Syllabus: CS 5114
Theory of Algorithms
Fall, 2020

1 General Course Information

CRN	83110
Meeting Time	12:30 PM–1:45 PM; Tuesdays and Thursdays
Classroom	McBryde 100

Instructor: Lenwood S. Heath

- **Office:** Zoom link for office hours on Canvas
- **Office Hours:** 9:30–10:30 and 2:00–3:00 Tuesdays and Thursdays
- **Email:** `heath@vt.edu`

Teaching Assistant: Rachita Sowle

- **Office Hours Held in:** Zoom link for office hours on Canvas
- **Office Hours:** TBD
- **Email:** `rachita18@vt.edu`

Web Site: `http://courses.cs.vt.edu/cs5114/fall2020/index.php`

Canvas (Grades Only): `https://canvas.vt.edu/`

Google Drive: After the first week of class, all students enrolled in the class will be given access to a CS5114 Google Drive that will be used when we move to online instruction. See Section 7.

Piazza: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the GTA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the Piazza developers, email `team@piazza.com`.

Find our class link at: `http://piazza.com/vt/fall2020/cs5114`

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 the **computational complexity** of a problem, the **efficiency** of an algorithm for solving a problem, **techniques** for designing algorithms, and the **inherent intractability** of certain problems. Skills that the student will take away from this course include: (1) determining whether a problem is NP-complete, (2) analyzing the time complexity of an algorithm, and (3) applying techniques for designing efficient algorithms.

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: October 1, 2020	150
Final exam: Distributed December 11, due December 14	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 Canvas by 5:00 PM on the due date[2]. Also, any required drawings must be drawn in a drawing program, not scanned and inserted. **If you must submit homework late due to illness, then please email me before the due date.**

4 Readings

For most classes, there is a reading assignment (see Section 9) to be completed by class time. Each assignment consists of sections or chapters 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.

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

[2] See Calendar on the course Web site.

7 Manner of Instruction

The nominal manner of instruction for this class is face-to-face in McBryde 100 until the Thanksgiving Break. Instruction will be online after that break. See Canvas for the CS5114 Zoom link once we move online. It is possible that the university will mandate a change in the manner of instruction to online at any time, in which case we will immediately switch to online and make greater use of the CS5114 Google Drive.

8 University Policies

Virginia Tech is committed to protecting the health and safety of all members of its community. By participating in this class, all students agree to abide by the Virginia Tech Wellness principles. To uphold these principles, in this class you must do the following:

- Wear a face covering during class, including as you enter and exit the classroom;
- Maintain the designated distancing guidelines of the classroom; and
- Enter and exit the classroom according to posted signage.

If you are exhibiting even the slightest sign of illness, you must not attend an in-person class. Notify me by email and follow the instructions posted at

`https://vt.edu/ready/health.html#tips`

9 Course Schedule

Dates	Reading Assignment	Topics
	August	
8/24–8/28	Chapters 1, 2, 3, and 4	Problems, complexity, analysis; divide and conquer — Mergesort
8/31–9/4	Chapters 7 and 9	Quicksort, order statistics
	September	
9/7–9/11	Chapter 15	Dynamic programming
9/14–9/18	Chapter 16	Greedy algorithms
9/21–9/25	Chapters 22 and 23	Elementary graph algorithms, minimum spanning trees
9/28–10/2	Chapter 34	Encoding problems; polynomial time (P); polynomial-time verification (NP)
	October	
10/1	**Midterm Exam**	Topics through minimum spanning trees
10/5–10/9	Chapter 34	NP-completeness and reducibility
10/12-10/16	Chapter 34	NP-completeness proofs
10/19–10/23	Chapter 34	NP-complete problems
10/26–10/30	Sections 35.1–35.3	Approximation algorithms
	November	
11/2–11/6	Chapter 32	String matching
11/9–11/13	Chapter 33	Computational geometry
11/16–11/20	Sections 26.1–26.2	Maximum flow
11/23–11/27	Thanksgiving Break	
11/30–12/4	Section 26.3	Maximum bipartite matching
	December	
12/8	**Last Day of Class**	Review for final; questions on homework solutions and course material
12/11–12/14	**Final Exam**	**Take-home:** Comprehensive final exam

End of Syllabus