**Boston University Department of Computer Science**

CAS CS 131: Combinatoric Structures

Fall 2021 Syllabus

Course Overview:

CS 131 is the mathematical background course needed for much of computer science, including data structures, algorithms, machine learning, data mining, security, cryptography, programming languages, computational complexity, and others. The overarching goal of this course is to help you grow as mathematical thinkers. We will focus especially on mathematical processes: problem solving, reasoning, communication, and making connections.

Although we will certainly learn specific content, CS 131 is more about processes and skills than about specific content. We will particularly focus on the skills of writing proofs and communicating mathematical ideas. The following graphic tentatively describes the core topics in the course and how they are related.
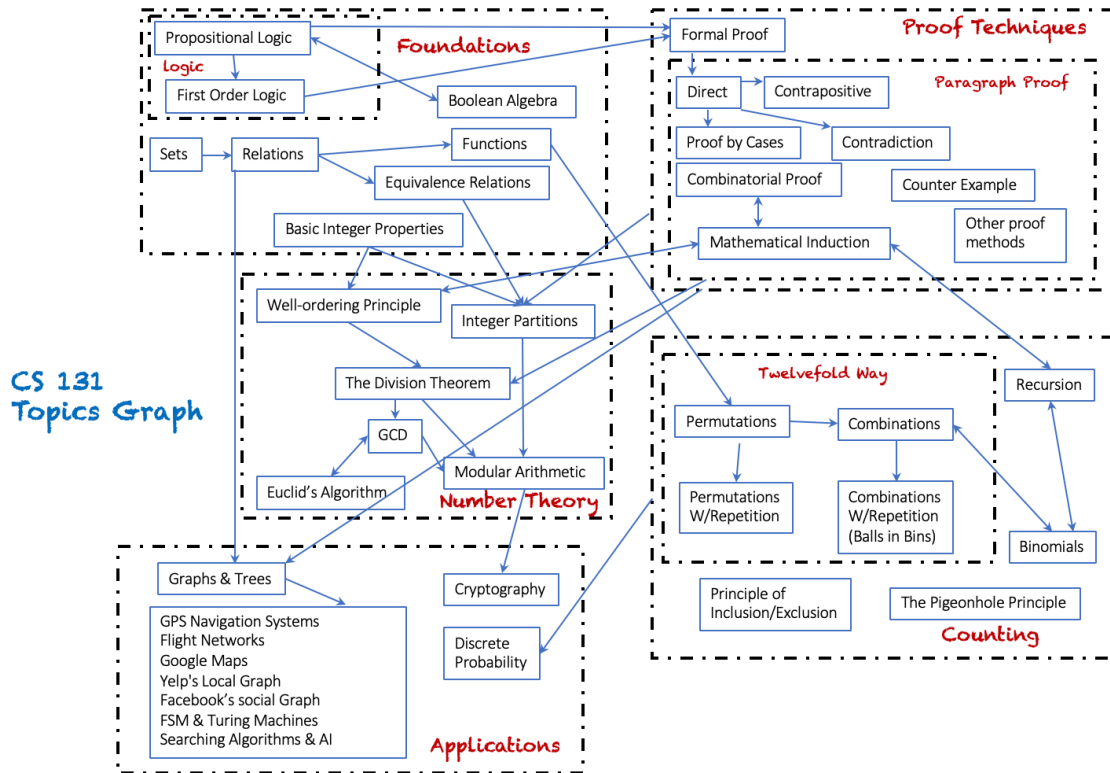
Instructors

A1: **Prof. Leonid Reyzin**: reyzin@bu.edu, MCS (111 Cummington Mall) room 138E.

B1: **Vahid Azadeh-Ranjbar**, Ph.D.: vranjbar@bu.edu, PSY (64 Cummington Mall) room 223

Please do not email us with course-related questions – use CampusWire instead.

Teaching Assistants (TAs)

Steve Huang (yhuang22@bu.edu)

Tilak Agarwal (tilak02@bu.edu)

Mingjun Wen (soroswen@bu.edu)

Venika Vachani (venika@bu.edu)

Course Assistants (CAs)

We are fortunate to have a number of undergraduate course assistants (CAs) as members of the course staff. They will be working with you in the labs and holding office hours each week. See the course Blackboard for their names and contact info.

Office Hours

See the Office Hours page on the course Blackboard.

