Syllabus: CS 5045
Computation for the Data Sciences 1
Fall, 2020

1   General Course Information

CRN	91162
Meeting Time	8:00 AM–9:15 AM; Tuesdays and Thursdays
Classroom	Hahn North 130

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: Sirui Yao

- **Office Hours Held in:** Zoom link for office hours on Canvas

- **Office Hours:** 9:00–10:00 Mondays, Wednesday, and Fridays

- **Email:** ysirui@vt.edu

Web Site: http://courses.cs.vt.edu/cs5045/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 CS5045 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/cs5045

Prerequisite: Graduate standing; not available for credit for computer science students

Required Textbooks:

- Python Algorithms. Magnus Lie Hetland. Apress, 2014. ISBN: 978-1-4842-0056-8.

- Programming in Python 3 (Second Edition). Mark Summerfield. Addison-Wesley, 2010. ISBN: 978-0-321-68056-3.

2   Course Description

This course emphasizes *fundamentals of computer science,* including proficiency in a specific programming language (Python 3); program design, implementation, and testing; programming language syntax and semantics; abstraction and object-oriented programming; data structures; algorithms and algorithm analysis; and databases.

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

Some homework assignments consist of 2 to 4 problems, posted on the course Web site approximately one week before the due date. Others will be Python 3 assignments, which must be submitted to Canvas according to instructions in the assignment.

Some homework may 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.

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

[2] See Calendar on the course Web site.

6   Announcement

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

7   Manner of Instruction

The nominal manner of instruction for this class is face-to-face in Hahn North 130 until the Thanksgiving Break. Instruction will be online after that break. See Canvas for the CS5045 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 CS5045 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	Summerfield Chapter 1	Introduction to Python 3
8/31–9/4	Summerfield Chapter 2	Simple data types in Python 3
September		
9/7–9/11	Summerfield Chapter 3	Collection data types in Python 3
9/14–9/18	Summerfield Chapter 4	Control structures and functions in Python 3
9/21–9/25	Summerfield Chapters 5 and 6	Modules and object-oriented programming in Python 3
9/28–10/2	Summerfield Chapters 7 and 8	File handling in Python 3
October		
10/1	**Midterm Exam**	Topics through file handling
10/5–10/9	Hetland Chapters 1 and 2	Introduction to algorithms and asymptotic notation; data structures for graphs
10/12-10/16	Hetland Chapters 3, 4, and 6	Divide and conquer, recursion, and recurrences; Mergesort; Quicksort
10/19–10/23	Hetland Chapter 7	Greedy algorithms; minimum spanning trees
10/26–10/30	Hetland Chapter 8	Dynamic programming; sequence alignment
November		
11/2–11/6	Hetland Chapter 5	Graph algorithms: breadth-first search, depth-first search, and topological sort
11/9–11/13	Hetland Chapter 9	Graph algorithms: shortest path problems
11/16–11/20	Hetland Chapter 11	Complexity classes P and NP; NP-completeness
11/23–11/27	Thanksgiving Break	
11/30–12/4	Summerfield Chapter 12	Databases and SQL
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