Syllabus for CECS 228, Discrete Structures With Computing Applications

Instructor: Dr. Todd Ebert

Fall 2021

General Course Information

Academic Unit Department of Computer Engineering and Computer Science, California State University, Long Beach

Prerequisites CECS 174 and MATH 113 or equivalent all with a grade of "C" or better

Catalog Description An introduction to discrete mathematics with applications towards computing. Topics include sets, functions, logic, relations, graphs, trees, recursion, combinatorics, and mathematical reasoning

Section 2 Call Number 1187

Instructor Dr. Todd Ebert (Todd.Ebert)

Instructor Office Hours M: 9:30-10:30 (Meeting ID: 881 2983 4812), Tu: 11:00-12:00 pm (Meeting ID: 844 5909 4282), F: 9:00-10:00 am (Meeting ID: 871 6640 9445)

Teaching Assistants
 Gerardo Lopez Gerardo.Lopez02@student Office Hours: MW 5-6 pm (Meeting ID: 845 6776 1596)
 Dillon Brown sgthawk240@gmail.com Office Hours: TuTh 3:30-4:30 pm (Meeting ID: 250 737 7802)

Course Meeting Times MW 8:00-9:15 am (Meeting ID: 891 0337 5012)

Zoom Dial In 1 669 219 2599 US (San Jose)

Textbook "CECS 228: Discrete Structures with Computing Applications", ZyBook ISBN: 978-1-394-12656-9, ZyBook Code: CSULBCECS228EbertFall2021
 Instructions for Accessing the textbook

1. Sign in or create an account at learn.zybooks.com. Required: you must either use the student.csulb.edu or csulb.edu domain to access the book and receive participation points.

2. Enter zyBook code CSULBCECS228EbertFall2021

3. Subscribe. A subscription is $58. Students may begin subscribing on Aug 09, 2021 and the cutoff to subscribe is Dec 03, 2021. Subscriptions will last until Jan 01, 2022.

Course Website `http://www.csulb.edu/~tebert/teaching/fall21/228/intro.html`

Course Topics

Logic propositional and predicate logic, logical equivalences and identities, truth tables, predicate functions and quantifiers, modeling natural-language statements with logic, using natural language to interpret a logical statement

Sets list notation, set-builder notation, cardinality, set operations, set identities, subset and membership tables

Functions function notation, domain and codomain, range, one-to-one and onto functions, function composition, images and preimages, floor and ceiling functions

Logical and Mathematical Reasoning using proof trees to satisfy logical statements, find all possible conclusions deducible from a set of statements using logical rules of inference, identify logical fallacies, construct a mathematical proof using mathematical induction, cases, the direct method, the indirect method, and proof by contradiction

Recursion recursive-function definitions

Big-O Notation definitions of notations, techniques for determining the growth of a function, Integral Theorem for determining the growth of a series

Counting sum, product, and complement rule, inclusion-exclusion principle, permutations and combinations, pigeon-hole principle

Graphs and Relations graph terminology,connectivity in graphs, bipartite graphs, relations over sets

Course Motivation

This course provides an introduction to much of the discrete mathematics that is fundamental for a solid understanding of computer science and computer engineering. Generally speaking, a student's degree of success in this course often represents a good predictor for success in later courses and academics. Part of the reason for this is due to the fact that a large component of this course involves creative problem solving (as opposed to rote memorization of facts), and ultimately this is what computer science and engineering are about. What I love most about discrete mathematics is that, not only do the topics seem interesting in and of themselves, but they offer many insights and applications to computing. As an undergrad I used to play lots of chess, and at times contemplated the thought of becoming a professional tournament player. But there was a part of me that did not approve, on the grounds that I wanted my life's work to include developing ideas that could benefit a more general audience. Discrete mathematics offers both worlds, in that studying the topics for their own sake can seem very enjoyable, and yet what is learned can also be applied to computing and programming.

