

## Math 4910: Geometry and Algorithms in Three-dimensional Modeling

**Professor:** Henry Segerman

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**Office Hours:** Tuesday, Thursday 4:30-5:30, MSCS 421 (3D printing lab), Wednesday 1-2, MLSC.

**Course Webpage:** [https://math.okstate.edu/people/segerman/geom\\_algors\\_3d\\_modelling.html](https://math.okstate.edu/people/segerman/geom_algors_3d_modelling.html).

**Online Classroom (D2L) site:** <https://oc.okstate.edu> (then log in and find our course, listed as MATH 4910-GEOM & ALGORS IN 3-D DESIGN-SEC IS AAG).

**Prerequisite:** Grade of C or better in Math 2163, Math 3013, CS 1113 (for some programming experience), or consent of instructor.

**Text:** *Applied Geometry for Computer Graphics and CAD* (Springer Undergraduate Mathematics Series) 2nd Edition, by Duncan Marsh. (The text is freely available in electronic form from [library.okstate.edu](http://library.okstate.edu).)

**Course Objectives:** There are two goals of this course.

- Students will learn some of the mathematical underpinnings behind the ways in which three-dimensional content is represented, generated and modified using computers.
- Students will apply their knowledge of these topics: they will learn how to use the CAD (Computer-Aided Design) program Rhinoceros, including automation with the programming language Python, and Makerbot 3D printers. They will use all of these to design and 3D print models at the 3D printing lab in the Department of Mathematics. Models will illustrate mathematical concepts, and/or be drawn from students' other academic interests. Students will write reports describing the mathematics, design choices, and other relevant details behind their models.

**Graduate Credit:** Graduate students will produce one additional project, illustrating a concept from a recent mathematics research paper.

**Syllabus Attachment:** Please read the OSU syllabus attachment on the web, linked at <http://academicaffairs.okstate.edu/current-students>. This has a lot of important information, including instructions about disability accommodations. If you need accommodations as the result of a disability, please contact Student Disability Services (<http://sds.okstate.edu/>) **as soon as possible**. Once they have sent me an appropriate Accommodation Letter, please follow up with me privately within the first two weeks of the course.

**Course requirements:** Students enrolled in this course will be graded on the following items:

Homework:	20%
Two 75 minute midterm exams:	10% each
Project 1:	15%
Project 2:	20%
Project 3:	25%

Earning 90% guarantees an A for the semester, 80% a B, 70% a C, and 60% a D. I reserve the right to use discretion if you are on the borderline between two grades, considering performance on the final exam, improvement or decline during the semester, attendance, and my subjective judgment of your effort. I will not drop any exam scores. I will drop your two lowest scores from the homework/quizzes category.

**Exams:** All midterm exams will be in class. The tentative exam dates are **February 18 and March 31**. I will communicate any changes in class and by email. There will be no final exam.

**Homework:** It is impossible to learn mathematics without practicing it. I will assign homework on most weeks. Students will produce written solutions, sometimes accompanied by a 3D model delivered electronically via D2L, or a physical 3D printed model. In addition to assigned homework, you should also be reading the book ahead of the lectures.

**Projects:** There will be three major projects throughout the semester, each expected to take a number of weeks to complete. Students will propose projects, discuss those proposals, research, construct prototypes, write-up and finally present their projects to the rest of the class. Some projects will be group projects, which may require meeting times outside of class. Group members will also evaluate each other's contribution to the project. Group members are not guaranteed to each earn the same grade on the project. See the course webpage for due dates of the three projects. **Note that the third and final project (including presentations) will be due the week before finals week.**

**Conflicts:** I will offer reasonable accommodation in the event that you miss a major assessment activity for a valid and documented reason, assuming documentation is provided **in advance unless absolutely impossible**. For an exam, tell me as soon as you know you have a conflict. If you won't be in class when homework is due, turn it in early or give it to someone else to turn in prior to the deadline. You should not assume you will be eligible for a make-up exam unless I have explicitly approved your request.

**Attendance:** Attendance is required. It is rare for a student to do well if he or she misses many classes.

**Academic Honesty:** Don't cheat. Don't copy from other students, allow other students to copy your work, or present work you find in printed or electronic sources as your own. You may get help on homework from other people or sources but you should write/calculate your solutions independently, without looking at anything someone else has produced. The university policies on issues of academic integrity are outlined in the syllabus attachment. For more details, contact the Office of Academic Affairs, 101 Whitehurst, (405) 744-5627, <http://academicintegrity.okstate.edu>.

**What if I need help?** Often students find it helpful to talk to each other and work through homework or practice problems together. You are encouraged to post questions and answers in the Discussion section of the Online Classroom. Take advantage of office hours! Seek out help before problems get too large to tackle.