Engineering 96A - Introduction to Engineering Design: Rockets
Spring 2019 Syllabus

Lecture 3: Wednesday 2 – 4:50pm Boelter Hall 2808 Christopher V./Alex L./Caleb L.

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

Group Tutors:

Name: Christopher Vincent
4th year, Mechanical Engineering
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Name: Alex Lima
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Name: Caleb Lessard-Clouston
3rd year, Mechanical Engineering
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Office Hours: W 8am - 10am and F 10am - 11am

All office hours held in the Lower Makerspace - Boelter 1805 unless otherwise announced.

Course Description: Welcome to UCLA and what may be your first engineering class! This course will be vastly different from your other classes as we will be exploring engineering through hands-on projects while learning to utilize many of the resources available in the new Makerspace. Additionally, this class will be led by the Group Tutors, upper-level undergraduate MAE students who have experienced many of the things you may be looking forward to during your time at UCLA. We will explore aerodynamics, computer-aided design, 3D printing, composite layup, machining, telemetry, and mechanical design and assembly. You will be working in teams to construct and test 2 projects: small 3D-printed rockets and larger, high-power rockets. The class will culminate in a field trip to the Mojave desert to launch your own rockets along with a presentation to peers and other guests.

Course Communication: Announcements, lecture slides, assignments, and other course materials will be posted on the UCLA CCLE course website (https://ccle.ucla.edu/course/view/19S-ENGR96A-3). Students are responsible for checking the site often and ensuring that they receive mass e-mail announcements sent via the CCLE website. A unified Slack channel will also be created for both lectures. This will be used to coordinate between classmates and instructors and as a forum to facilitate questions and discussion. Additionally, the course outline will be updated as needed.

Updated: 3/31/2019
### Course Outline and Schedule:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Assignments and Videos</th>
</tr>
</thead>
</table>
| 1    | **Space Today and Rocketry Basics**  
- Get excited about rockets and the space industry!  
- Introduce software to be used in class  
- Fundamentals of rocket design and OpenRocket  
- Walkthrough of the Makerspace and labs | **Assignments**  
- Download software (CAD, OpenRocket)  
- Join Slack  
- Form 3DPR pairs  
- Begin OpenRocket Design  
**Videos:** SolidWorks Intro and OpenRocket Intro |
| 2    | **CAD Basics**  
- Fundamentals of CAD  
- Begin design of 3DPR | **Assignments**  
- Finish OpenRocket design  
- Begin Rocket CAD  
- CAD Task  
**Videos:** SolidWorks Assemblies and Drawings and Rocket CAD Walkthrough |
| 3    | **Flight Dynamics**  
- Fundamentals of rocket flight (forces, analysis, dynamics, etc.)  
- Begin build of 3DPR | **Assignments**  
- Finish Rocket CAD  
- Print 3DPR  
- Rocketry Basics and Flight Analysis  
**Video:** 3D Printing |
| 4    | **First Flight**  
- Launch 3DPR | **Assignments**  
- 3DPR Reflection and Evaluation |
| 5    | **Materials and Manufacturing**  
- Fundamentals of material selection  
- Manufacturing techniques and considerations  
- Makerspace tool and machine demonstrations | **Assignments**  
- GHPR Project Outline and Timeline  
- Begin design of GHPR |
| 6    | **All Systems Go**  
- Organization that goes on during engineering projects (systems and management) | **Assignments**  
- Preliminary Design Review (PDR) Preparation  
- Finish design of GHPR |
| 7    | **Presenting Rocket Designs**  
- Preliminary Design Review presentations to class  
- Gain feedback on design of GHPR and work on improvements  
- Begin manufacturing of GHPR | **Assignments**  
- Manufacturing: finish body tubes, nose cone, fins  
**Video:** Rocket Propulsion Basics |
| 8    | **Propulsion Overview**  
- Learn about different current rocket propulsion technologies  
- Build GHPR | **Assignments**  
- Continued manufacturing; completion of nose cone and fins  
- Propulsion Technologies  
- Group Flight Readiness Reviews (FRR) |
| 9    | **Ready to Launch**  
- Learn about rocket launch safety and procedures  
- Prepare GHPR for launch  
- Group Flight Readiness Reviews (FRR) | **Assignments**  
- Finish GHPR assembly  
**Video:** Launch Safety and Preparation |
| 10   | **Launch Day in Mojave Desert**  
- Field Trip | **Assignments**  
- Download and analyze flight data  
- Final Presentation and Reflection  
- Good luck on finals! |
|      | **A Rocketry Reflection**  
- Present an overview of what was learned over the quarter and results of the GHPR | **Assignments**  
- Download and analyze flight data  
- Final Presentation and Reflection  
- Good luck on finals! |

**Updated:** 3/31/2019
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 rockets 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.

- The grading has been designed to both reward extra effort and account for missing requirements. There will be bonus points available for innovative rocket designs and optimum rocket performance. Each student will begin with 90 points and deductions and additions will be made as follows. Additionally, a portion of your grade will be determined by peer evaluation within your project groups.

<table>
<thead>
<tr>
<th>Course Point Opportunities</th>
<th>Letter Grade Rubric</th>
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<tbody>
<tr>
<td>Enrollment +95</td>
<td>A+: ≥ 100</td>
</tr>
<tr>
<td>Class Attendance</td>
<td>A: ≥ 90 and &lt; 100</td>
</tr>
<tr>
<td>&lt; 9 = -10</td>
<td>B: ≥ 80 and &lt; 90</td>
</tr>
<tr>
<td>&lt; 8 = -40</td>
<td>C: ≥ 70 and &lt; 80</td>
</tr>
<tr>
<td>Videos, Tasks, Assignments</td>
<td>D: ≥ 60 and &lt; 70</td>
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<tr>
<td>&gt; 4 Incomplete = -10</td>
<td>F: &lt; 60</td>
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<tr>
<td>3DPR and GHPR Project</td>
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<tr>
<td>Each Incomplete = -10</td>
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<tr>
<td>Bonus Points = up to +15</td>
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- 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 college and want to be able to support you. Please do not wait until the last minute to bring up any concerns.

Optional Reading:

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.
This Group Tutors of this course acknowledge the Gabrielino/Tongva peoples as the traditional land caretakers of Tovaangar (the Los Angeles basin and So. Channel Islands). As a land grant institution, we pay our respects to the Honuukvetam (Ancestors), 'Ahiihirom (Elders), and 'Eyoohiinkem (our relatives/relations) past, present, and emerging.

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 Week 5 and a final course evaluation form after Week 10.

https://goo.gl/forms/woJqAtpb6MwheZlx1