MTH/CSC 447 DISCRETE MATHEMATICAL STRUCTURES

FALL 2019

Instructor: Jie Han
Office: Lippitt Hall 200B, tel: 874.4439
Email: use messages on Sakai
Class Schedule: TuTh 3:30 – 4:45 pm, Lippitt 204
Office hours: TuTh 1:45 – 3:15 pm and by appointment.
Class materials: Class materials will be kept on Sakai (sakai.uri.edu).

Description: The objectives of the class is to learn the basic properties, techniques, theorems, and algorithms of discrete mathematics and graph theory. Discrete mathematics, including graph theory, has numerous applications in network science, design of algorithms, chip layouts, scheduling, management of cell phone networks, to name a few.

Topics to include: permutations, binomial theorem, pigeon hole principle, mathematical induction, partitions, inclusion-exclusion principle, recurrence relations, generating functions, graphs, trees, Eulerian walks, Hamiltionian cycles, matrix-tree theorem, planar graphs, graph colorings, graph algorithms.

Prerequisites: junior standing or better in physical or mathematical sciences, or in engineering.

Textbook: M. Keller, W. Trotter, Applied Combinatorics, GaTech.

Outcomes: At the conclusion of this semester you will be able to:

1. use basic enumeration techniques for counting strings, sets, permutations, and other finite mathematical structures.
2. read, understand, and construct mathematical arguments and proofs, including proof by induction,
3. solve linear and some nonlinear recurence relations,
4. define finite graphs, analyze their basic properties, and identify common applications of finite graphs
5. use and analyse basic graph algorithms.

Exams, Homework:

Exams: Exams will draw from material covered in class. That is, any theorem, proof, example, or homework problem is a possible material for the tests. The best way to prepare for the exams will be to start with your class notes and homework. There will be a midterm exam and a final exam. The exams will contain multiple choice questions. The midterm exam is tentatively planned on Tuesday March 19 and the final will be given Thursday May 2, 3 – 6pm, as scheduled by the Enrollment Office.

Homework: You learn more by doing, than by watching others give demonstrations. Therefore, homework is very important. When you sit down to do your homework is when you realize whether or not you understood the material from class. I will asign homework on a regular basis. Your solutions should be written up with your best effort at explanation and must be *readable and neat*. Some problems will challenge your problem solving abilities. I will be happy to give you hints if you are stuck with your homework. To keep the class running smoothly, late homework will not be accepted. However, your lowest homework score will be dropped.

Policy on working together: I encourage you to discuss homework problems with other students in the class. Before your group meeting, please do as many problems as you can on your own. However, you must write up the solutions by yourself. In practice, this means that you should not be looking at other people's solutions as you write your own. If identical homework sets are handed in, *all* of the identical copies will received 0 points. A word-by-word copy of a solution from another source (including the internet) is not acceptable and will also receive 0 points.

Evaluation: Your grade will be based on your homework assignments (the lowest homework score will be dropped), the midterm exam, and the final in the following way: homework 40%, the midterm exam 25%, the final 35% .

Missed exams: Makeup exams will be given only in the case of severe illness or other extreme emergency on the day of the exam.

Incompletes: University policy on "incomplete" grades will be strictly applied. As per University policy, grades of I (incomplete) are given at the discretion of the instructor for documented, University approved reasons only. Note that incompletes may only be given if the work in the course up until the documented problem is passing (60% and higher) by University policy.

A rough guideline for grading is as follows: A (93.00% - 100%), A- (90.00% - 92.99%), B+ (87.00% - 89.99%), B (83.00% - 86.99%), B- (80.00% - 82.99%), C+ (77.00% - 79.99%), C (73.00% - 76.99%), C- (70.00% - 72.99%), D+ (67.00% - 69.99%), D (60.00% - 66.99%), F (59.99% and below).

Important dates:

open add period: Sep 4-10.

open drop period: Sep 4-26. No mark on transcript

additional drop period through e-campus: Sep 27 - Oct 17. "W" on transcript

A course may be dropped by official procedures determined by the Office of Enrollment Services (e-campus) on or before the end of the third week of classes (Drop Period) with no mark on a student's transcript. Courses may be dropped through e-campus between the fourth and the end of the sixth week of classes (Withdrawal Period) and will be recognized on a student's transcript with a "W." After the end of the sixth week (Late Withdrawal Period), a student may drop a course only in exceptional circumstances and only with authorization of the dean of the college in which the student is enrolled. Such drops will also be recognized on a student's transcript with a "W." If the student has not dropped a course by the end of the withdrawal period the instructor must submit a grade.

Accommodations: Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with Disability Services for Students Office at 330 Memorial Union, 401-874-2098.

Class attendance: Class attendance is *strongly encouraged*. You are responsible for everything in class; anything announced in class, any material covered, any handouts or assignments etc., i.e. it is your responsibility to make sure you are aware of what takes place in class.

Standards of behaviour: Students are responsible for being familiar with and adhering to the published "Community Standards of Behavior: University Policies and Regulations" which can be accessed in the University Student Handbook. If you must come in late, please do not disrupt the class. Please *turn off* all cell phones, pagers, or any electronic devices.

Course schedule: This is a *tentative schedule* of topics for the class and we might be slightly ahead or behind at any given time. I suggest that you read the material prior the corresponding lecture. This will make the lectures more effective for you.

Week of	Topic	Textbook
Sep. 2	Introduction, enumeration	Sections 1.1, 1.2
Sep. 9	Introduction: graphs, optimization	Sections 1.3, 1.6
	Strings, permutations	Sections 2.1, 2.2
Sep. 16	Combinations	Sections 2.3, 2.4
	Binomial coefficients	Sections 2.5, 2.6
Sep. 23	Multinomial theorem	Section 2.7
	Induction	Sections 3.1 - 3.4
Sep. 30	Induction (cont'd)	Sections 3.5-3.7
Oct. 7	Strong induction	Sections 3.8, 3.9
	The pigeon hole principle	Sections 4.1, 4.2
Oct. 14	O,o-notation	Sections 4.3, 4.4
	Introduction to graphs	Sections 5.1, 5.2
Oct. 21	**Midterm exam, Tue 10/22**	
	Eulerian, hamiltonian graphs	Section 5.3
Oct. 28	Coloring	Section 5.4
	Planar graphs	Section 5.5
	Counting trees	Section 5.6
Nov. 4	Inclusion-exclusion	Sections 7.1-7.4
	Derangements	
Nov. 11	Generating functions	Sections 8.1-8.3
Nov. 18	Generating functions (cont'd)	Sections 8.4 - 8.6
	Partitions	
	Recurrence equations	Sections 9.1, 9.2
Nov. 25	Recurrence equations (cont'd)	Sections 9.3 - 9.7
Dec. 2	Graph algorithms (time permitting)	Sections 12.1 - 12.4
Dec. 9	Last class on Dec. 10 Review	