CRN: 01250 MATH-022.37Z Discrete Math, Spring, 2021

Instructor: Dr. Karl Schaffer
Class meeting days: Tue/Thu
Class time 6:30-8:45 PM
Classroom: Zoom via Canvas
email: schafferkarl@fhda.edu

Office phone: ~~408-864-8214~~ (In limited use Spr. 2021)
Office: Online
Office Hours: Mon., 7:30 – 8:20 PM, Thu. 12:30-1:20 PM
or by appointment
Class web site: Canvas web site

Description: Elements of discrete mathematics with applications to computer science. Topics include methods of proof, mathematical induction, logic, sets, relations, graphs, combinatorics, and Boolean algebra.

Course Philosophy: Discrete Mathematics encompasses a variety of topics of contemporary importance in applications, especially in areas of decision science, computer science, and computer engineering, but also in diverse fields such as biology and the social sciences. The Mathematics Association of America recommends that the course be taught at the "intellectual level" of calculus. Discrete mathematics incorporates work with algorithms, which are the codified procedures used to solve particular problems. The course explores what proof is, and provides students with practice in constructing proofs of different types, especially mathematical induction. Graph theory, investigating how things are connected and combinatorics, the science of counting complex arrangements, are important components this course. It explores recursion, and may go as deeply into that subject as to include generating functions. It also includes an introduction to symbolic logic and set theory, and their ramifications, and notes how Boolean algebras arise in each of these subjects. As the seemingly diverse topics covered in this course are examined, the student discovers that these distinct topics are interwoven and interrelated at many levels. Discrete mathematics can engage the student in challenging problem-solving, and leaves room for the instructor to include topics of contemporary and historical interest and the world-wide history of these topics.

Text: ***Discrete Mathematics with Ducks***, 2nd edition, by sarah-marie belcastro. Publisher: CRC Press.
We will cover chapters 1-8, 10-13, and parts of 16. We may also cover additional material on computational complexity. Please get a copy of the text prior to our first class meeting. You should be able to find either a used copy or an ebook online less expensively than at our college bookstore! Also, please begin reading chapter 1, as we will start working on that material on the first day.

Attendance: It is expected that you will attend and participate in online classes. Collaborative class exercises and quizzes will count towards your grade, and must be completed during class time – as you will see, they often will not make sense as problems to be solved outside of class.

Grades: 90-100 A, 80-89 B, 70-79 C, 60-69 D, < 60 F, based on:

20% short quizzes or in-class assignments, usually to be given during class. These will almost always involve group work. 80% of the possible score will count as full credit, so there will be no makeups – that is, if there are ten such quizzes, and you miss class for two of them, you can still get full credit.

Exams:
Exams are open book, notes allowed, in fact encouraged. I always involve collaborative work in my classes, but because of the unusual circumstances of the pandemic, more of this class will involve group work. One of the responsibilities of collaboration is to acknowledge and cite ideas and work that are not your own, even if this involves ideas communicated through casual conversation. We will practice such acknowledgement in group work; for example, for group quizzes, each student will turn in a paper, but give the names of those they worked with and cite important contributions of others.

Academic dishonesty regarding tests in this class is defined as using resources not made available by me to everyone in the class during the testing time. Academic dishonesty includes plagiarism. For work on the two exams that are individual I will ask you to sign a statement stating that you did not receive help from anyone else, either in or not in the class.

20%: one hour online exam, to be taken on Tue., May 11 - I have not yet decided exactly how that exam will be administered.
20%: Exam 2 will include as the major part a report assigned as both written paper and class presentation. Due date and more details TBA.

20% Homework assignments. Homework is assigned during each class and posted at the Canvas web site. Your homework will be turned in **ONLY** at the end of every two chapters. Homework is graded for completion, not correctness. **NO LATE HOMEWORK ACCEPTED.** You may miss one homework assignment and still

receive full credit.

20% Final Exam: mandatory, comprehensive, given on **Thur., June 24, 6:15-8:15 PM.** There will be no make-ups or early exams, but I have not yet determined exactly how the exam will be administered. A portion of the exam will be an individual online oral exam in which each student works several problems and shows work. The final exam score may be used to replace the first exam score, **if and only if** the final exam is higher and would raise the grade. Oral exam time schedule TBA.

NO LATE WORK IS ACCEPTED - NO MAKE-UPS. IF YOU MUST MISS THE FIRST MAJOR EXAM, IT WILL BE REPLACED WITH THE FINAL EXAM SCORE, BUT THIS IS NOT A GOOD IDEA! IF YOU GET BEHIND DO THE MOST RECENT WORK FIRST, KEEP YOUR WORK CURRENT!

Some background on the instructor: I have a Ph.D. in Mathematics from UC Santa Cruz, did undergraduate work at Univ. of Chicago and Univ. of Alabama, and I grew up in New England and Alabama. I do research in the mathematics of networks or graph theory, and am also a contemporary dancer and choreographer. The dance company I co-direct does shows about math and dance, among other things (see http://www.mathdance.org/) and has performed internationally. I am on the Teaching Artist Roster of the Kennedy Center for the Performing Arts for work integrating dance and mathematics, and have published widely on that subject.

Student Learning Outcome(s):

*Critique a mathematical statement for its truth value, defend choice by formulating a mathematical proof or constructing a counterexample.
*Analyze and apply patterns of discrete mathematical structures to demonstrate mathematical thinking.