Applied Discrete Mathematics (Math 0480)

Fall 2025

Time:	MWF 11:00 am – 11:50 am
Place:	G24 Benedum Hall
Course Page:	https://canvas.pitt.edu/courses/287790

Instructor: My name is Mohamed Moakher, but please feel free to call me Mohamed. I am originally from Tunis, Tunisia. I completed my PhD in Paris, and I am currently a postdoctoral associate here at Pitt, where I work in number theory.

How to contact me: You can email me at mom224@pitt.edu, and you are welcome to set up a meeting with me at my office, 518 Thackeray Hall.

Office Hours: Will be at the lounge on the 7th floor of Thackeray Hall, *initially* scheduled from 2pm to 3:30pm on Mondays and Wednesdays.

Course description: The purpose of this course is to introduce students to important discrete structures that appear in both pure and applied math as well as computer science, computer engineering, computer security and information systems. Math 0480 will be an excellent preparation for classes in Combinatorics, Graph Theory, Algebra and Number Theory. Topics include sets, functions, sequences, algorithms, induction, counting, arithmetic, graphs, and trees.

Main References: The main textbook that I plan to reference is

- Mathematics for Computer Science by E.Lehman, F.T. Leighton, and A.R. Meyer.

Another textbook that I plan to reference is

- Discrete and Combinatorial Mathematics by R.P. Grimaldi.

Both references can be downloaded from the course webpage. I highly recommend reviewing these textbooks and familiarizing yourselves with the material before and after class. Understanding mathematical concepts requires time, repetition, and personal effort. You shouldn't expect to grasp everything just by attending lectures.

Tentative course outline: Here is a tentative outline for the topics that will be covered in this course (some chapters or the order may be changed).

- Fundamental Principles of Counting : sums, products, permutations, binomial theorem...
- Fundamentals of Logic: quantifiers, propositional logic, SAT problem..
- Set theory: sets, functions, binary relations...
- Induction: the well ordering principle, ordinary induction, strong induction...
- Recursive Data Types: recursive definitions, structural induction, search trees...
- Infinite Sets: the halting problem, Russell's paradox...
- Number theory: GCDs, Euclid's algorithm, base-n, p-adic valuation, modular arithmetic, Euler's theorem, RSA...

- Graph theory I: directed graphs, adjacency matrices, relations and partial orders, Hamilton paths, communication networks.
- Graph theory II: trees, rooted trees, trees and sorting...
- Graph theory III: simple graphs, minimal spanning trees, transport networks, bipartite graphs, matching problems...
- Graph theory IV: planar graphs, Euler's formula...
- Combinatorics: cardinality Rules, counting subsets, the Pigeonhole Principle, inclusion-exclusion...

Problem sets: There will be weekly problem sets that you should submit through Canvas. The deadline will be 9:59am on Mondays.

Use of LaTeX is strongly encouraged. Problem sets completed using LaTeX, which is the standard typesetting package in mathematics and many other fields, will receive a 5% bonus. LaTeXis free and can be downloaded to your computer. You can use a free online version such as Overleaf to compile documents in LaTeX.

Late problem sets will not be accepted, unless you seek approval of an extension from me *at least 24 hours in advance*. Any problem set not turned in by the deadline receives a grade of zero.

Collaboration Policy: You may collaborate with fellow students on the problem sets, provided that you

- write up your explanations independently, and
- list the names of those that you collaborated with on your written assignment.

Grading Policy: Problem sets (40%) (lowest score will be dropped), Midterm (25%), Final (35%).

Disability Resource Services: If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 140 William Pitt Union, 412-648-7890, as early as possible in the term. Disability Resources and Services ("DRS") will verify your disability and determine reasonable accommodations for this course. More information may be found at http://www.studentaffairs.pitt.edu/drs/.

Academic integrity: Cheating/plagiarism will not be tolerated. Students suspected of violating the University of Pittsburgh Policy on Academic Integrity, from the February 1974 Senate Committee on Tenure and Academic Freedom reported to the Senate Council, will be required to participate in the outlined procedural process as initiated by the instructor. A minimum sanction of a zero score for the problem set or exam will be imposed (In particular, this includes following the collaboration policy described above).