Math/Comp Sci 240: Introduction to Discrete Mathematics, Lecture 001, Spring 2024

Course Information

Course Description: Basic concepts of logic, sets, partial order and other relations, and functions. Basic concepts of mathematics (definitions, proofs, sets, functions, and relations) with a focus on discrete structures: integers, bits, strings, trees, and graphs. Propositional logic, Boolean algebra, and predicate logic. Mathematical induction and recursion. Invariants and algorithmic correctness. Recurrences and asymptotic growth analysis. Fundamentals of counting.

Credits: 3.

Course Designations and Attributes:
Breadth – Natural Science
Level – Intermediate
L&S Credit – Counts as Liberal Arts and Science credit in L&S

Requisites: MATH 217, 221, or 275.

Meeting Time and Location: Lectures: MWF: 08:50AM–09:40AM in Van Vleck Hall, room B102. Discussion sections meet at various times and places (VV – Van Vleck Hall):

302	Bonat, Alexandra	bonat@wisc.edu	8:50AM–9:40AM	Tuesday	VV B313
304	Goff, Owen	ogoff@wisc.edu	11:00AM–11:50AM	Tuesday	VV B131
305	Goff, Owen	ogoff@wisc.edu	12:05PM–12:55PM	Tuesday	VV B129
306	Chen, Chenghuang	cchen594@wisc.edu	3:30PM–4:20PM	Tuesday	VV B203
307	Bonat, Alexandra	bonat@wisc.edu	7:45AM–8:35AM	Thursday	VV B305
308	Bonat, Alexandra	bonat@wisc.edu	8:50AM–9:40AM	Thursday	VV B317
309	Chen, Chenghuang	cchen594@wisc.edu	9:55AM-10:45AM	Thursday	VV B129
310	Argus, Robert	rargus@wisc.edu	1:20PM–2:10PM	Thursday	VV B131
311	Argus, Robert	rargus@wisc.edu	12:05PM–12:55PM	Thursday	VV B129
312	Chen, Chenghuang	cchen594@wisc.edu	3:30PM–4:20PM	Thursday	VV B203

Instructional Modality: Classroom Instruction.

Instructor: Mikhail Ivanov, Teaching Faculty, *Email:* mivanov@wisc.edu

Teaching Assistans: Information about the TAs will be available in Canvas at the !!!240 Staff Info page.

Office hours: For office hours, see the 240 Staff Info page.

Course Learning Outcomes

By the conclusion of this course, students are expected to be able to:

- Be able to construct proofs by induction to prove properties in a variety of domains (mathematical formulas, recursively-defined structures, loop invariants, correctness of recursive programs).
- Apply basic combinatoric techniques to counting problems.
- Develop basic skills to construct mathematically rigorous arguments and proofs.
- Gain exposure to the basics of program analysis (program correctness, recurrences, asymptotic analysis).
- Demonstrate a familiarity with and an ability to reason about discrete structures/data types (integers, strings, bit strings, sets, relations, functions, graphs, trees).

How Credit Hours are Met by the Course

This class meets for four 50-minute class periods each week over the fall semester and carries the expectation that students will work on course learning activities (e.g. reading, problem sets, papers, and studying) for about two hours outside of classroom for every class period. The syllabus includes more information about meeting times and expectations for student work.

Course Overview

The following is a tentative schedule of the topics to be covered (with the approximate number of weeks in parentheses):

- intro and course overview (0.5 week)
- propositions and predicates (1)
- sets (1)
- proof techniques (1)
- induction (1)
- invariants (0.5)
- program correctness (1)
- recursion and structural induction (1)
- recurrences (1)
- asymptotic analysis (1)
- functions and relations (1)
- graphs and trees (1.5)
- finite automata and regular expressions (1)
- counting (1.5)

Discussion Sessions

Each student attends one discussion section a week. Every discussion session will have a problem set pertaining to the week's lecture material for students to work on in small groups. In discussion session the student has the opportunity to get more practice with concepts in the course and solving problems under the direction of TA instructors. Each student can only attend the discussion section for which they are registered.

Course Website and Digital Instructional Tools

- Our Learning Management System is Canvas. All important course information will be relayed through Canvas. It is your responsibility to read any Canvas announcements.
- We will use Piazza. This page is a forum for you to discuss the material of this class with other students and your TAs and/or instructor. Posts to this page should be confined to questions regarding the material and logistical questions about the class (e.g., exam dates and locations). Please do not use email for math questions.
- You can use private question in Piazza to communicate with Instructor about personal circumstances.
- Any posts containing comments (either positive or negative) about the instructors, the class, the students, or anything else, will be deleted. Unprofessional conduct may result in disciplinary action.
- We will use Zoom for remote office hours.
- We will use Gradescope to grade and communicate feedback for some assessments. Instructions will be shared later.

