CRN: 01250 MATH-022.37Y Discrete Math, Spring, 2022

Instructor: Dr. Karl Schaffer
Class meeting days: Tue/Thu
Class time 4:00-6:15 PM
Classroom: Tue.: S16, Thu.: Zoom via Canvas
email: schafferkarl@fhda.edu

Office phone: 408-864-8214-(In limited use Spr. 2022)
Office: Online
Office Hours: Mon., 12:30 – 1:20 PM, Thu. 6:20-7:10 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, information technology, and computer engineering, but also in diverse fields such as biology and the social sciences. The Mathematical 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, which investigates how things are connected, and combinatorics, the science of counting complex arrangements, are important components of this course. The course 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. A secondary free e-text that we will use occasionally is *Discrete Mathematics: An Open Introduction, 3rd edition, by Oscar Levin*. You will find the beginning of chapter 5.2, pages 307-316 of Levin's text helpful at the very beginning of the course, so please read it.

Attendance: you are required to attend and participate in both in-person and 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.
The first class meeting will be online on Thursday, April 7, since the college has designated Monday and Tuesday, April 4 and 5 for faculty meetings.

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. One of your quizzes will be just a required visit to office hour to talk to me for 5 minutes at least about how the course is going for you.

Exams:
Exams are open book, notes allowed, in fact encouraged; however, if you are using an ebook for the text, you must print out any pages you need, since communication capable devices are not allowed during exams. 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.

20%: one-hour in-person exam, to be taken on Tue., May 11 - Bring a scantron (the half page kind). Written notes or written materials allowed, but communication capable devices are not allowed when taking tests. There will be no make-ups or early exams. The final exam will be used to replace this exam **ONLY** if final is higher.

20%: Exam 2 will include as the major part a report assigned as both written paper and class presentation. Due date will probably be **Tuesday, June 7**, though more details will be announced.

20% Homework assignments. Homework is assigned during each class and posted at the Canvas web site. Your homework will be turned in on Canvas **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 **Thu., June 23, 4:00 -6:00 PM.** There will be no make-ups or early exams. 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.

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 a contemporary dancer and choreographer. The dance company I co-direct does shows about math and dance, as well as issues of social justice (see http://www.mathdance.org/) and we have performed throughout North America and internationally. I am on the Teaching Artist Roster of the John F. Kennedy Center for the Performing Arts for work integrating dance and mathematics and have published widely on the connections between those disciplines.

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.