MATH 8650 Advanced Data Structures
Course Syllabus, Fall 2018

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Office Hours: MWF TBA

Class Time/Room: MWF 8:00-8:50am, Martin M-104

Description: This course is designed to introduce students to advanced data structures and algorithms from computer science. The goal is to provide a solid foundation for sophisticated software development and research in computational mathematics and other computational areas.

We will be using the Python programming language for weekly exercises and larger group projects.

Prerequisites: Knowledge of an "imperative" programming language—such as Java, C, C++, or Python—is expected; familiarity with the material in an undergraduate data structures course will also be useful, though some of that material will be reviewed here.

Textbook:
- M. T. Goodrich, R. Tamassia, M. H. Goldwasser, *Data Structures and Algorithms in Python*, Wiley, 2013 (recommended).
- B. Miller and D. Ranum, *Problem Solving with Algorithms and Data Structures using Python*, `https://interactivepython.org/runestone/static/pythonds/index.html` (recommended).

Recommended Software: Anaconda (`https://www.anaconda.com`) is a distribution of Python and R, including several development environments. It is available for Windows, Mac OS-X, and Linux. We will use the Python 2.7 distribution.

Topics (tentative):

- Overview of Python
- Stacks, queues, lists, collections
- Programming paradigms
- Object-oreinted programming
  - encapsulation, inheritance, polymorphism
- Functional Programming
- Algorithm complexity

- Graphs, trees
- Topics in scientific computing

Learning Outcomes: Upon successful completion of this course, students will be able to:

- Write programs of moderate complexity in the Python language
- Design, implement, test, and analyze advanced algorithms
- Implement a design using object-oriented programming techniques
- Contrast and use different, common programming paradigms

Grading:

Homework	30%
Midterm exam	35%
Projects	35%
Total	100%

Etiquette:
- Course interactions should be conducted in a professional manner. If you have a computer or other electronic device in class and you are not using it to take notes or complete programming exercises, keep it closed.
- E-mail correspondence is expected to adhere to professional standards.

Assignments and exams: Homework may be assigned each class. Problems to be turned in for grades will be designated when assigned. You are strongly encouraged to attempt to work problems that are not assigned for a grade as well. You are welcome to turn in any solutions on which you would like comments. Discussion and collaboration on homeworks is acceptable, however you should write up and turn in your own solutions. Extensions for one day may be granted in unusual circumstances, if arranged in advance.

Attendance: Students are expected to attend class regularly and punctually. If the instructor does not arrive within 15 minutes after the designated start time, class is considered dismissed.

A note on outside sources: It is in the nature of an introductory course that everything you will be asked to do for homework, exams or projects has been done before. The original papers, other textbooks that contain solutions, and computer codes may be available in the library or from other students or faculty or on the internet. In the interest of your own education and in fairness to other students, here are some ground rules for the use of outside sources.

- Before going to an outside source, you should make a good-faith effort to solve the problem on your own. This is the best way to learn the material, and to find out what you really know and don't know.

- If you do find the solution in an outside source, you should acknowledge the source. This is only fair to the original author, whether we're talking about a book, monograph or even a fellow student. Failure to disclose your sources is plagiarism.
- If you use an outside source, don't copy the result (proof, program, solution) verbatim. Rewrite it in your own words; improve the notation, construct a new example, reorganize the code, etc.. This will maximize the benefit to you of the experience of finding a solution in existing literature. Remember, not everything you read on the internet is true.
- Don't check out original sources (particularly journal articles and monographs) from the library during take-home exams. This is only fair to other students in the class who may be led to the same source.

Academic Integrity As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity."

Integrity Policy: `https://gradspace.editme.com/AcademicGrievancePolicyandProcedures#integritypolicy`

Disability Access Students with disabilities requesting accommodations should make an appointment with Disability Services (656-6848), to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Sexual Harassment Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veterans status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at `http://www.clemson.edu/campus-life/campus-services/access/non-discrimination-policy.html`. Mr. Jerry Knighton is Clemson University's Title IX Coordinator and Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864-656-3181 (voice) or 864-565-0899 (TDD).