Colorado Space Grant Consortium

Student Positions

Space Grant is seeking students from all backgrounds & majors with an interest in gaining real-world, hands-on experiences. All levels of experience, first-year to graduate level, should apply.

Spring 2020 Positions

1. GLEE
2. Simulated Reduced Gravity Microbial Research
3. RockOn
4. Miniature Steerable Parachutes
5. RocketSat
6. Releasable Seal for a Reusable Stratospheric Balloon
GLEE

GLEE is a unique mission that involves global collaboration to perform science on the lunar surface. This fall semester students will further the work done from this past summer. Students will work with the diverse team and staff here at COSGC along with students from Cornell University to make this ambitious mission a reality.

GLEE will use palm-sized packages called LunaSats. A LunaSat weighs ~5 grams, is ~0.17 x 4 x 4 cm in size and is flexible. They are Arduino based and have an extensive sensor suite (accelerometer, temperature, magnetometer, gyroscope, pressure, humidity, and GPS) as well as communication and power systems. GLEE will fly 500 LunaSats in a 3U CubeSat to the lunar surface and is scalable if launch conditions allow.

GLEE currently has a team with multiple backgrounds and involves students from engineering, science, space policy/law, business, marketing, media, education, and international relations. While there are some conceptual designs, ideas for marketing and international connections much of this semester will be spent finalizing and developing these aspects carried over from the summer. These details include but are not limited to: creating international connections, developing app, vlog and distribution media, general marketing, iterating on designs for the spacecraft (communication, power, structures etc.), designing missions to be done on the lunar surface with the LunaSats, developing software and electrical power systems, proposal writing, presentations, space policy/law and international law research, creation of briefings for NASA, companies and foreign governments, expansion on budgets and funding models, designing a new iteration of the LunaSats.

Current Position Openings:

- GLEE Electrical Engineer
- GLEE Mechanical
- GLEE Science Team Member
- Open to CU Boulder students

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<table>
<thead>
<tr>
<th><strong>Job Title:</strong> GLEE Electrical Engineer</th>
<th><strong>Position #:</strong> G01</th>
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<tbody>
<tr>
<td><strong>Project:</strong> GLEE</td>
<td><strong>Available Positions:</strong> 2</td>
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</table>

**Description:** Students working with the GLEE LunaSat subsystem will design and prototype LunaSats for use in this mission. Students will be specifically working on RF and antenna design and also designing a PCB to meet the mission requirements.

Majors: Electrical Engineering  
Grade Level: Junior, Senior

**Minimum Requirements**
- Experience with board layout (Altium/EAGLE/Ultiboard/MentorGraphics)  
  - a) Specifically, dealing with cross-talk, EMI pick-up noise, etc.
- Interested in RF and antenna design

**Desired Skills**
- Experience in schematic level design (and simulation, LTSpice/ORCAD/MultiSim/MentorGraphics/<insert your favorite simulation package here>)
- Prior experience in dealing with LNAs, and low noise/low voltage circuits
- Signal processing to extract information at low SNRs.
- RF and antenna design experience

**Time Commitment:** 6-10 hours/week
<table>
<thead>
<tr>
<th>Job Title:</th>
<th>GLEE Mechanical Engineer</th>
<th>Position #:</th>
<th>G02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project:</td>
<td>GLEE</td>
<td>Available Positions:</td>
<td>2</td>
</tr>
</tbody>
</table>

**Description:** Students working with the GLEE Spacecraft subsystem will work on a team to finalize designs and manufacture a 3U CubeSat to deploy the LunaSats on the lunar surface. Design considerations include integration to a commercial lunar lander.

**Minimum Requirements**
- Majors: Mechanical engineering
- Grade level: Junior or Senior
- Intermediate or higher CAD experience

**Desired Skills**
- Previous experience working on a project
- Machining Experience
- Finite Element Analysis experience
- Familiarity with space and/or space missions

**Time Commitment:** 6-10 hours/week
<table>
<thead>
<tr>
<th><strong>Job Title:</strong></th>
<th>GLEE Science Team Member</th>
<th><strong>Position #:</strong></th>
<th>G03</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project:</strong></td>
<td>GLEE</td>
<td><strong>Available Positions:</strong></td>
<td>2</td>
</tr>
</tbody>
</table>

**Description:** Students working with the GLEE Science subsystem will research several lunar science applications of LunaSats and work with the LunaSat subsystem to ensure a successful mission design. Students will also be responsible for structuring data analysis for post-mission processing and other aspects of a science experiment proposal.

