

COMPUTATIONAL GEOMETRY

St. Olaf College • MATH 261
Dr. Matthew Wright • January 2025

Class Meetings

10:40am – 12:00pm and 1:00pm – 2:20pm in RNS 204

Contact the Professor

If you have any questions or concerns about the course, email Prof. Wright at **wright5@stolaf.edu** or come to office hours. Office hours are scheduled daily 2:30pm – 3:30pm and also by appointment.

Web Site

The course web site is:

<https://math261.mlwright.org>

The professor maintains a course schedule and assignment calendar on this site. We will use Moodle for assignment submissions, grades, and items that require password protection.

Text

Devadoss and O'Rourke, *Discrete and Computational Geometry* (Princeton University Press, 2011)

Course Objectives

1. Demonstrate understanding of key theorems and proofs in discrete and computational geometry.
2. Engage in the process of mathematical exploration by asking questions, constructing examples, forming conjectures, proving theorems, and communicating ideas.
3. Understand and implement algorithms for manipulating discrete geometric objects, and assess the computational complexity of such algorithms.
4. Develop/improve ability to work computationally in programming environments such as Mathematica.

Grading

Your final grade will be a weighted average of the following:

Homework:	60%
Quizzes:	20%
Final Project:	20%

See the following sections for details about each of these grade items.

Homework

A major component of this course is problem sets, which will be posted on the course web site and due approximately every other class day. These problem sets will involve mathematical exploration, computation, mathematical proof, and analysis of algorithms.

You should plan to spend several hours per class day on this homework. *Keeping up with the homework is important, not only to get a good grade, but also for mastering the course material!*

Struggling with a homework problem is not a sign of failure, but part of the learning process. The proper way to work on a homework problem is as follows:

1. Read and attempt to understand the problem, looking up definitions or theorems if necessary.
2. Make a plan for solving the problem.
3. Attempt to carry out the plan. Revise the plan. Spend time thinking about the problem.
4. If you have spent significant time on the problem and still can't solve it, then talk to Prof. Wright or another student who is working on the same problem. Then go back to step 2.
5. If you think you have solved the problem, then check your answer. Ask yourself, "Is my answer reasonable? Can I verify it in some way?" See if you can improve your solution.
6. Write your solution neatly and thoroughly.

Collaboration on homework is encouraged (see #4 above), but *you must hand in your own work*. Write your solutions clearly and neatly, explaining your reasoning.

Given the fast pace of a January-term course, it is especially important to keep up with homework. Late homework will be penalized 25% per day. If extenuating circumstances prevent you from turning in work, talk with the professor as soon as possible.

Computer Science Elective Credit

If you are taking this course as an elective for the Computer Science Major, then you will need to complete certain homework problems that involve implementing algorithms. These will be clearly indicated on homework assignments.

The professor will primarily use *Mathematica* (available for St. Olaf students) for in-class coding and demonstrations. You may use Mathematica or other programming languages for assignments in this course.

Quizzes

Rather than exams, this course will involve approximately four quizzes. These quizzes will assess your grasp of the mathematical content, problem-solving strategies, algorithms, and applications in this course.

The St. Olaf Honor Pledge applies to quizzes in this course. The Honor Pledge reads:

"I pledge my honor that on this examination I have neither given nor received assistance not explicitly approved by the professor and that I have seen no dishonest work."

The Honor Pledge is violated when information that could result in an unfair advantage for one or more students is given or received before, during, or after a quiz. On each quiz, students will be asked to either affirm the Honor Pledge or indicate awareness of violations by intentionally not signing the pledge.

Final Project

The final project will be an opportunity to investigate a topic in computational geometry beyond what we study as a class. This could be a more in-depth study of a topic in the text, an application of some of the tools we discuss, or an advanced topic that we didn't get to in the semester. This will be a group project resulting in a written report and a brief presentation delivered during the final exam period: **Thursday, January 30, 8:00 – 10:00am.**

Strategies for Success

- Attend class faithfully and participate in class activities.
- Work with other students, in class and on the homework. You will find that you will both learn from and teach your classmates.
- Keep up with the assignments. Start early — don't wait until the last minute!
- Don't give up when your code doesn't work. Writing good code often requires many revisions. Understand that mistakes are opportunities for learning.
- Ask questions! Experiment!
- When you encounter trouble, seek help!

Getting Help and Academic Integrity

Collaboration with peers is encouraged in this class on everything except quizzes. Discussing mathematics with other people is an important part of learning mathematics. However, collaboration must be done appropriately and with integrity.

Inappropriate “collaboration” includes copying answers from a friend, looking up homework solutions in online forums, asking an artificial intelligence to do your homework, any use of any other resource that does the thinking for you. Remember, the goals of this course are to develop and demonstrate your own understanding of topology. You *will not* achieve these goals if you outsource your thinking to other experts (human or artificial). You *will* achieve these goals through time and effort spent solving topology problems.

Moreover, *you must document what sources you use and what assistance you receive* for work in this course. This could take the form of a simple acknowledgement at the end of your homework assignment.

Claiming someone's or something's work as your own will earn you a failing grade on the work in question. Don't do it. For more information, see the *Academic Integrity* section of *The Book* (wp.stolaf.edu/thebook/academic/integrity).

Prof. Wright is your primary resource for help in this course and is always happy to talk with you. When you need help, or if you have any concerns about the course, please email Prof. Wright or visit his office hours. Furthermore, the Academic Success Center offers academic coaching and other services – email the Academic Success Center for more information.

In summary:

- It's good to discuss course material and homework with classmates and the professor.
- It's not good to ask someone (or an artificial intelligence) to do the homework for you.
- For each assignment, you must indicate what sources you consulted and what assistance you received (if any).
- If you have any questions or concerns about this course, talk with Prof. Wright.

Attendance

January-term courses move quickly, and it's important for you to be present each day. If you don't come to class, you're missing out on the discussion and learning that takes place in class. Thus, it's crucial to develop consistent attendance habits from the beginning of the course.

If you miss two consecutive days without contacting me, I will reach out to the Dean of Students Office to make sure you're getting the support you need.

If you miss five days for any reason(s), and regardless of whether you contact me, I'll encourage you to consider dropping the course. Five days amounts to more than one fourth of this course, which is an excessive amount of absences that severely detracts from your learning.

Inclusivity and Access

Prof. Wright is committed to facilitating a safe, caring, and inclusive learning community, respecting those of differing backgrounds and beliefs. As part of St. Olaf College, we aim to be respectful to everyone in this class, regardless of race, ethnicity, religion, gender, or sexual orientation. All students are capable of success in mathematics, and Prof. Wright aims to create an environment in which all can succeed. If you have any questions or concerns, don't hesitate to talk with Prof. Wright.

If you have any concerns about access to course materials, or if English is not your first language and this causes you concern, please talk with Prof. Wright.

Health and Accommodations

Prof. Wright is committed to supporting all students. He recognizes that emotional, physical, or psychological experiences, both in and out of the classroom, have the potential to distract students from learning. If you have any concerns, please do not hesitate to contact the professor—he is available to listen and to discuss what resources may be available to you.

If you are sick, please do not come to class—instead, email the professor. Face masks to prevent the spread of respiratory diseases are welcome in class. Please respect individuals who may choose to wear face masks.

If you have an accommodation letter from the Disability and Access (DAC) office, please meet with the professor early in the course to discuss, plan, and implement your accommodations in the course. Otherwise, if you have or think you have a disability please contact the Disability and Access office at 507-786-3288 or wp.stolaf.edu/academic-support/dac/.