Syllabus MAE 292
Computer-Aided Analysis and Design
Spring 2020

Professor Nick Gravish

COURSE OVERVIEW AND MAIN GOALS

This is a lecture based course introducing computational tools to solve problems in mechanical design. The course emphasizes three main tools: 1) Numerical techniques for solving systems of equations and optimization, 2) Computer-Aided Design software for design and visualization, 3) Finite-Element Analysis for analyzing mechanical performance of designs. We will introduce these core tools through a series of lectures, workshops, and homeworks. Near the end of the quarter you will use all of the methods we have learned to compete in a design challenge.

LECTURE AND OFFICE HOURS

Lecture:
Tu & Th 9:30am - 10:50am
Zoom: https://ucsd.zoom.us/j/502710216
Lectures will be recorded and accessible
on Canvas

Prof. Office Hours:
Weds 1:00pm - 2:00pm
Or by appointment
Zoom: https://ucsd.zoom.us/j/269412617

TA Office Hours:
Mon 1:00pm - 2:00pm
Thurs 1:00pm - 2:00pm
Or by appointment
Zoom: https://ucsd.zoom.us/j/716907285

Contact information:
Prof: Nick Gravish ngravish@eng.ucsd.edu
TA: Wei Zhou wez237@eng.ucsd.ed

GRADING

Homework	25%
Midterm	25%
Design project	25%
Final	25%

RESOURCES

- Chapters from the course reader will be distributed through Canvas. You can also purchase a copy in the bookstore if you would like, but this is not mandatory.
- Handouts and homework assignments will be posted to Canvas.
- Homework will be turned in on gradescope (http://www.gradescope.com). You can enroll in the course using the course code **9X7BJB.**

Below is the schedule of lectures. However, this schedule may change throughout the quarter as needed. (updated 5/7/2020)

Week	Day	Date		Lecture/Tutorial subject	HW assign	HW due
Week 1	Tues	3/31/2020	1	Course introduction & syllabus. Introduce points and transforms.		
	Thurs	4/2/2020	2	Continue points and transforms.	HW 1	
Week 2	Tues	4/7/2020	3	CAD workflow.		
	Thurs	4/9/2020	4	CAD Assemblies	HW 2	HW 1
Week 3	Tues	4/14/2020	5	Functions in CAD; Bezier, Hermite polynomials, Lagrangian polynomials, Splines		
	Thurs	4/16/2020	6	Introduction to motion design and cams	HW 3	HW 2
Week 4	Tues	4/21/2020	7	Designing Cam motions and surface profiles: analytical or computational (envelopes)		
	Thurs	4/23/2020	8	Closed-chain linkages: mobility, constraint equations		HW 3
Week 5	Tues	4/28/2020	9	Solving constraint equations in Matlab applied to four bar linkages		
	Thurs	4/30/2020		Motion design in linkage systems	Mid.	
Week 6	Tues	5/5/2020	10	Simmechanics workflow -- Simulating multibody physics for design		Mid.
	Thurs	5/7/2020	11	Introduction to optimization in matlab (constrained and unconstrained)	HW 4	
Week 7	Tues	5/12/2020	12	Introduction to finite elements		
	Thurs	5/14/2020	13	FEA for trusses and beams	HW 5	HW 4
Week 8	Tues	5/19/2020	14	FEA for beams	DC	
	Thurs	5/21/2020	15	Motion design challenge introduction		HW 5
Week 9	Tues	5/26/2020	16	Optimization + CAD + FEA: Integrating multiple design tools		
	Thurs	5/28/2020	17	Open chain linkages and robotics		
Week 10	Tues	6/2/2020		Design project presentations 1		DC
	Thurs	6/4/2020		Design project presentations 2		
Final	Tues	6/9/2020		Final exam		

ONLINE CLASSROOM INSTRUCTION POLICIES

Overview
This course will be taught using live, online audio and visual instruction and will take place during the times indicated in the UCSD Schedule of Classes. Live lecture attendance is not required, but is highly encouraged so that questions can be asked and answered during the lecture and interactive discussions can be carried out.

Given the occasional disruptions that inevitably occur when using online conferencing tools (due to WiFi drops, service drops, etc.) we will adhere to the following plan of action for each and every online class meeting. All attempts possible will be made to record lectures and post them to Canvas in a timely manner. However, recorded lectures cannot be guaranteed. In the event that lecture recording fails, lecture notes will be posted.

