

Meeting Times: MWF 8:00-8:50 AM in Witmer 211

Instructor: Dr. Jeremiah Bartz, Witmer 317, 701.777.4600, jeremiah.bartz@und.edu

Office Hours: MWF 9-10, 11-12:30; or by appointment.

Course Text: *Introductory Combinatorics* by Brualdi (5e).

Goals: Learn techniques and reasoning used in combinatorial problem-solving. Combinatorics is the study of objects with a given patterns (i.e. arrangements). The three main types of questions are:

1. Existence/Construction. Is a given arrangement possible? If not, are there extra conditions to make it possible?
2. Enumeration. How many different ways can a given arrangement be made?
3. Optimization. What is the “best” (e.g. fastest, cheapest) way to produce a given arrangement?

For example, we may ask (1) is it possible to make change for a one dollar bill using pennies, nickels, dimes, and quarters? (2) How many possible combinations of coins are possible? (3) Is there combination which minimizes or maximizes the number (or maybe total weight) of coins used? We'll mainly focus on the first two questions. The last question is usually studied in operations research.

Calculator Policy: Feel free to use a calculator to evaluate or simplify expressions. However, supporting work should **always** be included when appropriate to indicate the techniques and reasoning used in a given problem. For example, the number of ways to select a four digit PIN number without any digits repeated is $10 \cdot 9 \cdot 8 \cdot 7$ or $P(10,4)$. A calculator may be used to see these expressions are equivalent to 5040. The response of 5040 by itself does not indicate the reasoning used and will not receive full credit.

BlackBoard: Course announcements and documents will be posted regularly in BlackBoard.

Course Coverage: Selected topics throughout the text with emphasis on chapters 1-7, 10, and 14.

Grading Procedure: Grades are determined by the following weighted system:

Homework.....	30%
Individual project.....	10%
2 midterm exams (15% each)	30%
Final Exam (Friday, May 10 at 8:00 AM).....	30%
	100%

Course letter grades are assigned as follows: * 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, and 0-59% = F.

* The final exam will be used as a proxy for the lowest midterm exam if it benefits the student.

Homework: Hand-in homework problems will be given regularly throughout the term and typically due on Friday by noon. Homework can be submitted in class or dropped off in my mailbox located in the Math Department (Witmer 313). [The math secretaries can assist you.] Late homework will not be accepted and receive a score of zero. Collaboration with others on homework assignments is encouraged, however it is expected for homework to be written up individually. Any copying of another person's homework assignment is considered plagiarism and all students involved will be awarded a score of zero for assignment in question.

Individual Project: Combinatorial designs, coding theory, and graph theory are areas of combinatorics with many interesting and practical applications. Unfortunately, there is limited time in the course to discuss these topics in depth. Nonetheless to gain some exposure, each student will investigate individually a combinatorial topic of their choice. The individual project consists of giving a 10-12 minute class presentation with slides and writing a 3-4 page paper. Information about expectations, deadlines, the grading rubric can be found in the Project Information handout.

Exams: There will be two midterm exams (2/15 and 4/5) and a 2-hour final exam (8:00-10:00 AM on 5/10 in Witmer 211). Each exam will be cumulative with emphasis on the most recent material. There are *no make-up exams* without prior approval. If you believe that you have a legitimate reason to reschedule the exam, you must make arrangements with me prior to the exam.

Special Needs/Accommodations: Please contact me to request disability accommodations, discuss medical information, or plan for an [emergency evacuation](#). To get confidential guidance and support for disability accommodation requests, students are expected to register with DSS, www.UND.edu/disability-services.

Academic Honesty: Exams are tests of *your* knowledge, and are to be done individually. Cheating or copying other's work, or using unpermitted resources during exams is considered academic misconduct and will be reported. Looking at another student's work during an exam is considered cheating. The instructor will determine appropriate sanctions which may include being awarded a grade of F for the course.