

Engineering 96G
Introduction to Engineering Design: Go-Karts
Summer 2023 Syllabus

Lectures: Monday-Friday 9:00 am – 4:00pm Boelter Makerspace 1805 Elizabeth vB/Madeleine S.

Instructor of Record: Prof. Jacob Schmidt, Ph.D., schmidt@seas.ucla.edu, Engineering V 5121G

Group Tutors:

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Course Description: Welcome to UCLA and what may be your first engineering class! This course will be vastly different from your other courses as we will be exploring engineering through hands-on projects while learning to utilize many of the resources available in the Makerspace. This class will be led by undergraduate MAE students. This practical course aims to teach prospective engineers the thrill of a multi-discipline, end-to-end team-based engineering design. As with most large projects, they are broken into smaller cycles that will be solved independently, then integrated together. This project is constructed in such a way to optimize the student's time in each step of preliminary design, Computer Aided Design, Finite Element Analysis, machining, detailing electric motor performance, and finally presenting their ideal Go-Kart. Students have creative freedom in the following areas: driver posture, steering and braking mechanisms, chassis layout and driver interface system. Over the course of the project students will learn how to give technical presentations and learn fundamental engineering concepts. At the end of the course, teams will participate in a competition where they will give a design presentation and drive their vehicle through a timed track. The presentation will allow students to consider their design process and consider ways in which they can be more efficient. The kart race provides the source of system goals for their go karts. The program's design, build, test cycle will mimic working in a real-life, collaborative industry environment. Mentors will define the big picture and assist in removing impediments to progress.

Course Communication: Announcements, lecture slides, assignments, and other course materials will be posted on the UCLA Bruin Learn course website. Students are responsible for checking the site often and ensuring that they read all mass email announcements sent via the Bruin Learn website. A Groupme will also be created for the class. This will be used to

coordinate between classmates and instructors and serve as a forum to facilitate questions and discussion.

Resources:

Students will be given access to the SEASNET Computing resources, the UCLA Engineering Maker Spaces, and conditional access to various on campus engineering machine shops to design, manufacture, assemble, and test their vehicles.

For new engineering students, SEASnet accounts will be required to access computing resources such as Solidworks. If you do not have a SEASnet account, you should apply for one through the web at: <https://seas.ucla.edu/acctapp/>

SEASnet Applications take approximately 1 business day to process.

Tentative Course Outline and Schedule:

| Day | Topic | Goals |
|---------------|--|---|
| Week 1 | | |
| 1 | <p><i>Course Intro and CAD</i></p> <ul style="list-style-type: none"> - Introduce mentors and course - Computer-aided design in Solidworks (2D sketching, 3D modeling, and Assemblies) | <ol style="list-style-type: none"> 1. Design and create a steering wheel in Solidworks 2. Get familiar with sketching and 3D modeling in solidworks 3. Lab Safety Fundamentals Training 4. Get familiar with assemblies in Solidworks |
| 2 | <p><i>Teams and Begin Design</i></p> <ul style="list-style-type: none"> - Begin go-kart design in groups <p><i>Chassis</i></p> <ul style="list-style-type: none"> - Introduce chassis and begin designing your team’s chassis <p><i>Steering and Ergonomics</i></p> <ul style="list-style-type: none"> - Learn how to design cars ergonomically - Learn the fundamentals of steering to create a smooth driving experience for your go-kart <p><i>Merchandise competition</i></p> <ul style="list-style-type: none"> - Introduce team merchandise competition | <ol style="list-style-type: none"> 1. Break out into teams and start design of go-kart 2. Design and CAD chassis of go-kart 3. Get feedback on chassis design and revise |

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| 3 | <p>Brakes</p> <ul style="list-style-type: none"> - Learn how brake systems work <p>Steering</p> <ul style="list-style-type: none"> - Work on steering and do peer design review | <ol style="list-style-type: none"> 1. Give cut lists for chassis to instructors 2. Design, CAD, and peer review steering 3. |
| 4 | <p>Drivetrain and Electronics</p> <ul style="list-style-type: none"> - Learn how to get your go-kart rolling efficiently - Learn how to supply power to the motors and create a speedometer | <ol style="list-style-type: none"> 1. Design review class presentation: steering 2. Drivetrain / electronics design and CAD 3. Get feedback on brakes and drivetrain/electronics and revise |
| 5 | <p>3D Print Design Challenge</p> <ul style="list-style-type: none"> - Learn and work on 3D print challenge <p>Begin Manufacturing</p> <ul style="list-style-type: none"> - Start manufacturing go-kart and how to use tools | <ol style="list-style-type: none"> 1. Design Review: brakes/drivetrain/electronics 2. Learn about manufacturing 3. Work time for team perch challenge 4. Peer review: 3D print challenge |
| Week 2 (Holiday Monday) | | |
| 6 | <p>Aerodynamics</p> <ul style="list-style-type: none"> - Learn the aerodynamics of the go-kart <p>Finite Element Analysis</p> | <ol style="list-style-type: none"> 1. Finish designing and CADing go-kart 2. Present design review slides 3. Work time: explore Finite element analysis |
| 7 | <p>Manufacturing</p> <ul style="list-style-type: none"> - Students begin manufacturing go-kart | <ol style="list-style-type: none"> 1. Start work on building go-kart 2. 3D print design competition |
| 8 | <p>Work Day</p> <ul style="list-style-type: none"> - Continue designing and manufacturing go-kart <p>Electronic Wire</p> <ul style="list-style-type: none"> - Learn how to wire the electronics | <ol style="list-style-type: none"> 1. Work on building the go-kart 2. Work on slides / design portfolio |
| 9 | <p>Work Time</p> <ul style="list-style-type: none"> - Continue designing and manufacturing go-kart - Continue working on slides for final design reflection <p>Go-Kart Testing</p> <ul style="list-style-type: none"> - Learn how to effectively test go-kart | <ol style="list-style-type: none"> 1. Work on building the go-kart 2. Start assembly of electronic components |
| 10 | <p>Work and Testing Day</p> | <ol style="list-style-type: none"> 1. Finish merch manufacturing |

