CCS Discrete II | Professor: Padraic Bartlett

Syllabus for Topics in Discrete Mathematics

Weeks 1-10 | *UCSB 2015*

Basic Course Information

- Professor: Padraic Bartlett.
- Email: padraic@math.ucsb.edu.
- Class time/location: MWF 11:30-12:50, CCS Building 494, Room 164B.
- Office hours/location: TTh 12-1:30pm at SH 6516, Su 7-8:30pm at Bldg. 494, Room 143. (The Sunday night OH will feature pancakes!)
- Homework due date: Fridays, at the start of class.

Course Description

This is a continuation of Fall 2014's run of Topics in Discrete Mathematics! We're going to pick up where we left our last class (i.e. with a strong footing in sets, groups and fields) and move to the study of **linear algebra** in a discrete setting! In particular, we will look at how concepts from linear algebra let us attack open problems in **coding theory, graph theory**, **design theory**, and other areas of combinatorics.

Course Evaluation

There are three components of your grade in this course:

1. **Homework** (75%.) There will be problem sets handed out on Mondays and Fridays, collected and turned in **at the start of class on the appropriate Friday** each week. Problem sets need to be written in LaTeX to be graded.

   These will be tricky homework sets, and will often contain problems that are hard/graduate-level/maybe even open/etc. Consequently, I'm not expecting anyone to solve every problem throughout the course! In fact, this is built into the structure of the assignments themselves; each problem set will consist of n problems, from which you will have to choose k to solve (for values of n and k defined on the homework set.) This allows you to pick out the problems that are interesting/challenging to you, and lets me assign a greater breadth of homework than a normal class.

   Over the course, your lowest Monday HW score and lowest Friday HW score will be dropped! Correspondingly, to make life easier for the grader and myself, **late homework will not be accepted.** Exceptions to this policy can be made with at least 24 hours notice for students with legitimate reasons (sickness, travel, other

reasonable difficulties.) If it is within 24 hours of the deadline, then exceptions will only be granted with a corresponding doctor's/counselor's note. Talk to me if you are confused by this policy, or have questions.

2. **Quizzes** (25%.) There will be weekly brief quizzes on Fridays at the start of class. Your lowest quiz score will be dropped; accordingly, quizzes cannot be made up (with a similar 24-hour-in-advance buffer required to seek any exceptions.)

3. **Extra Credit** (?%.) Fridays are now set aside for student presentations of problems! We will use this class to go through all of the HW problems done that week, and have students present their results to the class.

   If a student successfully presents a correct solution to a problem in a class, they get a flat +.5% to their final grade. In the event that there are multiple students with solutions to a problem, the student with the smallest number of presented problems will get priority. Ties for priority will be resolved via Rock-Paper-Scissors. Incorrect or flawed presentations may or may not receive partial credit, depending on the quality of the attempted solution.

   If you have an alternate solution to a problem that was already solved, we have time in our class, and the solution is markedly different to the one the class has already seen, you may be able to present this alternate solution as well for credit! Talk to me if you have such a solution.

This course is pass-fail and for four units. As defined by the CCS Mathematics department, your percentage score in this class is transformed into units via the following policy:

- Students receive five units (i.e. the full four units, plus a bonus unit to recognize strong work) for work at or above the A- level.
- Students receive the full four units for work at or above the B level.
- Students receive three units for work at or above the C level.
- Students receive no units for work below the C- level.

The correspondence between percentage marks and letter grades depends heavily on class performance; there are years where a 75% can correspond to an A, and others where it corresponds to a C, depending on the pace/difficulty of the course. Throughout the course, I will report HW averages along with what letter grade those performances correspond to, so that you can keep track of your position throughout the class.

Collaboration/resources policy

Collaboration is allowed (and indeed encouraged) on the homework sets; mathematics at the research level is a collaborative activity, and there is no reason that it should not also be this way in a classroom. Work with your classmates!

Resources are a little trickier. On one hand, you are now researchers; limiting your resources would seem to be contradictory to the spirit of emulating what research mathematics is like. On the other hand, answers to almost everything in elementary mathematics can be found via Google and some patience; if you had unfettered access to every resources in existence, you would likely inadvertently rob yourself of some of the best problems in your education. So we need to strike a balance.

For this class: Wikipedia is a legitimate resource, as are any physical books you get from the library or have yourself. Mathematica/Wolfram Alpha/etc. are also valid tools, though you need to justify any calculations you perform using any computational systems. Upper-classmen are also valid resources to talk to about problems, provided you follow the citation system described below; however, I would ask that you restrict them to hints instead of answers if they know the problem! (This should rarely happen; these are not problems they would have seen in their own run of this class.) Other resources are off-limits. If this policy seems restrictive, talk to me; I am more than glad to make common-sense exceptions where appropriate.

The only things that we ask of you are the following:

1. Write up your work separately, and only write up solutions you understand fully.

2. When writing up your own work, you can directly cite and use without proof anything proven in class or in the class notes posted online. Anything else — i.e. results from textbooks, Wikipedia, etc. — you need to both (1) cite in your writeup, and (2) reprove the results you're using from those sources carefully in your own words. Simply copying solutions over directly is plagiarism / cheating / otherwise poor academic form; it is passing of as your own work the ideas of others. You are certainly welcome to read and learn what other people have attempted! All I am asking you to do here is to (1) not pass it off as your own work, and (2) rephrase and present it in a new way so that it is clear that you have actually learned something.

3. As an important corollary to the above: if the TA or I find that you have copied sentences/work/etc. directly from outside sources,

   (a) On your first violation, the offending set's score will be set to -100%.

   (b) If there is any second violation, we will get the university involved. Consequences include failing the course and a likely dismissal from CCS.

   Please, please don't make me have to ever go through (b) above.

4. If you work with other students on a problem, it is considered good form to refer to them (i.e. "I worked with Andrew Wiles on this proof of Fermat's Last Theorem") when writing up your solutions. I mostly ask this because crediting collaborators is something you're going to do as mathematicians, and should get in the habit of.

5. Don't post questions to online messageboard-style services.

If you have any questions on the collaboration policy, please email me and I'll be glad to clarify matters.