CS 5114 Syllabus (Fall 2021)

Theory of Algorithms

Instructor: Bo Ji
Location: Litton-Reaves Hall (LITRV) 1800
Time: Tuesdays & Thursdays 12:30-1:45PM

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Note: Please include "CS 5114" and a brief topic in the subject line of all email messages.

Office Hours:
Tuesdays 3-5PM (https://virginiatech.zoom.us/my/bojifall2021) or by appointment

Teaching Assistant:

Name	Email	Office hours	Location (Zoom)
Zhongdong Liu	zhongdong@vt.edu	Fridays 3-5PM	https://virginiatech.zoom.us/j/84963803216

Textbooks:

1. *Algorithm Design*, Jon Kleinberg and Éva Tardos, Addison-Wesley, 2005. (Required)
2. *Introduction to Algorithms, Third Edition*, Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein, MIT Press, 2009. (Supplemental)

Course Description:
The course objective is to provide students with an understanding of the principles and techniques used in the design and analysis of efficient algorithms. This course emphasizes critical thinking, problem-solving, and rigorous analysis. The main topics cover Greedy Algorithms, Divide and Conquer, Dynamic Programming, Network Flow, Computational Intractability (NP-completeness), and Approximation Algorithms. A variety of classic algorithms will be chosen for discussion throughout the course, as they are important and are helpful for understanding the fundamental concepts.

Grading:
Homework assignments: 60%; Midterm exam: 15%; Comprehensive final exam: 25%.

Homework Policies:

1. There will be 6-7 homework assignments. Homework solutions must be well organized and typeset in LaTeX. A LaTeX homework template will be provided on Canvas, but you are free to use any reasonable template. Recommend https://www.overleaf.com for online editing.
2. If you are asked to provide an algorithm, you need to provide an actual algorithm with pseudo code, proof of its correctness/optimality, and the running time analysis. When you typeset in LaTeX, please use the algorithm environment for algorithms and use the math environment for symbols, equations, etc. (see, e.g., Sections "Algorithms" and "Mathematics" of https://en.wikibooks.org/wiki/LaTeX, respectively).
3. Homework assignments are due in two weeks. Submissions are via Canvas. No late homework submissions will be accepted. In special cases, please contact the instructor in advance.
4. You are encouraged to discuss homework problems with your classmates. However, you must write up your own solution and submit your own work.

Honor Code:
The Undergraduate Honor Code pledge that each member of the university community agrees to abide by states: "**As a Hokie, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do.**" Students enrolled in this course are responsible for abiding by the Honor Code. A student who has doubts about how the Honor Code applies to any assignment is responsible for obtaining specific guidance from the course instructor before submitting the assignment for evaluation. Ignorance of the rules does not exclude any member of the University community from the requirements and expectations of the Honor Code. For additional information about the Honor Code, please visit: https://honorsystem.vt.edu.

Special Accommodations:
Any student who has a need for accommodations based on the impact of a documented disability or medical condition should contact Services for Students with Disabilities (SSD) in 310 Lavery Hall (email: ssd@vt.edu; phone: 540-231-3788) to request accommodations and learn more about the resources available to you. If you have a SSD accommodation letter to share with the instructor, or you would like to discuss your accommodations, please contact the instructor as soon as practical. The instructor will work with you and with SSD to coordinate reasonable accommodations for all students with documented disabilities. All discussions related to your accommodations will be confidential.

Tentative Class Schedule:

Week (Dates)	Topic
1. 8/24 & 8/26	Course Overview & Introduction (Ch. 1)
2. 8/31 & 9/2	Algorithm Analysis (Ch. 2)
3. 9/7 & 9/9	Graphs (Ch. 3)
4. 9/14 & 9/16	Greedy Algorithms (Ch. 4)
5. 9/21 & 9/23	Greedy Algorithms (Ch. 4) & Divide and Conquer (Ch. 5)
6. 9/28 & 9/30	Divide and Conquer (Ch. 5)
7. 10/5 & 10/7	Dynamic Programming (Ch. 6)
8. 10/12 & 10/14	Dynamic Programming (Ch. 6)
9. 10/19 & 10/21	**Midterm examination**
10. 10/26 & 10/28	Network Flow (Ch. 7)
11. 11/2 & 11/4	Network Flow (Ch. 7)
12. 11/9 & 11/11	NP and Computational Intractability (Ch. 8)
13. 11/16 & 11/18	NP and Computational Intractability (Ch. 8)
14. 11/23 & 11/25	**Thanksgiving holiday (no class)**
15. 11/30 & 12/2	Approximation Algorithms (Ch. 11)
16. 12/7	Review
17. 12/15	**Comprehensive final examination (1:05-3:05PM)**