Meeting Times and Places

Lectures:

- Section A1: MWF, 2:30 – 3:20 pm, SAR (635 Commonwealth Avenue) Room 101
- Section B1: MWF, 3:35 – 4:25 pm, CAS (685 Commonwealth Avenue) Room 522
  (allow yourself an extra five minutes to reach that classroom after entering the building!)

labs: a weekly, one-hour session; see your schedule for the time and location.

Prerequisites

CS 131 has no formal prerequisites. A strong knowledge of high school mathematics (algebra and precalculus) is expected.

Requirements, Grading, and Attendance

1. Problem sets (40%)
2. Two midterms (30% total)
3. Final exam (20%) (see below for how the final can help more)
4. Pre-lecture Zybook Activities (5%)
5. Top Hat in-class questions and attendance (5%)

Note on attendance. Please do not come to class when potentially contagious. You will get full credit for item 5 above as long as you score at least 85%, so you are not going to be penalized for missing a few. If you get x points for x < 85, you will get x/85 of the total credit. If you lose more than 15% of in-class points as the result of illness, please contact us.

Note on grading and curves. We will not assign letter grades to individual assignments and exams. When assigning final letter grades, we will look at the total points you earned and decide on the cut-offs for A, B, C, etc. Those cutoffs will likely be lower than the usual US high school cut-offs (90, 80, 70, etc.), because this class is harder than a typical high school class.

We reserve the right to deviate from the grading formula in unusual cases.

Weekly Problem Sets (40%)

The problem sets are the heart of the course. The problems will be a mix of word problems and autograded problems requiring you to keep revising your work until it is correct enough to pass the Gradescope autograder. You may work with classmates on some of the problems (see collaboration policy below), but no one else.

There will be one problem set (almost) every week. They will be posted on the "**Problem Sets**" page of the Blackboard course with due dates. All problem sets will be submitted online through **Gradescope**.

There will be a **10% deduction** for problem sets that are up to 24 hours late. We will not accept any submission that is more than 24 hours late. Plan your time carefully, and don't wait until the last minute to begin a problem set. Starting early will give you ample time to ask questions and obtain assistance from members of the course staff. Extensions beyond that are not possible because we post solutions, regardless of your individual circumstances. To help with true emergencies, we have the following rule:

the final exam will replace your lowest problem-set grade if doing so helps your final grade.

Exams (15% + 15% + 20%)

Midterm 1: **Thu Oct 14 6:30pm-7:45pm**

Midterm 2: **Thu Nov 11 6:30pm-7:45pm**

A1 Section Final (tentative; may be still changed by the Registrar): Tue Dec 14 3-5pm

B1 Section Final (tentative; may be still changed the Registrar): Sat Dec 18 3-5pm

The final exam will replace your lowest midterm-exam grade if doing so helps your final grade.

Preparation and participation (5% + 5%)

A strong classroom community will help everyone learn, and you are part of creating that community. If you are a quick thinker or someone who likes to talk, that's great, but that's also not the only way to participate in creating community in the classroom. Here are some ways to help build community:

- Coming to class prepared
- Engaging in class activities and labs
- Respecting and encouraging classmates
- Listening actively and carefully to classmates and instructors
- Persisting even when the material is challenge
- Sharing mistakes, struggles, and successes, and thoughtfully responding when classmates share theirs

To successfully build such a community, the class is divided into three steps:

Step 1: Preparation before the lecture

Preparation plays a significant role in your learning process. If you are prepared, you are less stressed, and thus better able to focus, participate, and ultimately succeed. To help you prepare for lecture, you will typically be required to complete an assigned reading and some Zybook activities. The pre-lecture tasks must be submitted by the specified date and time. ***Late pre-lecture work will not be accepted.*** Pre-lecture Zybook activities have 5% of your final grade. You will receive full credit for pre-lecture Zybook activities as long as you get at least 85% of the points. If you get x points for x < 85, you will get x/85 of the total credit.

Step 2: Interactions and class activities during the lecture

In-class interactions help the learning process, creating a positive classroom atmosphere and enabling students to feel more comfortable. We therefore expect you to participate in small-group activities during lecture in which you will discuss questions with other students and vote on the answers using Top Hat. These activities are designed to deepen your understanding of the material. They make up 5% of your total grade. The same rule about 85% applies to Top Hat activities as to Zybook activities.

