

Syllabus

Location: RMB 323 (Robotics Building)

Time: TR 9:30 am - 10:45 am

URL: <http://voip.netlab.uky.edu/~fei/teaching/cs315/index.html>

Instructor

Zongming Fei

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Office hours: TR 11:00am - 12:00 noon (or by appointment)

Textbook

Sanjoy Dasgupta, Christos Papadimitriou, Umesh Vazirani, Algorithms, McGraw-Hill, 2008.

Description

Introduction to the design and analysis of algorithms. Asymptotic analysis of time complexity. Proofs of correctness. Algorithms and advanced data structures for searching and sorting lists, graph algorithms, numeric algorithms, and string algorithms. Polynomial time computation and NP-completeness.

Prerequisite

CS-215, CS-275, and engineering standing.

Needed Skills:

The student is expected to be familiar with basic concepts of programming in a general purpose programming language, and with a variety of mathematical tools for modeling and analyzing discrete structures. More specifically, the student should be familiar with programming features such as variables, control flow, iteration, and recursion, and structures such as arrays, records, lists, queues, stacks, trees, and graphs. The student should have some rudimentary understanding of time as a measure of program complexity and of basic ideas of program correctness. The student should be familiar with mathematical areas such as college algebra (especially polynomial, logarithmic, and exponential functions); calculus including differentiation and integration of basic functions; basic concepts of logic, set theory, and proof construction; counting techniques; and basic graph theory.

Ability to design, code and debug nontrivial programs in C or C++. Some knowledge of computer hardware organization.

Learning Outcomes

The student will develop a knowledge of intermediate level algorithms and data structures, techniques for the analysis of their complexity and correctness and some of the fundamental limitations on what can and cannot be computed efficiently. The student will be expected to learn models for asymptotic analysis of algorithms; techniques for searching and sorting lists, including binary search, and various sorts such as insertion, selection, merge, quick, heap, tree, bin and radix sorts; lower bounds on the complexity of sorting; advanced structures for data storage such as balanced trees and hashing; algorithms for performing a variety of operations on graphs, such as traversals, shortest path finding,

and spanning trees; a sampling of algorithms from other areas such as numerical and string algorithms; and the concepts of tractability and intractability of problems (including notions of polynomial time and NP-completeness).

Specifically, students will:

1. Understand the limiting factors of resources such as time and space in algorithmic solutions.
2. Understand how to approach the algorithm design and analysis
3. Understand basic algorithms and data structures and how to compare their quality.
4. Understand how to experimentally analyze the performance of programs.
5. (Ability to) analyze a problem, and identify and define the computing requirements appropriate to its solution.
6. (Ability to) apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Grading

The grade will be determined by class participation, performance on homework (6 to 8 assignments), quizzes, a midterm exam and a final exam. Some homework assignments will have a programming component. The tentative weights are as follows:

Class Participation/Attendance	5%
Homework and Quizzes	40%
Midterm exam	25%
Final exam	30%

Final grades will be assigned according to the following scale:

90 - 100	A
80 - 89	B
70 - 79	C
60 - 69	D
below 60	E

No incomplete grades will be assigned unless there exist exceptional, extenuating circumstances.

Final Exam Information

Final exam: 8:00am on May 2, 2013 (Thursday)

Mid-term Grade

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (<http://www.uky.edu/Registrar/AcademicCalendar.htm>).

Course Policies

Submission of Assignments:

Late submissions of homework assignments will not be accepted.

Attendance Policy:

Attendance is mandatory. For each unexcused absence, one point will be deducted from the final average.

Excused Absences:

Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit “reasonable cause for nonattendance” by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Information regarding dates of major religious holidays may be obtained through the religious liaison, Mr. Jake Karnes (859-257-2754).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Verification of Absences:

Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request “appropriate verification” when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.

Academic Integrity:

Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: <http://www.uky.edu/Ombud>. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Part II of Student Rights and Responsibilities (available online <http://www.uky.edu/StudentAffairs/Code/part2.html>) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student's assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability:

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Tentative Course Schedule

This schedule is tentative and subject to change.

Topics	Time
Introduction to algorithms – correctness and efficiency	one week
Divide-and-conquer algorithms	two weeks
Graph and depth first search	two weeks
Paths in graphs	two weeks
<i>Midterm Exam</i>	Feb. 28
Greedy algorithms	two weeks
Dynamic programming	one week
Search trees and sorting algorithm	one week
NP-completeness	one week
Algorithms with numbers	one week
Flexible (e.g., linear programming, string algorithm)	one week
<i>Final Exam</i>	May 2, Thursday at 8:00am