Netiquette
To minimize background noise and promote clear communications during live online lectures:
1) Use headphones for audio.
2) Keep your microphone on MUTE until you need to ask a question. Then return your microphone to MUTE.

Communication
In an online course, the majority of our communication takes place in forums that are visible and/or audible to all. However, when we have a need for communication that is private, whether personal, interpersonal, or professional, we will use individual email. For timely response to course questions, please contact the TA first. As needed, TA will refer questions that they cannot answer to me. In an online classroom, another major method of communication is written. The written language has many advantages: more opportunity for reasoned thought, more ability to go in-depth, and more time to think through an issue before posting a comment or sending an email. However, written communication also has certain disadvantages, such as lack of the face-to-face signaling that occurs through body language, intonation, pausing, facial expressions, and gestures. As a result, please be aware of the possibility of miscommunication and compose your comments/emails in a professional, respectful, and constructive manner.

CODE OF CONDUCT

As we, as a campus community, transition to online instruction, please be aware that your Professors and Administrators are adapting at the same time that you are. Let us all pledge to remain respectful, supportive, and adaptable to ensure that educational goals are met. All participants in the course are bound by the UCSD Code of Conduct, found at:
https://students.ucsd.edu/sponsor/student-conduct/policiesandprocedures.html

HOMEWORK, EXAM, AND GRADING POLICIES

Exams (Midterm & Final)
All exams will be proctored live online and will be closed book. It is recommended that students prepare a single 8.5"x11" piece of paper, front and back, to use during each exam as a reference sheet for constant values, conversion factors, and equations.

Homework
Homework assignments are due by midnight on the day indicated in the course schedule. Students are encouraged to engage in group-study and may verbally discuss general approaches to problem assignments. However, solutions must be the sole work of the submitting student. In other words, viewing and/or copying of another person's work and submitting it as your own is considered cheating and will be reported to the Office of Academic Integrity immediately and without a warning. Since verbal discussion is encouraged, students who do so should include an acknowledgements statement at the end of their submitted solutions stating the names of other students they spoke with about the problems. This acknowledgement is typical for industrial documentation requirements and, as such, is a good habit to practice. Its presence will in no way affect grading. Additional specific guidance will be given in the case of group projects. When submitted coursework incorporates material authored by a third party, the source should always be attributed according to the accepted standards of scholarly endeavor. Materials taken from the internet or other forms of electronic media are subject to the same requirements of attribution applicable to printed reference sources or materials. Work suspected of plagiarism will receive no credit. Students may not receive any form of help from other students during exams and the final.

Integrity
In cases of suspected academic dishonesty, including cheating in an examination, copying another student's homework problem solutions, or altering graded work and resubmitting it, the associated evidence will be immediately referred to the Office of Academic Integrity where the case will be deliberated. The academic penalty for serious academic dishonesty will generally be a grade of F. Under certain circumstances, such dishonesty may also result in a permanent record of the offense on the student's file, which may be discoverable by future employers. More information including full descriptions of these policies as well as others regarding exams, grading policies, etc. can be found at
https://students.ucsd.edu/academics/academic-integrity/index.html.

Homework and Exam Submission Guidelines
The final version of your work must be submitted for grading through Gradescope. Late assignment submissions, whether approved for an extension or not, may be subject to a late penalty at the sole discretion of the instructor. We cannot guarantee that late assignments will be returned on time, and they may not be eligible for re-grading. Assignments received after worked solutions have been posted out will receive no credit.

In fairness to all students, work will only be re-graded after consideration of a request made through Gradescope when there is evidence of grading error. We reserve the right to regrade an entire piece of work, which may result in an overall grade that is lower or higher. The deadline for re-grade requests is 1 week after an assignment has been returned. After 1 week, re-grade requests will not be considered.

If a student is unable to take an exam for valid reasons, the student must notify the instructor immediately and all attempts will be made to offer an alternative time and equivalent exam. Valid reasons include serious illness and family emergencies. Documented proof of the reason for absence is required. For more information, see https://senate.ucsd.edu/operating-procedures/educational-policies/courses/epc-policies-on-courses/policy-exams-including-midterms-final-exams-and-religious-accommodations-for-exams/