

**COMP 785 Advanced Analysis of Algorithms Spring 2007** TR: 3:00-4:15, McNair 132

**Albert Esterline** 331A McNair Hall

Tel.: 334-7245, ext. 462

email: [esterlin@ncat.edu](mailto:esterlin@ncat.edu) web: [www.ncat.edu/~esterlin](http://www.ncat.edu/~esterlin)

Office Hours: MWF 1:00-2:00 and 3:00-4:00, TR 1:00-3:00

*Catalogue Description*

This course discusses the design and analysis of efficient algorithms and algorithmic paradigms. Applications include sorting, searching dynamic structures, graph algorithms, computationally hard problems, and NP completeness.

*Prerequisites:* COMP 285 or Graduate Standing

*Text:* T.H. Cormen, C.E. Leieron, R.L. Rivest, and C. Stein, *Introduction to Algorithms*, 2<sup>nd</sup> ed., The MIT Press, 2001.

*References:*

Horowitz and S. Sahni, *Fundamentals of Computer Algorithms*, Computer Science Press, 1978.

*Course Objectives*

This course studies the analysis and design of algorithms and covers several kinds of algorithms in depth. On completion of this course, the student will be able to

- analyze the average- and worst-case performance of algorithms,
- use sorting and searching algorithms effectively,
- use dynamic programming and the greedy paradigm effectively,
- use graph algorithms effectively,
- apply the concept of NP-completeness and be familiar with approximation algorithms, and
- implement the families of algorithms mentioned above in the appropriate high-level language.

*Topics* (See the schedule for dates.)

Techniques for Analyzing Algorithms

Sorting and Searching

Dynamic Programming and Greedy Algorithms

Graph Algorithms

NP-Completeness and Approximation Algorithms

*Grading:* Assignments: 32%; Quizzes (2): 8%; Exams (2): 32%; Final: 28%

*Exam Policies*

Exams and quizzes are open book. Make-up is allowed only by prior arrangement.

*Late Submission of Assignments*

Assignments are accepted with a 15% penalty up to the next class session after they are due.

*Grade Ranges:* A: 85-100%; B: 73-84%; C: 60-72%; D: 50-59%; F: 0-49%

**Cheating:** Cheating covers any case in which a student has received unauthorized aid in his/her performance that contributes to a course grade or submits material contributing to a course grade with the intent to deceive the instructor or grader. If the unauthorized aid includes help from another student, then that student is considered to have cheated as well. If a student cheats on lab work or a homework assignment, then he/she will receive a grade of zero (a grade of F) for that item as will anyone assisting him/her in an unauthorized way. If a student cheats on an exam or final, he/she will receive a failing grade for the class. All cases of cheating will be reported to the Director of Undergraduate Studies. When a student cheats for the second or more time in any Computer Science class, he/she will receive an F in the class in which the most recent case occurred and will be referred to the University authorities for disciplinary action.

**Students with special needs** (e.g., hearing or vision) should inform the instructor at the beginning of the semester.

**COMP 785 Advanced Algorithms Spring 2007 Schedule of Topics**

Week	Dates	Topics	Text Readings
1	Jan. 9, 11	Introduction	1, 2
2	Jan. 16,18	Growth of Functions	3
3	Jan. 23,25	Recurrences	4, A
4	Jan. 30, Feb. 1	Counting & Probability. Probabilistic Algorithms	C.1-3, 5.1-4
5	Feb. 6, 8	Heapsort	6
6	Feb. 13, 15	Quicksort	7
7	Feb. 20, 22	Sorting in Linear Time, Medians & Order Statistics	8 (skip §4), 9 (skip §3)
8	Feb. 27, Mar. 1	Hash Tables	11
		<b>Spring break</b>	
9	Mar. 13, 15	Dynamic Programming	15
10	Mar. 20, 22	Greedy Algorithms	16.1-2
11	Mar. 27, 29	Graphs & Trees, Elementary Graph Algorithms	B.4-5, 22
12	April 3, 5	Min. Spanning Trees, Data Strs. for Disjoint Sets	23, 21 (skip §4)
13	April 10, 12	Single-Source Shortest Paths	24
14	April 17, 19	All-Pairs Shortest Paths, Maximum Flow	25.1-2, 26.1-2
15	April 24, 26	NP-Completeness	Handout
16	May 1	Approximation Algorithms	35

**Schedule of Quizzes and Exams**

Quiz 1	Tues., Jan. 25
Quiz 2	Thurs., Feb. 15
Exam 1	Thurs. March 1
Exam 2	Thurs., Apr. 19
Final	To Be Announced