

Syllabus: CS 4104

Data and Algorithm Analysis

Spring, 2013

1 General Course Information

CRN	12117
MEETING TIME	8:00 AM–9:15 AM; Tuesdays and Thursdays
CLASSROOM	340 Lavery Hall
FINAL EXAM	Friday, May 10, 7:45–9:45

Instructor: Lenwood S. Heath

- **Office:** 2160J Torgersen Hall
- **Office Hours:** 9:30–11:30 Tuesdays and Thursdays
- **Email:** heath@vt.edu

Teaching Assistant: Jacob Porter

- **Office Hours Held in:** 106/110 McBryde Hall
- **Office Hours:** 12:30–2:00 Tuesdays; 3–5:30 Wednesdays
- **Email:** jsporter@vt.edu

Web Site: <http://courses.cs.vt.edu/cs4104/heath/Spring2013/index.php>

Scholar (Course Grades Only): <https://scholar.vt.edu/>

Piazza: <http://www.piazza.com/>

Prerequisites:

- CS 3114, Data Structures and Algorithms, minimum grade C
- MATH 3134, Applied Combinatorics and Graph Theory, or MATH 3034, Introduction to Proofs

Required Textbook: Introduction to Algorithms (Third Edition). Cormen, Leiserson, Rivest, and Stein. MIT Press, 2009. ISBN: 978-0-262-03384-8.

2 Course Description

This course emphasizes techniques for constructing efficient algorithms and techniques for analyzing the efficiency of an algorithm. The notion of a *problem* is defined. Problems in a number of application areas are covered. Lower bounds on the efficiency of solving a problem are also addressed, especially the notion of NP-completeness.

3 Grading Policy

Grading for the course is on a 1000-point scale, with the points distributed as follows:

Homework assignments: 10 at about 60 points each	600
Midterm exam: March 21, 2013	150
Final exam: Friday, May 10, 7:45–9:45	250

A typical homework assignment consists of 2 to 4 problems, posted on the course web site approximately one week before the due date.

All homework must be prepared with L^AT_EX¹ or other word processing system and submitted as a stapled printout, in class, on the due date². **No late homework will be accepted.**

4 Readings

For most classes, there is a reading assignment (see Section 7) to be completed by class time. Each assignment consists of sections in the textbook.

5 Ethics

The Honor Code applies. All work submitted must be the student's own work. Students may solicit help only from the instructor or the GTA.

6 Announcement

If any student needs special accommodations because of a disability, please contact the instructor during the first week of classes.

¹See L^AT_EX resources on the course web site.

²See Calendar on the course web site.

7 Course Schedule

DATES	READING ASSIGNMENT	TOPICS
JANUARY		
1/21–1/25	Chapters 1 and 2	Problems, complexity, analysis
1/28–2/1	Chapter 3; Section 15.1	Asymptotics; dynamic programming
FEBRUARY		
2/4–2/8	Sections 15.2–15.4	Dynamic programming
2/11–2/15	Sections 16.1–16.3	Greedy algorithms
2/18–2/22	Section 22.1–22.4	Depth-first search; topological sort
2/25–3/1	Section 23.1–23.2	Substitution arguments; minimum spanning trees
MARCH		
3/4–3/8	Sections 24.1–24.3	Single-source shortest paths; relaxation; Bellman-Ford; Dijkstra
3/11–3/15	SPRING BREAK	
3/18–3/22	Sections 25.1–25.2	All-pairs shortest paths; Floyd-Warshall; transitive closure
3/21	Midterm Exam	Topics through single-source shortest paths
3/25–3/29	Sections 34.1–34.2	Polynomial time; optimization and decision problems; encoding problems
APRIL		
4/1–4/5	Sections 34.2–34.3	Polynomial-time reductions and NP-completeness
4/8–4/12	Sections 34.4–34.5	Proving problems NP-complete
4/15–4/19	Sections 32.1–32.3	String matching
4/22–4/26	Sections 35.1–35.3	Approximation algorithms
4/29–5/3	Sections 26.1–26.3	Maximum flow; maximum bipartite matching
MAY		
5/7	Last Day of Class	Review for final; questions on homework solutions and course material
5/10	Final Exam	7:45–9:45: Comprehensive final exam

END OF SYLLABUS