**Minimum Requirements**
- Physical Science Major
- Junior or senior
- Interest in space and the moon

**Desired Skills**
- Previous experience working on a project
- Familiarity with space and/or space missions
- Experience with study design
- Experience with sensors

**Time Commitment:** 6-10 hours/week
NASA-funded Simulated Reduced Gravity Microbial Research

Project Description

Humans will soon explore, live, and work on the Moon and Mars. How do microbes behave when they grow at those gravities (the Moon has about one sixth of Earth’s gravitational pull, while Mars has about a third)? Will we need different doses of antibiotics to fight bacterial infections depending on where (Earth, lower Earth orbit, the Moon, or Mars) they are occurring? Micro- (as astronauts currently experience on board the International Space Station), Lunar, and Martian gravities are simulated using a device called Clinostat, which doesn't remove the gravitational pull of Earth but allows scientists to replicate some aspects of the environment around cells at different gravitational environments.

Project Objectives

This NASA funded project aims to, among other things, determine if there are changes in the concentrations of drugs needed to inhibit microbial growth at different gravitational regimes. This systematic microbial study includes multiple commensal, opportunistic, and pathogenic bacterial and fungal strains.
<table>
<thead>
<tr>
<th><strong>Job Title:</strong> Undergraduate Research Assistant</th>
<th><strong>Position #:</strong> BIO_01</th>
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</thead>
<tbody>
<tr>
<td><strong>Project:</strong> Clinostat Research</td>
<td><strong>Available Positions:</strong> 2</td>
</tr>
</tbody>
</table>

**Description:** Students will work in the BioServe lab with Dr. Luis Zea to study bacterial resistance to antibiotics in different simulated reduced gravity environments. This section of the study will focus on non-pathogenic *E. Coli* and require learning how to use specialized laboratory equipment used during space life science research. A minimum of 4 continuous hours a week commitment is required.

**Useful Skills**
- Wet Lab experience (classroom or otherwise)

**Required Skills**
- Biology or related major
- Interest in space life science
- Successful completion of all biosafety training required by CU & BioServe to handle microbes (to be taken once project starts)

**Time Commitment:** 4-8 hours/week
RockOn

Project Description

The RockOn workshop is a six day hands-on workshop held every June at NASA's Wallops Flight Facility. Approximately 90 college students and faculty participate each year. During the workshop, participants form teams of three and proceed to build a sounding rocket payload from a prepared kit over the first three days. The payload is then launched to 72 miles on a Terrier-Improved Orion sounding rocket on the fifth day. The payloads are recovered and the teams analyze their data.

<table>
<thead>
<tr>
<th>Job Title: Prep Team Member</th>
<th>Position #: RW01</th>
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</thead>
<tbody>
<tr>
<td>Project: RockOn 2020</td>
<td>Available Positions: 3-5</td>
</tr>
</tbody>
</table>

**Description:** The work this semester will focus on preparing the kits as well the handbook/teaching materials for the workshop. The goal is to have all the kits, handbooks, and equipment ready to ship by May 22, 2020. There will be at least one weekly meeting with the team plus common work hours at least twice a week.

**Useful Skills**
- Engineering student
- Attention to detail
- Some experience with either Arduino, electrical design, coding, PowerPoint, and/or machining

**Required Skills**
- Work well on a team
- Learn quickly
- Very organized

**Additional Time Requirements**
- **Required:** Members of this team traveling to workshop are required to attend a walk-through where members construct a payload during a two-day expedited workshop run-through taking place usually over Spring Break or over a weekend during the spring semester.
- **Preferred:** Available to assist in final preparations and shipping all materials to the Wallops Flight Facility during the summer (May and June).
- **Preferred:** Available to assist in the workshop at the Wallops Flight Facility in June (travel dates June 17 - 26, 2020).

