Course Description

Instructor. Prof. Richard Chang, <chang@umbc.edu>, 410-455-3093.
Office Hours: Tue 1:00pm – 2:00pm & Wed 1:30pm – 3:30pm, ITE 326.

Teaching Assistant: Taneeya Satyapanich, <taneeya1@umbc.edu>
Office Hours: TBA.

Time and Place. Tu & Th 10:00am – 11:45am, Fine Arts 215.

Textbooks. *Introduction to Algorithms*, third edition, Cormen, Leiserson, Rivest and Stein. MIT Press, 2009. ISBN: 978-0-262-03384-8.

References.

- *Algorithm Design*, Kleinberg and Tardos. Addison Wesley, 2006. ISBN: 0-321-29535-8.
- *Algorithms,* Dasgupta, Papadimitriou and Vazirani. McGraw-Hill, 2006. ISBN: 978-007352340-8.

Course Web Page. http://umbc.edu/~chang/cs641/

Prerequisites. An undergraduate course on algorithms is a prerequisite for this class. At UMBC, the undergraduate algorithms course (CMSC 441) uses the same textbook and typically covers Chapters 1-4, Appendix A (Big-O notation, recurrences and summations), Chapters 6–9 (Heapsort, Quicksort, "linear-time" sorts and linear-time median algorithms), Chapter 15 (dynamic programming), Chapter 16 (greedy algorithms) and Chapters 22–25 (graph search algorithms, minimum spanning trees and shortest path algorithms). In addition hash tables and balanced binary trees are covered in CMSC 341 Data Structures. There will be minimal overlap in the material covered in the CMSC 441 and CMSC 641. If you are not familiar with some of these topics, you must have enough preparation to review the material on your own.

Objectives. The objective of this course is to prepare you to learn new algorithms — either from the literature or by designing your own new algorithms. Thus, this class will have you:

1) master advanced algorithm analysis techniques,
2) practice designing "new" algorithms,
3) accumulate the background knowledge needed to read and understand algorithms published in research journals, and
4) develop the writing skills for clear and logical presentation of algorithms.

Grading. Your performance in this course will be based upon 12 homework assignments, 5 tests and the final exam and will be weighted as follows:

Homework	24%
Tests	50%
Final Exam	26%

Tests and Exams. Tests will take place in the classroom. The first three tests will be held during the last 30 minutes of the class period. Tests 4 and 5 will take the entire class period. The dates of the tests are provided on the class schedule. The final exam is scheduled on **Tuesday, May 21, 10:30am – 12:30pm** in Fine Arts 215.

Lectures. The purpose of the lectures is to explain the parts of the reading that are difficult to understand. *Lectures do not replace the reading.* Lectures will be a mix of prepared slides and presentations on the white/blackboard. *You will need to take notes and read the textbook.* The slides are not a transcript of the lecture.

Homework Policy & Academic Integrity. The purpose of homework is for you to practice solving problems and for you to receive feedback on your work before the tests. *You should take advantage of this opportunity.* It is unlikely that you will learn much from finding solutions online. If you do not learn from doing your homework, the tests will be difficult.

You are encouraged to discuss the homework problems with your classmates. However, you must write up your solutions on your own — i.e., without looking at other people's homework, other people's notes, your notes of other people's homework, your notes of other people's notes, ... The *minimum* penalty for copying homework is that all students involved in copying will receive a grade of zero for the assignment. Cheating by graduate students is considered especially egregious because graduate students serving as teaching assistants are in a position of responsibility and must themselves uphold the university's academic integrity.

The UMBC Graduate School's academic integrity policy is available at:

`http://catalog.umbc.edu/content.php?catoid=21&navoid=1256`

In general, homework must be submitted when they are due. This allows for timely discussion of the solutions and for the graded assignments to be returned before the tests. If you have an excusable absence (e.g., travel for work, conference attendance, medical illness), please make arrangements with the instructor as early as possible.

We will follow the textbook *Introduction to Algorithms*, third edition, by Cormen, Leiserson, Rivest and Stein. The following schedule outlines the material to be covered during the semester and specifies the corresponding sections of the textbook. Selected topics not in the textbook will require reading from handouts.

			Homework	
Date	**Topic**	**Reading**	**Assigned**	**Due**
Tue 01/29	Review: Greedy Algorithms	16.1-16.4		
Thu 01/31	Review: Dynamic Programming	15.1-15.5	HW1	
Tue 02/05	Amortized Analysis: introduction	17.1-17.4		
Thu 02/07	Amortized Analysis: skew heaps		HW2	HW1
Tue 02/12	Disjoint Set Union	21.1-21.4		
Thu 02/14	Fibonacci Heaps	19.1-19.4	HW3	HW2
Tue 02/19	Maximum Flow	26.1-26.3		
Thu 02/21	Maximum Flow		HW4	HW3
Tue 02/26	Maximum Flow, **Test 1**			
Thu 02/28	Maximum Flow		HW5	HW4
Tue 03/05	NP-completeness	34.1-34.5		
Thu 03/07	NP-completeness		HW6	HW5
Tue 03/12	NP-completeness, **Test 2**			
Thu 03/14	NP-completeness			HW6
Tue 03/19	*Spring Break*			
Thu 03/21	*Spring Break*			
Tue 03/26	Approximation Algorithms	35.1-35.5		
Thu 03/28	Approximation Algorithms		HW7	
Tue 04/02	Approximation Algs, **Test 3**			
Thu 04/04	Approximation Algorithms		HW8	HW7
Tue 04/09	Randomized Algorithms	tba		
Thu 04/11	Randomized Algorithms		HW9	HW8
Tue 04/16	**Test 4**			
Thu 04/18	Randomized Algorithms		HW10	HW9
Tue 04/23	Linear Programming	29.1-29.3		
Thu 04/25	Linear Programming		HW11	HW10
Tue 04/30	**Test 5**			
Thu 05/02	TBD		HW12	HW11
Tue 05/07	TBD			
Thu 05/09	TBD			HW12
Tue 05/14	Review			
Tue 05/21	**Final Exam 10:30am – 12:30pm, Fine Arts 215**			