Reading Assignments

The textbook for this course is Sani Irani's interactive online Zybook titled "Discrete Mathematics". The key to understanding the course material is to work through the textbook and complete the reading assignments before attending class. After each class meeting a reading assignment will be assigned. Each assignment has a due date and time, which is usually at 8:00 am before the next class meeting. Students earn up to 5 class points for completing each reading assignment. Note: Zybook points are worth much less than class points. For example, Reading Assignment 1 is listed as being worth 46 Zybook points, but this only translates to 5 class points. To complete the assignment and earn the points you must work through each **participation activity** and **challenge activity** that occurs within one of the assigned reading sections.

Class Meetings

The first class meeting of each week will focus on reinforcing and expanding on the reading assignment that you should have completed before the meeting. It will primarily involve a lecture format. For the second meeting of the week, I will provide in advance a recorded lecture for your review and study. This lecture reinforces and expands on the reading assignment that is to be completed before the second meeting. The second meeting will begin with a 30-40 minute review session on topics related to the previous lectures and homework assignments. For the second half of the meeting, students will pair up and work on some **group problems** that build on the homework problems assigned during the previous week. Each group problem will be worth 10 points.

Each lecture is supplemented with notes that are available online in pdf format. These notes have several examples, some of which will be worked during lecture. The notes also contain all the needed definitions, formulas, theorems, exercises, and exercise solutions. All notes can be found at the course website.

Note that all lectures and class meetings are recorded through zoom. Students are encouraged to ask questions either through chat or using the "raise hand" feature. A link to each recorded class meeting and/or lecture shall be provided soon after it is completed.

Group Problem Guidelines

For the second half of the second weekly class meeting, students will be placed in pairs, with each pair being assigned two problems. Each problem builds on the homework problems assigned during the previous week. Each student will solve one of the two problems, while his/her partner solves the other problem. Use the class time to agree on who will solve each problem, discuss possible solutions for each, write up solutions, and review each other's solution. The group problems also allow you to

meet other students in the class and perhaps future study partners.

1. You are to only communicate with your partner when solving the problem, and may only reference course artifacts, including the lecture notes and recordings, textbook, and any notes/solutions you have written during the course. Communicating with others (whether inside or outside of class) or finding solutions online is considered cheating and is grounds for receiving an F grade for the class.

2. Have your partner review your solution, checking for correctness and quality of explanation.

3. Each solution should be handwritten (no typed solutions). Write your name, student ID, and your partner's name at the top righthand corner.

4. A single-file handwritten solution to each problem is due at the end of class with a 10 minute grace period. Each solution should be uploaded to the appropriate Beachboard dropbox. Please check your file at 100% scale for readability and make sure it is properly oriented.

5. The points you earn is the sum of the points earned by each of the two solutions (your solution and your partner's solution). This is why you should review your partner's work and stay in contact until both solutions have been uploaded.

Quizzes

There will be four quizzes (roughly, one every four weeks) provided over the semester. Each quiz question is worth 5 points and is based on one of the previously-assigned homework problems. Each of the first three quizzes will be completed during a second class meeting of the week (see schedule below), while the fourth quiz will be completed as part of the final exam. Moreover, in addition to 10 questions on the most recent homework problems, Quizzes 2, 3, and 4 will respectively have 5, 10, and 10 additional review questions from past material, for respective point totals of 50, 75, 100, and 100.

1. During a quiz, each student should attend the regular class zoom meeting.

2. During a quiz you are to only communicate with the instructor or instructor assistant should you have a question about what is being asked. Also, you may only reference course artifacts, including the lecture notes and recordings, textbook, and any notes/solutions you have written during the course. Communicating with others (whether inside or outside of class) or finding solutions online is considered cheating and is grounds for receiving an F grade for the class.

3. Students are expected to answer non-review questions in an average of 5 minutes, and review questions in an average of 2 minutes. Therefore, Quiz 1 will last 50 minutes, Quiz 2 will last 60 minutes, and Quizzes 3 and 4 will last 70 minutes.

