Syllabus - MATH 221 - Discrete Mathematics - Winter 2021

"Ever Tried. Ever Failed. No Matter.Try Again. Fail Again. Fail Better."
-Samuel Beckett

Instructor: Patrick R. Shields
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Course Website http://www.math.drexel.edu/∼ prs49
Most course material will be distributed using this website. It should be checked often for any updates. I will not utilize Drexel Learn except to post grades.

Offices Hours TBA

Times and places: Lecture: Tuesday/Thursday 9:30-10:50am
Zoom Meeting ID : On BbLearn

Zoom All lectures will be delivered live during our scheduled times using Zoom. You have a Zoom license provided for you by Drexel. You can join the lectures by going to https://drexel.zoom.us/ and entering the Meeting ID. The meeting ID is posted to our course space on BbLearn.

Textbooks I will compile material from several sources all of which are freely available and will be provided at the beginning of the course. Readings will be assigned weekly from one or more of the texts.

1. ⋆⋆ *Discrete Mathematics: An Open Introduction* by Oscar Levin
2. *Discrete Math: Elementary and Beyond* by L. Lovasz and K. Vesztergombi.
3. *Applied Discrete Structures* by Alan Doerr and Kenneth Levasseur
4. *Proofs and Concepts: The Fundamentals of Mathematics* by Morris & Morris

Material to be Covered

Our topics will adhere to the course catalog description, which is as follows:

Elementary set theory, combinatorics, elementary number theory, graphs, and special topics chosen from formal language theory, graph algorithms, coding theory, and other applications.

More specifically we will cover (in no particular order):

1. Set theory: equivalence classes, bijectivity, cardinality, naive paradoxes, Cantor.
2. Proofs: reading, understanding, and writing proofs using induction, double counting, pigeon-hole principle and more.
3. Combinatorics: combinations, permutations, probability, recursion, special sequences, randomness, statistical paradoxes, Pascal's triangle.
4. Number theory: the Euclidean algorithm, modular arithmetic, decimal representations in multiple bases, basic cryptography
5. Other: Open to student suggestions which fit the learning objectives

Homework
Homework will be assigned each week. It is absolutely essential that these problems be completed in full for a satisfactory understanding of the course material. However, the homework will be unmoderated and uncollected. Occasionally solutions will be provided. Further, my office hours can be used to address any difficulties you have in completing the homework.

Take Home Quizzes
Each week a take-home quiz will be posted which expounds upon the material learned in class that week. Students may work on take home quizzes as a group, but each student must submit their own solutions. Take-home quizzes are graded on "correctness" and cleanness of presentation.

In Class Problems / Group Work
Each week problems will be assigned to be completed in class either individually or as group work with other students in breakout rooms. This work will be graded primarily on effort. The lowest two of these grades will be dropped.

Exams
Exams will be taken "live". Students must be present in Zoom chat with their webcams on and their microphones for the duration of the exam. During the scheduled time the exam will be posted to DrexelLearn and shared via Zoom's chat. You will have a designated amount of time to complete the exam and 10 mins to submit your solutions via email. Work can be submitted via emailing scanned papers or photographs. There will be one midterm and a non-cumulative final. Make-up exams will be given only for students with extreme documented reasons for missing an exam.

- Midterm: Tuesday, July 28
- Final: Tuesday, September 1

Grade Breakdown

- In Class Quiz Average: 20%
- Take Home Quiz Average: 20%
- Average of Midterm and Final: 60%

Attendance
Class attendance will not be monitored and will not be considered when calculating a student's grade. While not compulsory, regular attendance is imperative if a student wishes to properly grasp the material.

Asking Questions
I encourage students to ask questions without relent until they understand the material at hand. Questions are always welcomed and appreciated.

Answering Questions
I will frequently pose questions to students in class. I view participation as absolutely essential to creating a constructive learning environment. When I ask questions, I am not looking for "the right answer." Students will never be judged negatively for the content of their responses and all viewpoints are helpful.

Course Surveys
I will distribute (via email) weekly surveys looking for student input into the progression of the class. These surveys are completely optional and totally anonymous.

Changes to syllabus
Any changes to the syllabus will be communicated in class and via email. Changes can be made at any time according solely to my discretion.

