Syllabus

Computational Design and Fabrication

CSE 490H Fall 2022

Summary

This course introduces students to the new and exciting field of computational design and fabrication, which is currently laying the foundations on which the next generation of manufacturing workflows and systems will be built. We will cover the essential computational tools of every stage in the computational fabrication pipeline: from hardware and its abstraction to the high level specification methods of design and their interactions with designers and engineers. Topics include concepts of hardware abstraction languages, geometry processing fundamentals, physics-based simulation, optimization techniques, data-driven design methods, and algorithms for high-performance interactive applications.

Prerequisites

- A good working knowledge of Python programming

- Basic linear algebra (matrices and vectors)

- Some mathematical sophistication

- No prior knowledge of manufacturing is assumed

Communication

- See website for updates on lecture topics, assignments and lecture slides: `https://courses.cs.washington.edu/courses/cse490h/22au/`

- Assignments will be posted and submitted via Canvas

- We will use Ed for a discussion board (link available via Canvas)

Policies

This syllabus is designed to be a guideline for the course and these policies are subject to change.

Grades

- 60% Assignments

- 15% Participation

- 25% Labs

- No final exam

Note on grade curves: The number and level of difficulty of the assignments was designed to avoid needing to create curves when mapping percentages to a 4.0 scale. We reserve the right to curve the grades if needed (this is, after all, the first version of the class) but we want to note that this is not our intention from the beginning. We have no exams, only 3 assignments with ample opportunity to get TA support, and opportunities for extra credit; we therefore expect to be able to use a linear scale.

Assignment Policies

- Initial code and libraries will be provided for all assignments. A writeup should be submitted via Canvas for each assignment, with all code pushed to your course-assigned individual repositories, by the due date.

- **Collaboration policy** Discussions are encouraged but implementations and write-ups must be done *individually*. Students are encouraged to meet up and discuss assignments. They can write ideas or pseudo-code on paper or a whiteboard during discussions but they may *not* take any code or notes away from those conversations. A good rule of thumb is the Gilligan's Island Rule[1]. Please indicate in your writeup any discussion group you participated in.

- **Late policy** Assignments must be submitted by 7:59pm on the listed due date. Late days are measured in periods of 24 hours. We do *not* have a set of late days that students can use as they wish. Late assignments will lose 25% credit per day (additively). However, we *do* have a policy for accommodating students who are not able to submit the assignments on time due to *extenuating circumstances*. Please read the details carefully under **"Don't suffer in silence"** below.

Lab Policies

- Labs are designed to expose students to hands-on fabrication experience and commercial tools that implement some of the concepts learned in class and that the students may find useful in their future design/fabrication work.

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[1]The Gilligan's Island Rule: This rule says that you are free to meet with fellow student(s) and discuss assignments with them. Writing on a board or shared piece of paper is acceptable during the meeting; however, you should not take any written (electronic or otherwise) record away from the meeting. After the meeting, engage in a half hour of mind-numbing activity (like watching an episode of Gilligan's Island), before starting to work on the assignment. This will assure that you are able to reconstruct what you learned from the meeting, by yourself, using your own brain.

- Four labs will be scheduled on the regular class time (Monday).

- Students must attend and submit a short report after the lab to get full credit. Reports are due one week after the lab.

- Since each lab will be offered multiple times and the Monday lab time is part of the schedule, we do not anticipate any issues with students not being able to attend labs, but we have polices to help under extenuating circumstances. See the details under **"Don't suffer in silence"** below.

Participation Policies

- Engaging in class discussion is essential for one of the key learning objectives of this course: to reflect on computational solutions that will enable the next-generation design tools for manufacturing that fundamentally change what can be made, and by whom. **Since there are no scheduled exams and the coding assignments can only reflect a small portion of the topics discussed in class, the participation grade is designed to reflect this key learning objective.**

- Students will be awarded one participation point for every lecture they are *actively* present, participation is measured using "Duck Points".

  Participating Ducks, or "Duck Points" Each student will receive one rubber duck at the beginning of the quarter, which they should keep and return by the end of the quarter. During each class, the student can throw the duck to the lecturer when they engage in class discussion — engagement means either asking or answering a question. The lecturer will keep the "participating ducks" at the front of the classroom until the end of class. At the end of the class, the TAs will take note of all the ducks that are up front and give their owner students a participation point for that lecture. **Note:** Adriana is known to have no chance at a career as a catcher. You will get your participation point whether or not she is able to catch your duck at the first throw, but she will be very excited if she is able to do it so you should try to make it easy on her ;)

- A full score will be given to students that accumulate at least 15 "Duck Points". Since there are 19 scheduled lectures this quarter, this means that students can be absent for up to 4 lectures with no penalty. Under extenuating circumstances, student will be able to get a participation point for a missed lecture by submitting a report on the lecture they have missed. See the details under **"Don't suffer in silence"** below.