Step 3: Participation in lab sessions, office hours and online discussion boards after the lecture

You cannot expect to fully digest all of the concepts and techniques by only attending the lectures. You must attend the ***required lab sessions*** to sharpen your problem-solving skills. Moreover, participating in ***office hours*** is a necessary part of this course. Even if you know how to solve a problem, office hours may help you find new approaches and make connections to course material. We are fortunate to have a number of graduate teaching fellows, graduate teaching assistants and undergraduate course assistants as members of the course staff. They will be working with you in the labs and holding office hours each week to facilitate your learning process.

You may interact with other classmates and the course staff online using **Campuswire**. Course-related questions should be posted there. Don't be shy: if you have a question, it's likely others do, too, so post it! Private questions for the course staff should also go there (instead of email).

Required Course Materials

For the required course materials, please go to the CS 131 Blackboard course and take a look at the "**Course Tech**" page. Install the necessary software and create the necessary accounts now (you'll need them shortly). Students taking CS courses are expected to have a computer capable of running a currently supported OS. See this page for more info:

https://www.bu.edu/cs/undergraduate/undergraduate-life/laptops

Equity/Inclusion

As your professors, we pledge to work to create an equitable learning environment where all students belong. Although frustration and struggle are also part of the learning enterprise, ultimately, we see our work as setting up situations where all students have the opportunity to experience the joy of mathematics and computer science. Welcome!

How to Succeed in This Course

1. Think! In order to grow as a mathematical thinker, you have to think -- you can't just mimic, Google, or memorize. Enjoy thinking for yourself. Play with ideas.

2. Persist. Engage in productive struggle. Tolerate being stuck or confused; it's part of the process.

3. Make mistakes and learn from them. Perfection is neither possible nor required.

4. Prepare for class, attend class (on time), and be engaged in class. Bring your best academic self. Focus on the material and engage with your classmates and instructor.

5. Establish a steady rhythm of work outside of class and start each problem set early. Like all college classes, you can expect two to three hours of out-of-class work for each hour in class. In this class the workload will be relatively consistent. Working in shorter sessions (20 minutes to an hour – depends on the person) followed by breaks can help you retain knowledge better. If you're working on some challenging problems, it's often helpful to go back to them almost every day -- you often have fresh insight after a delay.

6. Work with others from the class. Working together helps you find small mistakes, so the group can spend their time on more substantive matters. If you work with others, allow them to maintain ownership of their ideas. Listen to you peers' thinking and ask questions that help them develop an idea; avoid telling them how to do the problem your way.

7. Request accommodations for students with disabilities if you need them: If you are a student with a disability or believe you might have a disability that requires accommodations, please contact the Office for Disability Services (ODS) at (617) 353-3658 or access@bu.edu to coordinate any reasonable accommodation requests. ODS is located at 19 Buick Street.

8. Use other resources that help you succeed if you need them:
   - BU Mental Health Services: http://www.bu.edu/shs/behavioral-medicine/behavioral-resources/
   - Project Bread (for if you don't have enough food): http://www.projectbread.org/get-help/
   - BU Sexual Assault Response and Prevention Center: http://www.bu.edu/shs/sarp/

Collaboration Policy & Academic Misconduct

You are strongly encouraged to collaborate with one another in studying and preparing for quizzes and exams. You are also strongly encouraged to collaborate on the homework assignments as long as **you complete the actual solution write-up on your own** and **list your collaborators in your write-up. Do not copy each other's solutions.** When collaborating on the homework, keep in mind that there is no collaboration on exams, so if you are always getting answers without contributing ideas, you are not going to do well on exams. Make sure you spend a good deal of time thinking on your own.

We will assume that you understand BU's Academic Conduct Code:
http://www.bu.edu/academics/policies/academic-conduct-code

Prohibited behaviors include:
- copying someone else's work or getting someone to tell you what to write, even if you subsequently modify it
- consulting solutions from past semesters, or those found online or in books
- posting your work where others can view it (e.g., online).

Incidents of academic misconduct will be reported to the Academic Conduct Committee (ACC). The ACC may suspend/expel students found guilty of misconduct. *At a minimum, students who engage in misconduct will have their final grade reduced by one full letter grade (e.g., from a B to a C).*

If you are unsure how to collaborate without breaking the rules, talk to us. We will be glad to explain, and will not punish you for asking!

Other Policies
- Makeup exams will only be given in documented cases of serious illness or other emergencies.
- You cannot redo or complete extra work to improve your grade.
- Incompletes will not be given except in extraordinary circumstances.

Credit
This Syllabus has borrowed ideas and text from CAS MA 293: Discrete Mathematics taught by Professor Debra K. Borkovitz (https://debraborkovitz.com/)