Required Textbook, Software and Other Course Materials

Course content comes from many sources:

- lectures; Instructor intend to post slides and recordings of lectures.
- on-line readings; The on-line readings are available on the Canvas site for this course.
- zyBook e-text; The required course text is the ebook: Introduction to Discrete Mathematics zyBook (Irani et al.), ISBN: 979-8-203-27642-1. Students must purchase zyBook access online through Canvas. The cost is $64.
- discussion worksheets;
- course Canvas page;
- Piazza discussions.

Exams, Quizzes, Papers, Homework and Other Assignments

zyBooks Participation Activities. These are weekly zyBook readings to prepare for the each week of lectures, typically due Sunday nights. No late participation activities will be accepted, but three lowest scores will be dropped.

zyBook Challenge Activities. These are weekly autograded zyBook exercises to be completed after the week of lectures, typically next Friday nights. No late challenge activities will be accepted, but two lowest scores will be dropped.

Written Homework. Weekly homework assignments can be accessed through the Canvas website. Written assignments will be several questions long and will be assigned weekly usually due on Fridays. Assignments will be submitted through Gradescope, according to instructions.

Collaborating with other students on the homework is encouraged, but you must write up all reasoning and solutions on your own (in other words, no copying). Failure to abide by this guideline could be construed as a form of academic dishonesty.

Each problem should be completed with neat, understandable, detailed solutions and explanations. Your explanations and proofs must be sound and rigorous, paying attention to detail and clarity.

Late homework will generally not be accepted. Since it is quite likely that during the semester you will either experience a technical difficulty (e.g., missed the deadline, your computer shut down as you were submitting it, internet outage, etc) or a personal emergency (being sick, attending a funeral, etc), the two lowest HW scores will be dropped. You do not need to contact your instructor if such a situation does come up.

Exams. The course will have three exams.

Students must notify the instructor (via an on-line form available on Canvas) of conflicts with any exam during the first two weeks of class.

Midterm Exam I	Wednesday, February 28, 07:30PM–09:00PM
Midterm Exam II	Wednesday, April 10, 07:30PM–09:00PM
Final Exam	Monday, May 6, 07:25PM–09:25PM

Calculator Policy. During an exam no books, notes, calculators, cell phones, pagers, or any electronic devices will be allowed.

Discussion Participation. Teaching assistants count participation points on discussion sessions in weeks 2 to 14 with 3 drops (so 10 sessions counting). A student must attend the discussion section for which they are registered; missed discussion sections may not be made up.

Participation. This course depends on students' active participation in class discussions and group works. You are expected to engage your fellow classmates in relevant discussions, work on the assigned problems, ask questions, share your approach to problems, keep on task by contributing ideas and analyze material of lectures after class. Your attendance and attention are important to your success in this course. Please remove any distractions while attending this course. If you experience long-term absence due to a serious illness with verification or accommodations from the McBurney Center, then contact your instructor. Participation also occurs by completing the pre-reading assignments each week.

Grading

In this course, you will be evaluated based on components described above with their corresponding percentages:

Written homework	15%
zyBook participation activities	3%
zyBook challenge activities	6%
Discussion participation	3%
Midterm Exam 1	24%
Midterm Exam 2	24%
Final Exam	25%

Grading Scale. Final grades will be curved.

Academic Policies and Statements

- Academic Calendar and Religious Observances
- Academic Integrity Statement
- Accommodations for Students with Disabilities
- Course Evaluations
- Diversity and Inclusion Statement
- Mental Health and Well-Being Statement
- Privacy of Student Records and the Use of Audio Recorded Lectures Statement
- Students' Rules, Rights and Responsibilities
- Teaching and Learning Data Transparency Statement

Mathematica

Mathematica and Wolfram—Alpha Pro are available at no charge to UW Madison students. They are useful for: (a) solving problems, (b) obtaining step-by-step solutions, and (c) writing programs with the assistance of Artificial Intelligence. (AI chat is built in.) To get access, go to www.wolfram.com/siteinfo and enter your University of Wisconsin email. (Here are click-by-click steps if you need them: wolfr.am/UWMadison) Learn how to use Mathematica at www.wolfram.com/wolfram-u/