

College of the Holy Cross, Spring Semester, 2022
Math 243, Section 02 (Professor Hwang)
Course Information Sheet

Contact Information

Student Hours: M 11-11:50, W 1-1:50, or by appointment

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web: <http://mathcs.holycross.edu/~ahwang/teach/243/index.html>

Introduction

In *Mathematical Structures*, we'll develop the basic frameworks of logic, algebra, and analysis. The course emphasizes concepts, precise statements, and logical reasoning ("proofs"). **These are not incidental details, but the heart of the course.** It is normal to have difficulty adjusting to new expectations and ways of thinking, differing emphasis, and the pace at which new ideas are introduced. However, with steady work, you will experience moments of clarity as pieces of the course fall together.

The most important action you can take is to **keep up with the course**: Read the book actively before class (with paper and pen, working out omitted details that aren't perfectly clear), ask questions in class and student hours. Complete each day's activity sheet no later than the following day. Speak with me immediately if feel you're starting to fall behind; much more so than in earlier courses, the material of *Structures* builds on itself.

Grading

Problem write-ups (10 + 40%), midterm tests (15 + 10 + 10 = 35%), final exam (15%).

Problem Write-Ups The written assignments are detailed on the page

<https://mathcs.holycross.edu/~ahwang/teach/243/prob.html>.

Briefly, there are written problems due each Friday, worth 10% of the course grade.

There are also ten proof portfolio write-ups due by the end of the semester, one for each of ten topics, worth 40% of the course grade in total. You have a choice of at least three questions for each topic, and will normally rewrite and resubmit these to improve your work with feedback.

Midterm Tests There are three in-class midterm tests, scheduled for Friday, February 25, Friday, April 1, and Friday, April 29. Your highest score is worth 15% and the others 10% each; in total, the midterms count for 35% of your course grade.

Final Exam The cumulative final exam is worth 15% of the course grade. The final exam will be given during the exam period in May, at the time to be announced by the College.

Meeting Schedule

Deviations from this schedule will be announced by email.

W	Jan 26	Section 1.1	Welcome and Introduction
F	Jan 28	Section 1.1	Statements and Truth Tables
M	Jan 31	Section 1.2	Quantified Statements
W	Feb 2	Section 1.3	Sets and Partitions
F	Feb 4	Section 1.4	Cartesian Products and Mappings
M	Feb 7	Section 2.3	Induction with Formulas
W	Feb 9	Section 2.3	Induction with Properties
F	Feb 11	Section 7.1	Rational Numbers
M	Feb 14	Section 7.1	Real Numbers and Inequalities
W	Feb 16	Section 7.1	Inequalities and Absolute Values
F	Feb 18	Section 7.2	Complex numbers
M	Feb 21	Section 7.2	Geometry of Complex Multiplication
W	Feb 23	Section 7.2	Cayley Tables, Roots of Unity
F	Feb 25		Midterm 1
M	Feb 28	Section 3.4	Counting Subsets
W	Mar 2	Section 7.3	The Binomial Theorem
F	Mar 4	Section 3.1	Images and Preimages
M	Mar 14	Section 3.2	Surjectivity and Injectivity
W	Mar 16	Section 3.2	The Pigeonhole Principle
F	Mar 18	Section 3.2	Bijections and Cardinality
M	Mar 21	Section 3.3	Composition and Inverses
W	Mar 23	Section 2.2	The Division Algorithm
F	Mar 25	Section 2.2	Subgroups of the Integers
M	Mar 28	Section 5.1	Greatest Common Divisors
W	Mar 30	Section 5.2	Primes and Unique Factorization
F	Apr 1		Midterm 2
M	Apr 4	Section 4.1	Equivalence Relations
W	Apr 6	Section 6.1	Modular arithmetic
F	Apr 8	Section 6.2	Units and Inverses
M	Apr 11	Section 4.2	Well-Definedness
W	Apr 13	Section 4.2	Induced Mappings
W	Apr 20	Section 3.6,3.7	Binary Operations
F	Apr 22	Section 8.1	Sets of Real Numbers
M	Apr 25	Section 8.1	Uncountable Sets
W	Apr 27		Academic Conference
F	Apr 29		Midterm 3
M	May 2	Section 8.2	Suprema and Infima
W	May 4	Section 8.2	Completeness
F	May 6	Section 8.2	Real Square Roots
M	May 9	Section 8.3	The Archimedean Property