

## Math 576 Combinatorial Game Theory, Spring 2025

**Instructor:** William Linz      **E-mail:** wlinz@mailbox.sc.edu      **Office:** LeConte 405  
**Section:** 001      **Time:** TR 2:50 pm - 4:05 pm      **Classroom:** LeConte 348  
**Office Hours:** Tuesday 11am-12pm, Thursday 12-2pm.  
**Textbook:** *Winning Ways for Your Mathematical Plays*, vol. 1, second ed., by Berlekamp, Conway and Guy, published by AK Peters, Wellesley, Massachusetts.  
**Supplementary Textbook:** *Playing with Discrete Math*, by Burke and Tennenhouse, available at [kyleburke.info/PlayingWithDiscreteMath.pdf](http://kyleburke.info/PlayingWithDiscreteMath.pdf).  
**Prerequisite:** A grade of C or better in Math 300 or Math 374.

### OVERVIEW OF COURSE

**Course Content:** Combinatorial game theory is the study of two-player games with perfect information and no chance. On the practical side, we will study winning strategies for many simple combinatorial games. On the theoretical side, we will dive into the rich theory of combinatorial games, including the Sprague-Grundy theory of impartial games. We will cover many parts of the assigned textbook *Winning Ways*, with some selections from the online book *Playing with Discrete Math*. I will provide lecture notes after each class for the material we covered in class that day.

**Learning Outcomes:** Students will learn:

- (1) Winning in certain combinatorial games such as Nim, Hackenbush, and Domineering.
- (2) Sprague-Grundy theory of impartial games.
- (3) Equalities and inequalities among games.

### COURSE POLICIES

**Attendance:** I expect you not to miss lectures because we will be covering a lot of material at a very rapid pace.

**Cell Phones:** It is the policy of CAS that all cell phones must be turned off during class.

**Academic Integrity:** I expect you to familiarize yourself with the Honor Code found in the current student handbook. Keep in mind that “Any student who violates this Honor Code or who knowingly assists another to violate this Honor Code shall be subject to discipline.”

**Disability Accommodations:** Students who would like to request accommodations for disabilities must register with the Student Disability Resource Center before I can make any accommodations.

**Make-Up Policy:** Exams can be made up **ONLY** for legitimate reasons. You may need to provide supporting documentation for missing the exam. It is your responsibility to contact me within a reasonable time to request a make-up exam.

## ASSIGNMENTS

**Homework:** Homework will be assigned and handed in every week. Homework will typically be due on Tuesdays. There will be a total of ten homework assignments. The lowest two homework scores will be dropped. **Late homework will not be accepted.**

**Midterm Exam:** There will be one in-class midterm exam, tentatively scheduled for March 6. You may use one 8.5 by 11 inch *handwritten* page of notes on this exam. No books, electronic devices or other notes will be allowed during the exam. Any changes to the test date will be announced in class at least one week in advance.

**Final Exam:** The final exam is cumulative and will take place on Thursday, May 1, 4:00-6:30 pm. You may use one 8.5 by 11 inch *handwritten* page of notes on this exam. No books, electronic devices or other notes will be allowed during the exam.

## GRADES

**Grading Scheme:** Grades will be based on homework, the midterm exam and the final exam.

Homework	Midterm exam	Final exam
50%	25%	25%

**Grading Scale:** Letter grades will be assigned according to the following scale.

A	B+	B	C+	C	D+	D	F
90-100%	85-89%	80-85%	75-79%	70-75%	65-69%	60-65%	0-59%