Metropolitan State University of Denver
Regular Course Syllabus

CS - 4050 - Algorithms and Algorithm Analysis Fall 2016

Status	completed
Tracking:	LAS 1617-47
Department	Mathematical and Computer Sciences, Department of
Status:	Active-Visible
Prefix:	CS
Course Number:	4050
Course Type:	Computer Science
Course Title:	Algorithms and Algorithm Analysis
Transcript Course Title:	Algorithms & Algorithm Analysi
Equivalent/ Crosslisted?	Crosslisted
List all equivalent courses:	
List all crosslisted courses:	HON 4050
Check All That Apply:	Required for Major
Credit Hours:	4
Schedule Type:	Lecture
Grade Mode:	Letter
Lecture:	60
Lab:	
Internship:	
Practicum:	
Other:	
Additional Student Work Hours per course:	120
Variable topics umbrella course:	No
If yes, number of credits/ repeats allowed	
Specified repeatable course:	No
If yes, number of credits/ repeats allowed	
Prerequisite(s):	CS 3240, CS 3250, and 4 additional credits of upper division CS courses all with grades of "C" or better, or permission of instructor. MTH 3210 is recommended.
Corequisite(s):	
Prerequisite(s) and/or Corequisite(s):	
Banner Prerequisite(s):	
Banner Corequisite(s):	
Banner Prerequisite(s) and/or Corequisite(s):	
Level	
Class	
Program/Major	
Student attribute	
Catalog Course Description:	The emphasis of this course is on the design, analysis, and evaluation of efficient algorithms for a wide variety of computing problems.

Required Reading and Other Materials will be equivalent to:	Algorithms in C++, Sedgewick, Addison Wesley, 1992. ISBN: 0-201-51059-6
Specific, Measurable Student Behavioral Learning Objectives:	Upon completion of this course the student should be able to: 1. Analyze algorithms 2. Use a recurrence relation to analyze a recursive algorithm. 3. Remove recursion from an algorithm. 4. Discuss and implement random number generator. 5. Implement a linked list using arrays. 6. Describe the shortcoming of brute-force algorithms. 7. Implement a greedy algorithm to solve an appropriate problem. 8. Implement a divide-and-conquer algorithm to solve an appropriate problem. 9. Discuss alternatives to exhaustive search. 10. Use backtracking to solve an appropriate problem (e.g.: navigating a maze). 11. Describe various heuristic problem-solving methods. 12. Implement a string searching algorithm. 13. Use pattern matching to analyze substrings. 14. Use dynamic programming to solve an appropriate problem. 15. Discuss various methods of parsing. 16. Implement distributed algorithms.
Detailed Outline of Course Content (Major Topics and Subtopics) or Outline of Field Experience/ Internship	I. Algorithm Analysis A. Asymptotic analysis of upper and average complexity bounds B. Identifying differences among best, average, and worse case behaviors C. Big O, little o omega, and theta notation D. Standard complexity classes E. Time and space tradeoffs in algorithms F. Using recurrence relations to analyze recursive algorithms II. Removal of Recursion III. Random Number Generators IV. Array Implementation of a Linked List V. Algorithm Strategies A. Brute-force B. Greedy C. Divide-and-Conquer D. Exhaustive Search E. Backtracking F. Branch-and-bound G. Heuristics H. String Searching 1. Brute Force 2. Knuth-Morris-Pratt Algorithm 3. Boyer-Moore Algorithm I. Pattern matching 1. Pattern Matching Machine J. Dynamic programming 1. Knapsack 2. Matrix-chain multiplication 3. Optimal Binary Search Trees VI. Parsing A. Introductory Concepts B. Top-Down and Bottom-Up Parsing

	VII. Distributed Algorithms A. Consensus and Election B. Termination Detection C. Fault Tolerance D. Stabilization
Evaluation of Student Performance	A combination of the following: 1. Homework and Programming Assignments 2. Quizzes and Examinations 3. Final Examination 4. Research papers and/or Book Reports 5. Oral Presentations 6. Significant Programming Projects Written communication skills will be applied in this course.
Learning Objectives	
Distribution of Credit Hours	(4 + 0)

Steps	**Edits**	**Decision**	**Date**	
Originator				
Gerald Shultz	1	approve	10/03/2016 04:29PM	
Department Curriculum Committee Chair				
Clark Dollard	0	approve	10/05/2016 03:18PM	
Department Chair				
Lindsay Packer	4	approve	10/06/2016 10:32AM	
Dean's Office Tracking Assignment				
Kelsey Smith	1	approve	10/06/2016 02:57PM	
Substantive College Level				
Gerald Shultz	5	approve	12/09/2016 09:30AM	
Linda Lang-Peralta	0	approve	12/15/2016 04:59PM	
Mona Mocanasu	0	approve	12/14/2016 10:48AM	
Faculty Senate President				
Matthew Makley	0	None		
Erica Buckland	0	force-approve	12/22/2016 09:29AM	
AVP Academic and Student Affairs				
Bernice Harris	1	approve	12/22/2016 10:03AM	