

## Class Information

- Description: Computer Algorithms
- Credit: 3CR
- Meeting time: MoWw 4:00-5:15pm
- Location: Engineering Laboratory 325

## Instructor: Prof. Lixin Gao

- Telephone: 413-545-4548
- Office: KEB 211B
- Office Hour: Monday 2:20-3:20 and Thursday 2-3, KEB 211B
- Email: [lgao@ecs.umass.edu](mailto:lgao@ecs.umass.edu)

## Teaching Assistant:

- Tian Zhou
- Office Hour: Tuesday 4:00-5:00 and Thursday 3:00-4:00
- Location: KEB 309D
- Email: [tzhou@umass.edu](mailto:tzhou@umass.edu)

## Textbook:

*Algorithm Design, Foundations, Analysis and Internet Examples*, by M. T. Goodrich, R. Tamassia, John Wiley & Sons Inc, 2002, ISBN: 0-471-38365-1

The book is available in Amazon.

## Reference Book for Discrete Math:

*Discrete Mathematics and its Applications*, by Kenneth Rosen

## Course Website:

[http://rio.ecs.umass.edu/~lgao/ece665\\_20](http://rio.ecs.umass.edu/~lgao/ece665_20)

## Course Description

Algorithmic ideas are pervasive, from software design to hardware design, to networking protocols, computational biology. Algorithmic problems form the heart of computer systems. Yet, they rarely are cleanly specified, precise questions. Rather, they are typically buried in domain-specific detail, some of it might be essential while others might be extraneous or less important. As a result, one has to perform the task of abstracting the problem into the mathematically well defined problem, and then the task of identifying the appropriate algorithm design techniques. Sometime one has to performed the two phases iteratively in order to achieve a satisfying answer to the problem. The goal of this course is to introduce the students to the process of algorithmic design. We will cover a broad range of basic techniques described in the course outline with the goal of illustrating the process of problem abstraction and algorithmic design. We will also use applications in computer networks as examples for algorithm design. Basic understanding of data structures, such as arrays, linked list, and trees is required.

## Course Outline:

- Algorithm Analysis: methodologies for analyzing algorithms
- Basic Data Structures: stacks, queues, trees, heaps.
- Combinatorial Algorithms: search trees and sorting algorithms.
- Fundamental Design Strategies: greedy methods, divide-and-conquer, dynamic programming, branch-and-bound method, simulated

- annealing, etc.
- Graph Algorithms: graph traversals (DFS and BFS), shortest/critical paths, minimum spanning tree.
- Randomized Algorithms
- Network Flows and Matching: max-flow/min-cut.
- Text Processing
- NP-completeness, approximation algorithms.

## Grading Policy

Homework (30%): There are five homework assignments.

Midterm Exam (30%): Date to be announced.

Final Exam (30%): Date to be announced.

Final Project (10%): Due date to be announced.

## Late / Make-Up Policy

Assignments are due as posted on the course web page. Late submissions will not be accepted. Scheduling conflicts regarding exams should be reported to the instructor immediately. In case of a medical emergency, late submission or a make-up exam can be requested if a note from a medical professional is provided. The note must indicate that the student was medically incapable at the time of the exam. If advanced notice is possible and not given, the instructor may refuse the request.

## Academic Integrity

Consultation with fellow students is encouraged. However, directly copying another student's work (past or present) defeats the purpose of the assignments and exams and is an honor code violation. Unless otherwise noted, you are expected to complete all assignment individually. Violations will result in serious penalties including course failure and possible disciplinary action. If in doubt, please consult the instructor or the official UMass guidelines regarding academic honesty.

## Inclusivity Statement

We are all members of an academic community with a shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect. The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing or speak with Dr. Paula Rees, Director of Engineering Diversity Programs ([rees@umass.edu](mailto:rees@umass.edu), 413.545.6324, Marston 128).