Syllabus for *Theory of Algorithms*
CS 5114, CRN 82760, Fall 2018

Meeting Times	4pm–5:15pm, Mondays and Wednesdays, MCB 218
Instructor	T. M. Murali, 231-8534, Torgerson 2160B murali@cs.vt.edu, **Please include "CS 5114" and a brief topic in the subject of all email messages.** http://bioinformatics.cs.vt.edu/~murali
Office Hours	9:30am–11:30am, Mondays and Wednesdays
Course Web Page	http://bioinformatics.cs.vt.edu/~murali/teaching/2018-fall-cs5114/

Course Description

CS 5114 is a traditional introduction to the theory of algorithms for computer science graduate students. It covers methods to construct algorithms and to analyze algorithms mathematically for correctness and efficiency (e.g., running time and space used). The course starts with definitions of algorithmic efficiency, discusses powerful paradigms for algorithm design, defines the theory of NP-completeness, and presents current approaches for coping with intractability, including approximation and randomized algorithms. The course provides a foundation for research in the design and analysis of algorithms itself or on problems with significant algorithmic content.

Course Restrictions

- CS , CSA , GBCB , MATH majors only
- Senior BS/MS , Regular Masters , Regular Post Masters , Doctoral students only

Textbook and References

The required textbook is "Algorithm Design" by Jon Kleinberg and Éva Tardos, published by Addison-Wesley in 2006. The ISBN for the textbook is 0-321-29535-8.

Grading

There will be 7–8 homeworks, a midterm examination, and a comprehensive final examination. Both examinations will be take-home. Homeworks account for 60%, the midterm examination for 15%, and the final examination for 25% of the grade.

A typical homework assignment consists of three or four problems, posted on the course web site one week before the due date and announced by email or on the Canvas site for the class. You must submit a PDF copy of your solutions to each homework by the deadline via Canvas. Do not hand-write your solutions. Use word-processing software to create your solutions. I strongly suggest that you use LaTeX to format your homeworks; there are many graphical front-ends to LaTeX (e.g., LyX and Kile on Linux) as well as web-based systems (e.g., Overleaf and ShareLaTeX). While you may use other software such as Microsoft Word or OpenOffice Writer, note that they produce mathematical output that is not visually pleasing.

Homework and examination problems are often tricky and difficult. Many of them will not involve straightforward applications of concepts taught in class but will require you to apply these concepts in creative ways. *Start working on the homeworks and examinations early. Do not wait till the last two–three days!* For most of the homework problems, there is more than one correct solution. Therefore, solution sketches posted by the instructor cannot cover all possible answers.

The instructor designs and grades the homeworks and exams. If you feel that an exam or homework has been graded incorrectly, you may request that it be regraded. You must make requests for regrades to the instructor within one week of the date you received the graded assignment back.

Syllabus

Below is an approximate schedule for the course. *This schedule is subject to change. Please consult the course website for the most up-to-date schedule.* The schedule on the course website will list required reading for each class. Lectures will cover the reading material as comprehensively as possible. *Students are expected to supplement lectures with a careful study of the relevant sections of the textbook.*

- Introduction and Stable Matching (Chapter 1)
- Basics of Algorithm Analysis (Chapter 2)
- Graphs (Chapter 3)
- Greedy Algorithms (Chapter 4)
- Divide and Conquer (Chapter 5)
- Dynamic Programming (Chapter 6)
- Network Flow (Chapter 7)
- NP and Computational Intractability (Chapter 8)
- Coping with intractability (Chapter 10)
- Approximation algorithms (Chapter 11)
- Randomised Algorithms (Chapter 13, if there is time)

Honor Code

Students enrolled in this course are responsible for abiding by the Graduate Honor Code. Please familiarise yourself with this code at https://graduateschool.vt.edu/academics/expectations/graduate-honor-system.html 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. Specifically, the Honor Code applies in this class as follows.

1. You are expected to do your own work for every homework and for every examination. No one (person or resource) may give you answers to exams.

2. You may not consult any sources of information apart from the textbook, the course slides, and your own notes.

3. Only students enrolled in this CRN this semester may use the notes, homeworks, exams, solutions, and other materials distributed to or generated in this class. Without the teacher's written permission, no one may show, give, or otherwise make such class materials available to anyone not enrolled in this CRN this semester. Prohibited activities include, but are not limited to, uploading an exam or homework, uploading solutions to problems, and submitting such class materials for online posting. The prohibition on sharing solutions applies to all solutions, regardless of who wrote the solutions.

The instructor is available to provide any assistance that you may need.

Announcement

If you are unable to attend scheduled office hours and need to meet with us, please send us email to set up an alternative time. If you need any accommodations because of a disability, if you have emergency medical information to share with the instructor, or if you need special arrangements in case the building must be evacuated, please meet the instructor as soon as possible.