| Week 3 | | |
|--------|---|--|
| 11 | Manufacture day Makerspace scavenger hunt - Learn the way around the makerspace | 1. Continue to build go-kart and make changes if necessary |
| 12 | Manufacture/Test Dat - Continue testing go-kart determine strength of design | 1. Test the go-kart 2. Fix go-kart if necessary |
| 13 | Test Race - Practice race to test go-kart and practice driving | 1. Practice driving the course and test the go-kart 2. Make any changes if necessary |
| 14 | Final Work Day - Continue to test and complete the go-kart - Work and finish presentation | 1. Test and fix go-kart 2. Add finishing touches 3. Finish design portfolio slides |
| 15 | Final Presentations - Student groups recap what they did over the 3 weeks Race - Race the go-karts and give out awards | 1. Present the design portfolio slides to the class 2. Race the go-karts 3. Awards ceremony 4. Course evaluations |

Grading Policy:

- Since this is a 2 unit, letter graded course, much of what you get out of this course depends on the amount of work you put in. It's early in your engineering studies/career, so we understand that go-karts may end up not being something you are passionate about. However, there is a minimum standard that all students will be held to. Requirements are reflected in the grading scheme and include the following: attendance and active participation at every class session, active participation in your project groups, completion of smaller assignments, and participation in group project presentations.

Course Point Opportunities:**• Class Attendance**

- 2 points per day, 1 for morning and 1 for afternoon
- 1 point per day for participation

• Videos, Tasks, Assignments

- Points will be assigned on
bruinlearn

• Design Reviews and Final Project

- Worth 10 points, Final is 25
- Bonus Points = up to +15

Letter Grade Rubric (%)

- A+:** ≥ 100
- A:** ≥ 90 and < 100
- B:** ≥ 80 and < 90
- C:** ≥ 70 and < 80
- D:** ≥ 60 and < 70
- F:** < 60

- Course attendance is extremely important. If you need to miss a class, please contact an instructor at least 3 days in advance. Excused absences will be given to those with acceptable excuses.
- If you are concerned about your level of participation in the class and whether this may result in a failing grade, please approach any of the instructors and talk about it before dropping the course. We understand it can be a difficult transition to a college level class and want to be able to support you. Please do not wait until the last minute to bring up any concerns.

Academic Integrity:

- UCLA expects and requires all of its students to act with honesty and integrity, and respect the rights of others in carrying out all academic assignments and projects.
- Working in groups is allowed and encouraged. However, submitting the work of others, cheating, and plagiarism are unacceptable. The key to working in an effective group is compiling input from all members and making equal contributions.
- In accordance with UCLA policy, any cases of suspected cheating or academic dishonesty will be reported to the Dean of Students Office and the Department of Student Affairs. Sanctions may include zero credit on an assignment or a no-pass. If warranted, a student may be disqualified, suspended, or expelled from the School of Engineering. It is your responsibility to know and understand the University Academic Integrity Policy and the UCLA Student Code of Conduct (<http://www.deanofstudents.ucla.edu/>).

Additional Information:

- Counseling and Psychological Services (CAPS) exists to support your mental health needs as you pursue your academic goals. CAPS services are designed to foster the development of healthy well-being necessary for success in a complex environment. A variety of services are available including: crisis counseling by phone 24/7, emergency

intervention, Individual counseling and psychotherapy, group therapy, psychiatric evaluation and treatment, educational programs and workshops, campus mental health and wellness promotion. Visit <https://www.counseling.ucla.edu/> for more information or call 310-825-0768. For emergencies, please contact 911.

- Students requesting accommodations for a disability, including additional time or resources for taking exams, must be registered with the UCLA Center for Accessible Education (CAE; <http://www.cae.ucla.edu/>) and must submit appropriate documentation from the CAE.
- Title IX prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. If you have experienced sexual harassment or sexual violence, you can receive confidential support and advocacy at the CARE Advocacy Office for Sexual and Gender-Based Violence, 1st Floor Wooden Center West, CAREadvocate@caps.ucla.edu, (310) 206-2465. In addition, Counseling and Psychological Services (CAPS) provides confidential counseling to all students and can be reached 24/7 at (310) 825-0768. You can also report sexual violence or sexual harassment directly to the University's Title IX Coordinator, 2241 Murphy Hall, titleix@conet.ucla.edu, (310) 206-3417. Reports to law enforcement can be made to UCPD at (310) 825-1491.
 - Faculty and Group Tutors are required under the UC Policy on Sexual Violence and Sexual Harassment to inform the Title IX Coordinator should they become aware that you or any other student has experienced sexual violence or sexual harassment.

Feedback/Suggestions:

We take feedback and suggestions very seriously in this course. Since this is a new class, we are always looking for ways to make it better--more educational, engaging, and exciting. Please feel free during any time to use the following form to anonymously submit course feedback. It will be checked regularly. In addition, we will be sending out a more formal mid-course evaluation form around Day 8 (Wednesday of Week 2) and a final course evaluation form on the last day of class.