Syllabus: CS 4104
Data and Algorithm Analysis
Spring, 2015

1 General Course Information

CRN	19506
Meeting Time	2:00 PM–3:15 PM; Tuesdays and Thursdays
Classroom	330 Lavery Hall
Final Exam	Wednesday, May 13, 1:05–3:05

Instructor: Lenwood S. Heath

- **Office:** 2160J Torgersen Hall
- **Office Hours:** 9:00–11:00, Tuesdays and Thursdays
- **Email:** `heath@vt.edu`

Teaching Assistants:

	Sorour Ekhtiari	Rathna Senthil
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Office Hours	See Web site	See Web site
Room	See Web site	See Web site

Web Site: `http://courses.cs.vt.edu/cs4104/heath/Spring2015/index.php`

Scholar: `https://scholar.vt.edu/`

Piazza: `https://piazza.com/vt/spring2015/cs4104`

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 5, 2015	150
Final exam: Wednesday, May 13, 1:05–3:05	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 LaTeX[1] or other word processing system and submitted as a PDF to Scholar by 5:00 PM on the due date[2]. **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 teaching assistants.

6 Announcement

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

[1] See LaTeX resources on the course web site.

[2] See Calendar on the course web site.

7 Course Schedule

Dates	Reading Assignment	Topics
	January	
1/20–1/23	Chapters 1 and 2	Problems, complexity, analysis
1/26–1/30	Chapter 3; Section 15.1	Asymptotics; dynamic programming
	February	
2/2–2/6	Sections 15.2–15.4	Dynamic programming
2/9–2/13	Sections 16.1–16.3	Greedy algorithms
2/16–2/20	Section 22.1–22.4	Depth-first search; topological sort
2/23–2/27	Section 23.1–23.2	Substitution arguments; minimum spanning trees
	March	
3/2-3/6	Sections 24.1–24.3	Single-source shortest paths; relaxation; Bellman-Ford; Dijkstra
3/5	**Midterm Exam**	Topics through minimum spanning trees
3/9–3/13	Spring Break	
3/16-3/20	Sections 25.1–25.2	All-pairs shortest paths; Floyd-Warshall; transitive closure
3/23–3/27	Sections 34.1–34.2	Polynomial time; optimization and decision problems; encoding problems
3/30–4/3	Sections 34.2–34.3	Polynomial-time reductions and NP-completeness
	April	
4/6–4/10	Sections 34.4–34.5	Proving problems NP-complete
4/13–4/17	Sections 32.1–32.3	String matching
4/20–4/24	Sections 35.1–35.3	Approximation algorithms
4/27–5/1	Sections 26.1–26.3	Maximum flow; maximum bipartite matching
	May	
5/5	**Last Day of Class**	Review for final; questions on homework solutions and course material
5/13	**Final Exam**	**1:05–3:05:** Comprehensive final exam

End of Syllabus