Extenuating circumstances: "Don't suffer in silence!"

We recognize that our students come from varied backgrounds and can have widely-varying circumstances. Our ultimate goal is to help every student be successful in the course. Extenuating circumstances can include physical or mental health and wellness, work-school-life

balance, familial responsibilities, military duties, unexpected and unavoidable travel, or anything else beyond your control that may negatively impact your performance in the class.

While we want to make sure all students feel comfortable reaching out to the staff under extenuating circumstances, we realize that people come from diverse backgrounds and therefore may be more or less likely to feel comfortable doing do. This often leads to students not being treated equally. To this end, we have decided to make policies for handling extenuating circumstances explicit as part of the syllabus. We also designed them so that students do not have to disclose the specifics of their circumstances with the staff, which may cause additional discomfort. If you have circumstances that require additional support outside of these polices, then we encourage you to reach out to the advisors or the DRS and discuss the situation with them directly. We will be happy to work with them to accommodate your situation, but we are not comfortable creating accommodations beyond what we have described without the supervision of staff dedicated to supporting students.

Note on dates: For administrative reasons, we cannot accept anything past Dec 14 in order to be able to submit the grades in time.

Policy for accommodating late assignments: In case of unforeseen or extenuating circumstances, student should email the staff mailing list, and say: "Because of personal circumstances, I will need X late days on assignment Y." **As long as $X \leq 5$ and this email is received before the due date of assignment Y, this request will be granted, no questions asked.** Please *include* the TAs and do *not* disclose the specific circumstances in your email. If you need more that 5 late days, we recommend you contact the advisors or DRS.

Policy for accommodating missed lectures: If you have to miss more than 4 lectures and want to make up for participation grade, you can submit a report on the lecture that you missed. Please note that we cannot guarantee that recordings will be available and you may need to reach out to colleagues or the TA for help understanding the lecture you missed. In case of unforeseen or extenuating circumstances, student should email the staff mailing list, and say: "Because of personal circumstances, I had to miss class X and I would like to submit this report (attached) to show that I understand the material that was covered." Please *include* the TAs and do *not* disclose the specific circumstances in your email. All reports must include all topics discussed in the class, and must be submitted by 12/09/2022. We will accept up to 5 reports. If you need to submit more that 5 reports (that means you will miss more that half of the quarter), we recommend you contact the advisors or DRS.

Policy for accommodating missed labs: Missed labs are very hard to make up and students will definitely miss out on the experience, so we urge students to try their very best to attend labs. Since each lab will be offered 2 to 3 times, students should contact the staff immediately and ask to be stitched to another section should circumstances arise. That said, we will allow students to submit a report for a missed lab. In case of unforeseen or extenuating circumstances, student should email the staff mailing list, and say: "Because of personal circumstances, I had to miss lab X and I am submitting my report with extra details to show I understood what the lab was about." If you need to miss more than ONE

lab, we recommend you contact the advisors or DRS.

Policy for accommodating late lab reports: In case of unforeseen or extenuating circumstances, student should email the staff mailing list, and say: "Because of personal circumstances, I will need X late days on the report for lab Y." As long as $X \leq 5$ and this email is received before the due date of lab report Y, this request will be granted, no questions asked. Please *include*the TAs and do *not* disclose the specific circumstances in your email. If you need more that 5 late days, we recommend you contact the advisors or DRS.

Disability Resources for Students

Your experience in this class is important to us. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to the instructor at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but are not limited to: mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at disability.uw.edu.

Religious and Disability Accommodation Policy

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy. Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form. Please refer to university policies regarding religious and disability accommodation at the following links:
`http://depts.washington.edu/uwdrs/current-students/accommodations/`
`https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/`

Lecture Recordings

This course is scheduled to be fully in-person, but lectures will be recorded. Because technical issues with recordings may arise, we cannot guarantee that all lectures will be made available offline and therefore students are strongly encouraged to attend classes unless they are unable due to extraordinary circumstances.

Privacy Note: The recording will capture the presenter's audio, video, and computer screen. Student audio and video will be recorded if they share their computer audio and video during the recorded session. The recordings will only be accessible to students enrolled in the course to review materials. These recordings will not be shared with or accessible to the public. The University and Zoom have FERPA-compliant agreements in place to protect the security and privacy of UW Zoom accounts. Students who do not wish to be recorded

should: Change their Zoom screen name to hide any personal identifying information such as their name or UW Net ID, and not share their computer audio or video during their Zoom sessions.

Sick Policy

To keep everyone safe, please stay home if you are sick or feel sick. We will make special accommodations to ensure there is no incentive for students to come to class while sick.