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Math 596: Discrete Geometry
Fall 2021

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Instructor:	Christopher O'Neill
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Office Hours:	Monday 2:00pm - 3:30pm, 6:00pm - 8:00pm,
	Tuesday 10:00am - 1:00pm,
	Wednesday 11:00am - 12:00pm, 2:30pm - 3:30pm,
	Thursday 3:20pm - 3:50pm,
	and other times by appointment

Course Content: Convex polyhedra and polytopes; lattice point enumeration methods; Ehrhart's theorem; generating functions; applications to discrete optimization and enumerative combinatorics.

Texts: Material will be pulled from the following source, among others. Purchasing is **optional**.

- *Computing the Continuous Discretely*, by Matthias Beck and Sinai Robins, ISBN: 978-1493929689

Prerequisites: Math 320 or Math 330 with a grade of C or better, or instructor approval.

Course Organization: The class will be organized as follows.

- One class day each week (usually Tuesday), I will give a lecture on course material.
- The other class day each week will be a "problem session" wherein you work in small groups on problems designed to lead you to discover some of the course content (in particular, these problems **introduce new material**).

A problem list will be distributed at the beginning of each problem session, containing the in-class problems as well as the weekly homework problems. The in-class problems will not be turned in, but the content they introduce will be vital to the course. All completed homework probems will be turned in for credit, usually the following Thursday.

Before each problem session, a short list of "preliminary problems" will be assigned, and should be completed before the problem session. These assignments will be short, usually requiring at most 10 minutes to complete, and will be computational in nature (i.e. no proofs).

Although I intend to use this format throughout the course, I reserve the right to restructure the course as the term progresses, based in part on student feedback and performance. I will periodically collect anonymous feedback in class, but feel free to come talk to me if you have suggestions or concerns.

Grading Policy: Your grade will be determined by weekly homework submissions, a midterm exam, a final project, and a participation grade, weighted as follows.

Participation	10%	Midterm Exam: November 9	A = 90-100
Homework Average	30%	Final Presentations: December 14	B = 80-89
Midterm Exam	30%		C = 70-79
Research Project	30%		D = 60-69
Total	100%		F = 0-59

The final project presentations will occur during the final exam time. Keep this date in mind when making travel plans for the end of the term.

Midterm Exam: The exam will take place in our lecture classroom, on the date above. **No makeup exams** will be given. If you miss the exam for a university approved reason (illness, etc), your grade will be replaced with your grade on the final project. However, you must notify me via email **by the day of the missed exam**, and provide sufficient documentation (doctor's note, etc). Otherwise, you will receive a 0. Any questions regarding grading/scoring must be done within one week of returning the exam, and cannot be done the day the exam is returned.

Research Project: Each student will complete an independent research project. Topics will be selected from a list provided by the instructor. The research project grade will be determined by

- regular progress in biweekly(ish) meetings with instructor,
- a final writeup due on the day of our final exam time, and
- an optional final presentation during the final exam time (**required** for graduate students).

Participation: Attendance in problem sessions is vital to success in this class, since **new material** will be covered. Your participation grade will be based on the following:
- attending and participating in lectures;
- attending and engaging in problem sessions; and
- completing all preliminary problem.

Missing class will result in a lowered participation grade, and only university excused absences with **advance notice** to the instructor will be accepted. I reserve the right to deduct one **additional full letter grade** from your course grade if you miss too many classes, or if sufficient participation is not demonstrated during problem sessions.

Homework: There will be one homework assignment given each week, as well as a short list of preliminary problems to be completed before each problem session. Completed homework assignments will be submitted to the instructor for a grade, but preliminary problems will not be collected. Collaboration on homework is encouraged, but solutions should be written individually, and **collaborators should be identified** on the front of your assignment.

Homework assignments, along with their due dates, will be posted on the course webpage as they are assigned. Out of fairness to the other students, late homework assignments will not be accepted for credit. However, the lowest homework grade of the term will be dropped.

Class Announcements, E-mail Policy and Communications: Class announcements will be posted to my class web page and sent to your university e-mail account. Be sure to regularly check your e-mail. If you send me an e-mail, please include your name and course information (i.e. class and section) as well as any additional information that I might need to respond to your e-mail.

Attendance, Absence, and Makeup Work Policies:
- Attendance is strongly encouraged.
- No makeup exams will be given. If you miss an exam for a university approved reason (e.g. illness), your grade will be replaced with the average of the remaining exams. However, if you fail to notify me via email on the day of the missed exam, you will receive a 0.
- Late homework will not be accepted. However, your lowest homework grade will be dropped.
- The last day to drop this class is **September 3rd**.

Student Learning Outcomes:
- Students will be able to state and prove precise geometric statements, and provide high-level explanations of their significance and the intuition behind them.
- Students will be able to prove discrete math statements in different ways: combinatorial, algebraic, and geometric.
- Students will be able to formulate conjectures substantiated by existing results and well-chosen examples in response to open-ended research style questions.

A.D.A. Policy Statement: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. This legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please contact the Student Ability Success Center.

If you require additional time on quizzes and/or exams, you must **contact me at the start of the course**. You will not be given extra time if you present this information just before an exam.

For additional information, visit `http://go.sdsu.edu/student_affairs/sds/`.

Copyright Policy: The handouts used in this course are copyrighted. By "handouts," I mean all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, in-class materials, review sheets, and additional problems sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission.

Scholastic Dishonesty: *An Aztec Does Not Lie, Cheat, or Steal, or Tolerate Those Who Do.* The San Diego State University Student Conduct Code will be enforced in this course. For the purpose of this course, cheating will be defined as (but not limited to) access or use of unauthorized material during exams and quizzes, collaboration between students during exams, quizzes or assignments for which group work is not allowed, perusal of another student's work during exams and quizzes, copying other student's work or allowing other students to copy your work on any assignment, quiz or exam, and having unauthorized programs or other information stored on calculators when these calculators are accessible during an exam or quiz. Note: Falsifying documentation is considered scholastic dishonesty and may result in a grade of F for the course.

For additional information, visit `http://go.sdsu.edu/student_affairs/srr/conduct.aspx`.