CS 173 - Discrete Structures

Instructors:

Professor Margaret Fleck and Professor Viraj Kumar usually teach CS 173; however, there may be some different professors in different semesters. In Fall 2018, Professor Tandy Warnow and Professor G Carl Evans taught the course. The professors historically are great at carefully explaining confusing material during their office hours and to a limited degree lecture. They typically take extra care to ensure that all questions are answered and the material is learned.

Prerequisites:

CS 173’s few prerequisites are of limited importance to being able to succeed in the course. Coding experience is mainly helpful for analyzing Big-O for several algorithms, but also helps in the specific mindset it promotes. Having the prerequisites done is still recommended, especially since the requirement for ECE students to take ECE 220 before this course has been enforced recently.

When to Take It:

Discrete Structures officially a prerequisite for CS 225, which is the gateway to most, if not all CS courses. However, some students do well by taking CS 173 and CS 225 together. There is a lot of overlap between the two classes. However it is still recommended that CS 173 be taken before CS 225. As such, take Discrete Structures as early as possible, especially for Computer Engineering majors. Most higher level CS courses will definitely cover discrete math concepts so the topics introduced in CS 173 will be reviewed again and again. Furthermore a lot of the computer engineering concepts are also introduced in this class and so it will complement a lot of early computer engineering classes, like ECE 120 and ECE 220. Though it is possible to do well even when taking discrete structures concurrently with a coding class, like ECE 220 or CS 125, it is highly recommended to take the coding class before taking CS 173. An exposure to coding will greatly help the understanding of discrete math and taking them concurrently will most likely just be a bigger burden to try and grasp the concepts faster.

Class Content:

The topics covered in CS 173 will introduce number theory concepts, mathematical proofs, especially inductive proofs, set theory, graph theory, recursive relations, trees, counting, common algorithms, and big O analysis.

The beginning of the course is first a review of math concepts and basic boolean logic, then the class covers proofs and number theory. After number theory the class covers sets, relations and functions. Around after the 6th week, the class will cover graph theory and induction which will lead to recursive functions and unrolling. The class then goes into trees and big O analysis. The last topics covered will be algorithms, sets of sets, counting and planar graphs. All of the concepts introduced in CS 173 will definitely be seen in higher level CS and ECE courses. Set theory, graph theory, recursive relations, algorithms, proofs and trees will all be seen again in CS 225. Counting is a major part of ECE 313 and PHYS 213. ECE 120 and 220 will also cover a small amount of algorithms, trees, state diagrams and counting. Most importantly, though CS 173 will introduce the fundamentals, a lot of higher level classes will work from these concepts so the content seen in CS 173 will be very persistent in a lot of the core ECE/CS classes.

Work:

The class structure (as of Fall 2018) consists of two different lectures A and B that cover the same material but have different assignments and grading policies. Both lectures are TR, for 75 min each, and a one hour discussion is required.

- **Lecture A** was taught by Professor Warnow in Fall 2018. Section A has two midterms and a final. Homework and reading quizzes take up the work during the semester, with reading quizzes covering content to be discussed in lecture the next day and homework being application of content learned in previous lectures. There is a discussion participation grade. Lecture covers content not in the textbook, and students are responsible for all class content.

  The full A section grade breakdown:
  - Discussion participation: 10%
  - Reading quizzes: 10%
  - Homework: 20%
  - Midterms: 20% each (2 total)
  - Final exam: 20%

- **Lecture B** was taught by Professor Evans in Fall 2018. The difference from the A section is the B section's `examlets', weekly 30 minute quizzes worth the large majority of the final grade. There are no midterms, but there is a bigger final examlet covering all the course material. Students have the ability to retake a previous examlet during the final exam time, as the final examlet doesn't require the full 3 hours. Weekly examlets have two pages, one with mainly multiple choice and short answer, with the other typically having a long answer problem or a proof. There are two reading quizzes and a homework weekly on Moodle. The reading quizzes have feedback on grades before the due date and are significantly more basic than the homework, which does not reveal grades until after they're due. Discussion attendance is also graded, with the focus on completing the set of problems listed for the week as well as retrieving previous examlets.

  The full B section grade breakdown:
Discrete Structures is a very straightforward class but it is very easy to fall behind at the end of the semester. The mini-HW's are usually not too hard, but it’s good to check answers with other students. The long-form HW's are more difficult, but still doable. The examlets usually consists of one large proof-like problem and other smaller problems. These pretty straightforward, and as long as you pay attention in class and do the HW you should be mostly fine. Be careful, however: the examlets sometimes simply ask you to write down definitions, so make sure to learn definitions as well. Reading the textbook will be more than enough to keep up with the class. Some parts, like trees and relations may seem really straightforward but students should always just try and keep up with the class since there are some concepts are the very, very difficult, like graph theory, sets of sets, functions, and counting. There is also a textbook available for the class (which I highly recommend reading), and it is very helpful in explaining the concepts but is not specifically required to do well in the course. I found the discussion section extremely helpful in clearing up confusing concepts and doing practice problems. Overall, Discrete Structures covers a lot of material but is given at a very good pace with a lot of support from the staff. Students should just try and keep up with the material and everything should be fine.

Life After

CS 173 is the gateway to all higher level CS and ECE tech-electives. Content seen in CS 173 will be reviewed again and again for most ECE/CS tech-electives. CS 225 (Data Structures) can be taken afterwards, if not taken concurrently. For students who enjoy CS theory, consider CS 373 (Theory of Computation) and CS 473 (Fundamental Algorithms), which both build on the fundamentals introduced in CS 173.