- **Important Dates**

  1. Sunday, January 17: Last day to Add/Drop
  2. Monday, January 18: Martin Luther King Day (No Classes)
  3. Friday, July 3: No Classes
  4. Midterm: Tuesday, July 28
  5. Friday, February 26: Last Day to Withdraw
  6. Saturday, March 13: Last Day of Classes
  7. Final: TBA

- **Calculator Policy** No electronic devices of any kind are permissible while students take exams or quizzes.

- **Classroom Etiquette** Be respectful of the entire class. If you wish to use your cell phone, tablet, laptop, etc., please sit in the back of the room and keep the volume down. If you cause any major distractions or behave disruptively, then you will be kicked out of class for the rest of the lecture and will not be allowed to return until you apologize to entirety of the class in person.

- **Disabilities and Accommodations** Students requesting accommodations due to a disability at Drexel University need to request a current Accommodations Verification Letter (AVL) in the ClockWork database before accommodations can be made. These requests are received by Disability Resources (DR), who then issues the AVL to the appropriate contacts. For additional information, visit the DR website at drexel.edu/oed/disabilityResources/overview/, or contact DR for more information by phone at 215.895.1401, or by email at disability@drexel.edu.

- **Course Drop/Withdrawal Policy** Students should be familiar with the drop/withdrawal policy:
  http://www.drexel.edu/provost/policies/course_drop.asp
  http://www.drexel.edu/provost/policies/pdf/course_withdrawal.pdf

- **Academic Honesty** Cheating and other forms of academic misconduct are serious offenses and are dealt with harshly (e.g. at the very least a 0 on the exam, quiz, or assignment and a letter sent to the Office of Student Conduct.) A copy of the student code of conduct in the student handbook can be found at:
  http://www.drexel.edu/provost/policies/academic_dishonesty.asp
  http://www.drexel.edu/studentaffairs/community_standards/studentHandbook/general_information/code_of_conduct/

Appropriate Use of Course Materials It is important to recognize that some or all of the course materials provided to you may be the intellectual property of Drexel University, the course instructor, or others. Use of this intellectual property is governed by Drexel University policies, including the policy found here: https://drexel.edu/it/about/policies/policies/01-Acceptable-Use/

Briefly, this policy states that course materials, including recordings, provided by the course instructor may not be copied, reproduced, distributed or re-posted. Doing so may be considered a breach of this policy and will be investigated and addressed as possible academic dishonesty, among other potential violations. Improper use of such materials may also constitute a violation of the University's Code of Conduct found here: https://drexel.edu/cpo/policies/cpo-1/ and will be investigated as such.

Tentative Schedule This is real life though so we will diverge from this in all likelihood.

Week Of	Material Covered	Textbook Sections
01/10	Functions and Bijections	Levin 0.3-0.4
01/17	Cardinality	Notes
01/24	Counting: Permutations & Binom Coeff	Levin 1.1-1.3
01/31	Double Counting	Levin 1.4
02/07	Graphs & Pigeons	Levin 4.1 & 4.4
02/14	Planar Graphs & Euler's Formula **Midterm - Tuesday 02/16**	Levin 4.2 Weeks 1-5
02/21	Recursion?	
08/10	Generating Functions?	
02/28	Combinatorial Statistics?	
03/07	A bit of Number Theory?	
03/14	**TBA - Final Exam**	Weeks 6-10

Let me suggest a theme for you: to state to yourself precisely and completely what that walk over the mountains amounted to for you,—returning to this essay again and again, until you are satisfied that all that was important in your experience is in it. Give this good reason to yourself for having gone over the mountains, for mankind is ever going over a mountain. Don't suppose that you can tell it precisely the first dozen times you try, but at 'em again, especially where, after a sufficient pause, you suspect that you are touching the heart or summit of the matter, reiterate your blows there, and account for the mountain to yourself. Not that the story need be long, but it will take a long while to make it short. It did not take very long to get over the mountain, you thought; but have you got over it indeed? If you have been to the top of Mount Washington, let me ask, what did you find there? That is the way they prove witnesses, you know. Going up there and being blown on is nothing. We never do much climbing while we are there, but we eat our luncheon, etc., very much as at home. It is after we get home that we really go over the mountain, if ever. What did the mountain say? What did the mountain do?

-Henry David Thoreau