

# COURSE LEARNING OUTCOMES

DEPARTMENT: Mathematics

<b>COURSE #: 36500</b> <b>COURSE TITLE: Elements of Combinatorics</b> CATEGORY: Required for Applied Math; Elective for Pure Math and Secondary Ed. TERM OFFERED: Spring 2021 PRE-REQUISITES: A grade of C or better in Math 20300 or MATH 21200 PRE/CO-REQUISITES: HOURS/CREDITS: 4 hrs/wk; 4 credits DATE EFFECTIVE: 1/12/22 COURSE COORDINATOR: Vladimir Shpilrain	<b>CATALOG DESCRIPTION</b> The three problems of combinatorics (existence, counting, optimization), basic counting rules, graph theory, generating functions, principles of inclusion and exclusion, pigeonhole principle, selected additional topics.  Suggested Text: Kenneth H. Rosen, <i>Discrete Mathematics and its applications, 7th edition</i> , McGraw Hill
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## **COURSE LEARNING OUTCOMES**

Please describe below all learning outcomes of the course, and indicate the letter(s) of the corresponding Departmental Learning Outcome(s) (see list at bottom) in the column at right.

After taking this course, the student should be able to

	Contributes to Departmental Learning Outcome(s):
1. model real-world problems with graph theory ;	b, c
2. identify when graphs are “essentially the same”, i.e., isomorphic;	e,f
3. demonstrate a knowledge of classical formulas and their proofs (Euler’s, etc.) relating the numbers of vertices, edges, and faces of graphs;	a, b, e, f
4. demonstrate a knowledge of the Graph Coloring Theorems;	a, b, e, f
5. demonstrate a knowledge of the ‘rule of sums’ and ‘rule of products’ and their applications;	a, b, c, e, f
6. use generating functions in combinatorial problems;	a, b, c, e
7. use recurrence relations in combinatorial problems;	a, b, c, e
8. demonstrate a knowledge of the proof of the ‘inclusion / exclusion formula’ and its applications.	a, b, c, e, f

## **COURSE ASSESSMENT TOOLS**

Please describe below all assessment tools that are used in the course.

You may also indicate the percentage that each assessment contributes to the final grade.

1. Homework, Classwork, and Quizzes (25%)
2. Exam grade (75%)

The exam grade will be a weighted average of the final exam and midterm grades, with each midterm counting half as much as the final exam.

## **DEPARTMENTAL LEARNING OUTCOMES** (to be filled out by departmental mentor)

*The mathematics department, in its varied courses, aims to teach students to*

- a. perform numeric and symbolic mathematical computations;
- b. model a physical situation using mathematical terms;
- c. use mathematical computation to solve ‘real-world’ problems;
- d. use technology to help organize data and solve problems;
- e. master the fundamental definitions and theorems of a branch of mathematics, and see how this branch of mathematics represents a cohesive body of knowledge;
- f. present (generally in writing but, occasionally, orally) a coherent and logical mathematical argument.