Syllabus for *Data and Algorithm Analysis*
CS 4104, CRN 18154, Spring 2017

Meeting Times	2:30pm–3:45pm, Mondays and Wednesdays, SURGE 104C
Instructor	T. M. Murali, 231-8534, Torgerson 2160B murali@cs.vt.edu http://bioinformatics.cs.vt.edu/~murali **Please include "CS 4104" in the subject of all email messages.**
Office Hours	9:30am–11:30am, Mondays and by appointment
Teaching Assistant	Wenjie Zhuang, kaito@vt.edu,
Office Hours	To be announced
Teaching Assistant	Peter Steele, peter707@vt.edu
Office Hours	To be announced
Course Web Page	http://courses.cs.vt.edu/~cs4104/murali/spring2017

Course Description

This course emphasizes the understanding of data structures and algorithms from an analytical perspective rather than from an implementation standpoint. It covers methods to construct algorithms and to analyze algorithms mathematically for correctness and efficiency (i.e., running time and space used). The course starts with definitions of algorithmic efficiency, discusses powerful paradigms for algorithm design, and defines the theory of NP-completeness as a means to understand intractable problems.

Pre-requisites

- Grade of C or better in CS 3114, Data Structures and Algorithms
- Grade of P in MATH 3134, Applied Combinatorics and Graph Theory, or in MATH 3034, Introduction to Proofs

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 Piazza site for the class. You must submit a PDF copy of your solutions to each homework at the beginning of the class 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). 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 all the homeworks and the exams (midterm and final). The instructor grades both the exams. The TAs grade the homeworks. If you feel that an exam, homework, or project 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.

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: www.honorsystem.vt.edu.

Specifically, the Honor Code applies in this class as follows.

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

2. You are allowed to work in pairs for homeworks but you must write the final solutions independently from your partner. The homework assignments will make the policy explicit.

The instructor and the TAs are 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.