by Jeff Ericsson, An online book, http://www.cs.illinois.edu/~jeffe/teaching/algorithms/, Latest update December 25, 2013
3. *Algorithm Design.*, J. Kleinberg, E. Tardos, Addison Wesley, 2005.
4. *Python Algorithms*, **Magnus Lie Hetland**, Apress, ISBN 978-1-4302-3237-7, 2010
5. Task collection, Programming.in.th
6. *Artificial Intelligence – The Modern Approach*, Stuart.Russell and Peter Norvig, Prentice Hall

Course Description
Techniques for designing algorithms using divide and conquer, greedy method, dynamic programming and backtracking by emphasizing on analysis of efficiency, design techniques for NP problem domain.

Course Objectives
The students will understand the development and comparative advantages of various data structures. The students will be able to appropriately apply data structures in an application development through algorithm analysis. The students will understand various searching and sorting techniques and be able to analyze the impact of the data structures that are applied to these techniques.

Lecture Schedule:

Weeks	Topics	Remarks
1	Summary of the algorithm analysis and its correlation with the real program efficiency. Introduction to NP-Complete Problems	$O(n^3)$ vs $O(n^2)$ vs $O(n)$ for the same problem.
2	Python rehearsal I : iterative algorithms	Max contiguous subsequence, Location
3	Python rehearsal II: simple recursive algorithms	Fibonacci, Square and Domino Tiles (extended to 3), Tower of Hanoi
4	Recursion - a critical key in algorithm design	Location revisited, Cut-rod
5	Memoization	Cut-rod, Coin Change
6	Memoization : 2-argument problems	0-1 Knapsack
7	Dynamic Programming I: Bottom-up	0-1 Knapsack, Longest Common Subsequence
8	Dynamic Programming II	Edit Distance
	Midterm Examination	

9	Breadth-First Seach	n-Queen, Maze
10	Uniform Cost Search	Priority queue, Shortest route in map
11	Heursistics search	Maze version 2
12	Backtracking & Pruning, Branch and Bound	0-1 Knapsack, Fractional knapsack
13	Greedy Algorithm	Kruskal's MST + Disjoint-Set, Activity selection
14	Divide and Conquer	Fast exponentiation, Mergesort & Counting inversion
15	Term project presentation	
	Final Examination	

Mark Allocation:

Term Project	20%
Assignments (4)	20%
Midterm Examination	30%
Final Examination	30%

Other Requirements:

1. 80% attendance (checked **ONLY** within the first 15 minutes of each 90 minutes)
   IMPORTANT : The class attendance checking has been strongly enforced for many semesters and students who missed checking more than 20% had been withdrawn from the course. Therefore, it is emphasized here that ***the percentage of attendance is calculated from the checking in the first 15 minutes***. A student who walks in later than the specified checking period may be allowed to sit in the class, *but he or she will not be checked for attending the session*.
2. Participating in the project presentation

Term Project Description :

A group of **no more than two** members will study for an algorithmic solution for a specified problem (must not be listed in http://portal.scitech.au.edu/thitipong/index.php/2019/08/01/algorithm-design-term-projects-12016/) and implement the solution. The report will include the solution, its running time analysis, the implemented program, and the example executions, including the test cases. The completion of the project includes presentation.