# 1 Course Information

**Class:** Combinatorics  
**Instructor:** Kevin Lamb  
**Email:** km lamb@math.ucdavis.edu  
**Office:** Mathematical Sciences Building (MSB) 2131  
**Lectures:** MWF 10:00-11:40a in Hart 1120  
**Office Hours:** MWF 12-1 + p in my office (other appointments may be negotiated).  
**Textbook:** *Introductory Combinatorics*, Richard A. Brualdi, 5e  
**Webpage:** [https://www.math.ucdavis.edu/~km lamb/MAT145](https://www.math.ucdavis.edu/~km lamb/MAT145)  
**Canvas:** [https://canvas.ucdavis.edu/courses/168034](https://canvas.ucdavis.edu/courses/168034) Set permissions to allow email from me.  
**Important Dates:** 8/11 - last day to add (waitlists end); 8/14 - drop deadline; exam dates below.

# 2 Course Description

The subject of Combinatorics is actually quite expansive and sits under the rather large umbrella of Discrete Mathematics, so it is impossible to speak to all of its facets in a six-week course. As such, this will be an introductory course on Enumerative Combinatorics and Graph Theory; that is, the mathematics of how to count things and how they can be connected. The goal of this course is to familiarize students with fundamental counting principles, techniques, and arguments that are common to the subject and are often used in practice.

Our main focus will be on the topics of (1) Combinations and Permutations, (2) the Pigeonhole Principle, (3) the Inclusion-Exclusion Principle, (4) Graph Algorithms, and (5) Graph Colorings and Topology. If time permits, we will also give an introduction to the theory of (6) Generating Functions.

Students will be graded not only on being able to produce correct answers to problems - they will be graded on their ability to clearly write out and coherently explain their ideas to their peers and the instructor. Mathematical proof is a substantial element in this process.

**Prerequisites:** Students must have sufficient knowledge of differential, integral, and sequence/series Calculus as covered in MAT 21ABC. It is preferred, though not a requirement, that students have a basic, working knowledge of computational Linear Algebra as covered in MAT 22A. Students may be allowed to take the course without these prerequisites after obtaining the consent of the instructor.

# 3 Grading, Homework, and Exams

- **Group Work:** 15% (3 in-class assignments, announced ahead of time)  
- **Homework:** 40% (6 assignments, drop 1)  
- **Midterm:** 20% (Friday 8/25, maybe Monday 8/28)  
- **Final Exam:** 25% (MANDATORY; last day of class, Friday 9/15)

Homework will be assigned on the class webpage and collected roughly once per week at the beginning of class (see webpage for exact due dates). Work that is sloppy or not organized and stapled together runs the risk of being graded poorly. Grading of this homework will be based on completion, correctness, understanding of the material, and writing style and clarity. Late assignments will receive at most half credit and will be accepted solely at the discretion of the instructor. Assignments not submitted by the specified deadlines at the beginning of class will receive zero credit. The lowest homework score will not be included in the students’ final grades.
There will be one 50-minute midterm exam in class tentatively scheduled for Friday 8/25. It will cover all material before we begin our unit on Graph Theory (see Textbook section below).

The 100-minute final exam will be given on the final day of instruction, Friday 9/4, from 10:00-11:40a in Hart 1120 (our usual classroom). It will be comprehensive, covering the sections listed in the Textbook section below but emphasizing the material covered after the midterm. You must take the final to pass this class. No practice final will be distributed; however, there are many references that will provide sufficient practice for this exam. A review session may be held at the discretion/availability of the instructor.

There are no make-up versions or alternate-time arrangements given for exams (nor is late homework eligible for full credit) unless students can demonstrate/document an emergency or extenuating circumstance preventing them from completing the cited assignments by their respective deadlines. Allowance of such provisions is at the sole discretion of the instructor.

4 Textbook and Planned Schedule

Our course material is drawn from the fifth edition of Brualdi’s *Introductory Combinatorics*. My lecture notes from each class will be posted on the class webpage after class that day, and we will closely follow these sections (in the order presented):

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - Permutation and Combinations</td>
<td>1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>5 - The Binomial Coefficients</td>
<td>1, 2, 4, 5</td>
</tr>
<tr>
<td>3 - The Pigeonhole Principle</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>6 - The Inclusion-Exclusion Principle</td>
<td>1, 2, 3, 4</td>
</tr>
<tr>
<td>11 - Introduction to Graph Theory</td>
<td>1, 2, 3, 4, 5, 7</td>
</tr>
<tr>
<td>12 - More on Graph Theory</td>
<td>1, 2, 3</td>
</tr>
<tr>
<td>13 - Digraphs and Networks</td>
<td>1, 2</td>
</tr>
<tr>
<td>7 - Generating Functions</td>
<td>1, 2, 3, 4, 6</td>
</tr>
</tbody>
</table>

5 Academic Integrity

Students are expected to comply with University policies and regulations. In particular, UC Davis campus standards include the Code of Academic Conduct, and students must be honest and fair in all their academic work. Failure to comply may result in one or more parties being reported to Student Judicial Affairs.

6 Students with Disabilities

In compliance with the Federal Rehabilitation Act and the Americans with Disabilities Act, reasonable accommodation will be provided for students with physical, sensory, cognitive, systematic, learning, and psychiatric disabilities. To arrange such accommodations, please contact the Student Disabilities Center (SDC). I am only allowed to provide the accommodation recommended by the SDC.

I request that students with documented disabilities must inform me of their disability on the first day of class and be registered with the SDC no later than Wednesday of the first week of instruction.