

BIOE 447
Digital Design and Visualization
Spring 2025
Fridays from 1:00 – 5:00 PM, OEDK Computer Lab

Instructor: Dr. Bilal Ghosn
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Office hours: 12-1 PM on Fridays or by appointment

Course Description

In this course, students will be asked to learn and develop their skills using computer-aided design (CAD) software tools to produce functional designs for bioengineering problems.

Course Objectives

Students should learn:

- 1) To gain beginner to intermediate skills using CAD software to generate working-level design drawings for manufacturing
- 2) To generate 3D renderings of designs
- 3) To communicate their designs effectively through the use of digitally prepared design drawings

Course Outcomes

Students completing this course will be able to:

- 1) Master the use of the computer aided design package of AutoCAD at an intermediate level
- 2) Prepare high quality annotated 2D schematics that provide effective information for the production of a design
- 3) Produce 3D renderings of their designs for presentation purposes

Class Time and Location

Students are expected to be PROMPT (if not a few minutes early) to lab. Students are expected to stay until the end of the lab period. Students are to plan on all meetings running for the entire duration of the laboratory time, which will include both content delivery and in class practice of the software packages. At least one brief break will occur each meeting based on energy level and natural flow of content.

This class meets Fridays from 1:00 – 5:00 p.m. in the **OEDK Computer Lab** with some meetings potentially in the BIOE Teaching Lab (BRC 230).

Required Texts

All text materials will be provided to students as needed.

Attendance policy

Students are required to attend **ALL** sessions of the laboratory. Job interviews, medical school interviews, other classes, or extracurricular activities are not valid excuses. Because this lab involves active learning for the full meeting time and the content is cumulative it is impossible for you to “make up” any sessions. Therefore, you are **STRONGLY DISCOURAGED** from missing any sessions. Students choosing to miss a lab session to attend another commitment must speak with Dr. Ghosn to discover a way to learn the content and complete the required assignments. Illness and family emergencies will be dealt with on an individual basis. Contact Dr. Ghosn immediately as soon as an emergency arises.

Safety

This laboratory carries no safety requirements.

Honor Code

Students in this course are to abide by the Rice Honor System. Students are expected and should do all of their own work. All essays and written material should be of their own creation and otherwise should be correctly attributed with proper referencing. Collaborative learning between students is encouraged in class, however, each student should still do their own work including the preparation of their design and prototype. Written work should not be shared with any other student outside of class. Any violations to this code will be reported to the Honor Council for evaluation. The Rice Honor System policy can be found at <http://honor.rice.edu>.

Course Materials

Course materials will be posted to students using the Owl-space System. Students can log on using their Rice netid by going to <http://owlspace.rice.edu> and going to the courses page. Information including reading assignments, the course syllabus and other helpful materials can found on this site.

Teaching Assistants

The function and purpose of the TAs in this course are to ensure that everyone is both paying attention, caught up, and able to complete the content for each of the assignments. The TA will be present at each meeting to interact with students and provide feedback and guidance. Learning digital design takes practice. Therefore, every weekend TAs will hold an afternoon-long session for those who require additional assistance for their homework or own learning.

Late Work

Students who submit assignments following the designated deadlines will be docked 20% per 24 hours the paper is late. Assignments more than 4 days late, will receive an automatic zero. All assignments will be due at the beginning of class on the date stated in the syllabus unless otherwise stated.

Software and Computer Resources

All computers with an engineering build should have the necessary programs installed. This specifically includes Mudd Lab and the OEDK computers at the least.

Furthermore, AutoCAD and Autodesk Inventor software packages are available to students for academic use on their personal computer via the Autodesk Academic Resource Center at www.autodesk.com.

GIMP software is a free-ware program available for download at www.gimp.org.

A quality computer mouse is as essential as a personal pen or pencil for adding comfort and speed to your work. Additionally, by bringing your own mouse to class you will not be subject to the style or quality of those on the lab computers.

An external storage solution (i.e. flash drive) or at least 8 GB is recommended for storing your data for this course.

Course Assessment and Assignments

Students will be given several assignments to complete throughout this course, which along with the final project will encompass the majority of their grade. Some assignments will be assigned for in class completion, while others will be expected to include work outside of class. Quizzes will also be given at the beginning of each class based on the material of the previous session and assignments. All assignments will be done on an individual basis.

Grade Breakdown:

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|-------------------------|-----|
| • Quizzes | 10% |
| • In-Class assignments | 20% |
| • Take Home Assignments | 40% |
| • Final Project | 30% |

Final Project

The final project in this course will consist in production and development of 2 parts in the presentation of your senior design prototype. Each student will be asked to complete a set of design schematics for their assigned project's prototype including dimensioning that can be used by a professional to produce the actual physical prototype by the method desired or needed. This will include assembly documents. The second aspect will be the production of a 3D rendering of their prototype that they will present in front of the class on the final session. All work for this project will be done by the individual even if their senior design partner(s) is(are) in the course as well. Students not currently undertaking a senior design project will be assigned to a senior design team for their project.

Students with Disabilities:

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with course instructors during the first two weeks of class. All discussions will remain confidential. Students with disabilities should also contact Disability Support Services in the Allen Center.

Tentative Course Schedule

Subject to change

Week	Date	Lecture Topic	Assignment Due Date
1	1/17/2025	Introduction to Course Spatial Visualization Sketching vs Drawing	
2	1/24/2025	Introduction to CAD and AutoCAD Software Basic Drawing and Making Selections	HW #1
3	1/31/2025	Refining Geometry Modifying objects in AutoCAD Isometric Drafting/Drawing in AutoCAD	
4	2/7/2025	Dimensioning and labeling Organizing Drawings (Layers and Layouts) Reusing Content	
5	2/14/2025	<i>NO CLASS – Spring Recess</i>	
6	2/21/2025	Producing working drawings for manufacture Working with layouts and creating outputs Title Blocks	HW #2
7	2/28/2025	Creating 3D elements in AutoCAD Navigating and Drawing in 3D 2D Projections of 3D drawings	
8	3/7/2025	Rendering in AutoCAD	HW #3
9	3/14/2025	Introduction to Inventor* Inventor Sketches and Parts*	
10	3/21/2025	<i>NO CLASS – Spring Break</i>	
11	3/28/2025	Inventor Assemblies and Assembly Drawings* Inventor Animations*	HW #4
12	4/4/2025	Using photo editors to enhance the quality of your presentation*	
13	4/11/2025	Guided work on final projects	HW #5/HW #6
14	4/18/2025	Guided Work on Final Projects	
15	4/25/2025	Guided Work on Final Projects	
16	5/6/2025	<i>Final Project due Date</i>	<i>Final Project Due[#]</i>

* Topic may or may not be taught based on available time.

Final projects deadline is set for last day of final exams.