MATH 548-001 Fall 2024

Mo,We,Fr 10:10 - 11:00AM, PH 332, Gradescope PYPN63

Course Goals and Key Learning Objectives: This advanced course will be mainly devoted to Enumerative Combinatorics and its applications, including the Number Theory aspects (finite fields, elements of Galois theory), Modeling (dimers, Fibonacci numbers, population growth, pricing options). It is designed for senior undergraduate students interested in Combinatorics and its applications. Due to the scope of topics (which can be very new for quite a few students), the course will require willingness, self-motivation and systematic efforts. The notes will be provided in Canvas.

TEXT: **"Combinatorics, Modeling, Elementary Number Theory: from basic to advanced"**, *World Sci 2023,* by Ivan Cherednik

INSTRUCTOR: Ivan Cherednik [chered@email.unc.edu] Office Hours: MoFr: 12:10-1pm or Zoom (by appointment).

FINAL EXAM: **Dec 14, Thus, 8:00 -11:00am**; there are no make-ups for final exams, except by petition to the Dean (well in advance). The other exams, tests and assignments are mostly via Gradescope. All questions must be discussed with ODOS (https://odos.unc.edu/about-us/contact-us) and the instructor **before** the exam.

TESTS: **10/4, 10/28** in-class or via Gradescope during the class time. All questions/requests must be discussed **before** the tests/exams.

GRADING: (0.6×EXAM+0.3×TESTS+0.1×HW)

HOLIDAYS: 09/02, 09/23, 10/18, 11/27, 11/29

PREREQUISITES: Math 233, Math 381, Math 383 or equivalent

HOMEWORK: HW will be assigned bi-weekly and graded via Gradescope (PYPN63). Home assignments are absolutely necessary for your successful perfomance. Notice the reviews before the exam/test: we will solve problems similar to the ones in the exams.

HONOR SYSTEM: It is expected that each student in this class will conduct him or herself within the guidelines of the Honor System. All academic work should be done with the high level of honesty and integrity that this University demands. Students may work together on homework, but they should write up individually any work to be submitted. The exam is open book (using the notes is allowed).

SYLLABUS

TOPICS, HOMEWORK PROBLEMS (from *"Combinatorics, ..."*)

THE DATES The last date (†) is the deadline

The teacher reserves the right to make changes to the syllabus, including the dates of home works and project due dates; these changes will be announced as early as possible.

dominoes, magic squares, designs 8/19,8/21,8/23,8/26,8/28,8/30, **9/4** †	`1.4` – 1(iii), 10(i), 13, 15(i), 23, 27(i), 30, 32, 34
permutations and combinations 9/6, 9/9, 9/11, 9/13, 9/16, **9/18** †	`2.6` – 1, 7, 11, 13, 14, 16, 18, 19(i,ii), 41(i)
binomial coefficients & applications 9/20,9/25,9/27,9/30,10/2,**10/4**(**quiz**) †	`3.7` – 2, 21, 22, 24, 27, 32, 33, 34, 37, 38(i).
Fibonacci numbers, recurrences 10/7,10/9,10/11,10/14,10/16,10/21,10/23,**10/25**†	`4.6` – 1(i,ii), 2(i,ii), 12(i,ii), 17, 19, 31(i,ii), 33.
Review: 10/25, **TEST**:	**10/28**
modular calculations, Latin squares 10/30,11/1,11/4,11/6,11/8,11/11,**11/13**†	`5.6` – 1, 8, 23, 25, 26(i,iii), 42(i,ii), 45, 48.
graphs, Catalan numbers, roulette 11/15, 11/18, 11/20, 11/22, 11/25, **12/2**†	`6.4` – 8, 12(i), 19, 22, 29(i,iii), 34, 38(i).
Reviews: 12/2, 12/4, **EXAM**:	**Dec 14, 8am.**

Accommodations: If there any special circumstances that will affect your performance in this class, please let me know and contact https://odos.unc.edu/about-us/contact-us and links there, so that we can work together to meet your needs. Concerning Accessibility Resources and Services (ARS), Counseling and Psychological Services (CAPS), Title IX resources, Dean of Students (exams, etc.), please visit: `https://ars.unc.edu/`, `https://caps.unc.edu/`, `https://safe.unc.edu/`, `https://dos.unc.edu/` .