Exams

In addition to the four quizzes There will be a midterm exam and a written portion to the final exam. Here are some guidelines to follow when completing the midterm and written-portion of the final.

1. During an exam, each student should attend the regular class zoom meeting.

2. Each exam will be delivered and taken in parts, with each part being made available at a Beachboard dropbox that usually expires after 30-45 minutes. It is the responsibility of the student to upload answers before the drop box expires. Should the deadline pass, then the student must email the solution **ASAP** to the instructor. Note: points may get deducted for each late submission. Submissions that are emailed egregiously late will not be accepted.

3. When taking the exam you may use any course artifacts, including the textbook, course notes, and any notes/solutions that you have written during the course. You may use the internet to access *only* the exam and any online course artifacts, including (annotated) lecture notes and recorded lectures. Use of other websites or other information is not permissible, and there is *no communication* allowed with anyone, except with the instructor and TA. This includes no posting of questions, or reading of answers from a discussion board or other website. Failure to abide by these rules is grounds for receiving an F grade for the class.

4. Each solution shall be handwritten (no typed solutions).

5. Make sure your name and ID appear in the upper righthand corner of the first page.

6. Number all solutions. You do *not* need to write the problem. Just write the solution.

7. The solutions to each exam part should be uploaded as a *single* file. Please check your file at 100% scale for readability and make sure it is properly oriented.

8. Make up exams are only provided in case of serious illness, accident, or family emergency, and requires official documentation of the event. For illness, this means a doctor's note on official letterhead.

9. The midterm has 150 possible points to earn, while the written portion of the final has 100 points to earn.

Final Grade Determination

At the end of the semester, grades will be assigned according to the number of points earned throughout the semester. Although there is no set grading scale, two progress reports will be issued during the semester to give you an idea of where you currently stand in the class.

Here is a rough estimate of the number of points that will be available from each of the following categories.

Reading Comprehension Questions 125 points

Group Problems 200 points

Quizzes 325 points

Midterm 225 points

Final Exam (Written Portion) 150 points

Quiz and Exam Dates

Quiz 1 September 15th

Quiz 2 October 6th

Midterm October 27th

Quiz 3 November 17th

Final Exam Monday, December 13th, 8:00-10:00 am

Technology Requirements and Policies

1. Each student is required to have access to internet that is both reliable and sufficient in bandwidth in order to participate in zoom meetings and interact with the campus Beachboard site.

2. Should the instructor lose connection with the class meeting, please be patient and wait for his return. When the instructor returns, for the sake of achieving a full lecture, the lecture may proceed past the scheduled ending time. When this happens and you must move to another class, rest assured that the lecture's recording and annotated notes will be shared with the class as soon as possible.

3. Please inform the instructor ahead of time if you need special accommodations or if you have any issue related to access and use of technology.

Tips for Studying

1. Outside of the class meetings, study for at least 60-90 minutes, six days per week. Learning mathematics is similar to learning how to program or play an instrument. It requires daily practice in order to attain mastery. Studying every day helps break down the resistance to learning new and more complex topics as the semester progresses.

2. Make a study schedule and stick with it. In the evening write down your goals for the next day so that, while sleeping, your brain can work on how to achieve them.

3. Focus on reading the text and working homework problems. Your final grade will largely be based on your ability to solve new problems that are similar to ones from the homework.

4. Whenever a problem uses a term that was defined in lecture, force yourself to spend at least one minute recalling the definition before looking it up. This is a very good exercise for your brain and will help you accelerate towards mastery. Remembering formulas, definitions, and examples has a functional effect on the brain that leads to increased skill and creativity towards the subject.

5. Keep a journal with all your attempted problem solutions. Review them and improve them when preparing for quizzes and exams. Learning is more cyclic than linear, in that we benefit from returning to past work and improving it based on our increased level of understanding.

6. Make sure to get 6-8 hours of sleep each night. Much of your learning takes place while you sleep!

7. Stay connected with other students in the class and form study groups.

8. For the sake of additional practice, use your creativity to create problems that are similar to the HW problems.