**Time Commitment:** 8-10 hours/week

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Miniature Steerable Parachutes: Targeted Payload Return

Project Description

The concept of using a steerable and/or autonomous system for targeted landing has been explored by many researchers, including the high-altitude scientific balloon payload community and engineers and scientists interested in on-demand International Space Station sample return. Working with mentors from CU’s Laboratory for Atmospheric and Space Physics this team will explore the possibility of self-recovering payloads utilizing steerable parachutes, including the design, build, and testing of the system.

<table>
<thead>
<tr>
<th>Job Title: All project positions available</th>
<th>Position #: SP1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project: Steerable Parachute</td>
<td>Available Positions: 8-10</td>
</tr>
</tbody>
</table>

**Description:** This is a new project and therefore all positions are currently available. When you apply for this project, be sure to discuss what skills you bring to the project, what skills you are hoping to develop/hone on the project, what team you hope to join and why (i.e. power, systems, structure, software, etc).

**Useful Skills**
- Previous project experience helpful
- One or more of the following basic coding, basic use of machine shop, basic use of various software applications (i.e. SolidWorks, Altium, etc.), basic use of microcontrollers, basic electronics design, etc.

**Required Skills**
- Ability to work effectively on a team.

**Time Commitment:** 6-10 hours/week
RocketSat

Project Description

Be on a team that will design a sounding rocket payload that will go 98 miles into space. The team will continue a mission that was started last year and complete the design during the fall semester, bringing the design to a Critical Design Review level by the start of Spring semester. During Spring semester, the team will build and test the payload preparing it for launch in August of 2020 from NASA’s Wallops Flight Facility.

RocketSat-13 Project Description:

The University of Colorado Boulder’s RocketSat-13 is working to design a strain energy actuated deployment of a panel stack, sequenced by pin/socket mechanisms, in partnership with ROCCOR (https://roccor.com).

RocketSat-13 will return the flight data (IMU, video, downlinked images, and environmental) to ROCCOR after data analysis has been performed (using methods developed throughout the year). This data will be used for modeling and verification of deployment.

Current Position Openings:

- Avionics Lead
- Avionics Team Member
- Science Lead
- Science Team Member
- Open to CU Boulder students

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<table>
<thead>
<tr>
<th><strong>Job Title:</strong></th>
<th>Avionics Lead</th>
<th><strong>Position #:</strong></th>
<th>R01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project:</strong></td>
<td>RocketSat-13</td>
<td><strong>Available Positions:</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

**Description:**
As Avionics Lead, you are responsible for managing the avionics subteam to ensure all tasks are completed by launch. Avionics is responsible for integration and testing of flight hardware, rocket interfacing (power and telemetry), and maintaining the functional block diagram, schematics, and power budget. A member of the avionics team is expected to have programming skills to write and work with the software for all the electronics, solder, and have some experience with microcontrollers and PCB design.

**Required Skills**
- Programming experience
- Soldering
- Schematics
- PCB Design and manufacturing
- Leadership experience

**Recommended Skills**
- Experience working with IMU’s

**Time Commitment:** 10 hours/week
<table>
<thead>
<tr>
<th><strong>Job Title:</strong> Avionics Team Member</th>
<th><strong>Position #:</strong> R02</th>
</tr>
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<tbody>
<tr>
<td><strong>Project:</strong> RocketSat-13</td>
<td><strong>Available Positions:</strong> 2-3</td>
</tr>
</tbody>
</table>

**Description:**
Avionics is responsible for integration and testing of flight hardware, rocket interfacing (power and telemetry), and maintaining the functional block diagram, schematics, and power budget. A member of the avionics team is expected to have programming skills to write and work with the software for all the electronics, solder, and have some experience with microcontrollers and PCB design.

**Required Skills**
- Programming experience
- Soldering
- Schematics
- PCB Design and manufacturing

**Recommended Skills**
- Experience working with IMU’s

**Time Commitment:** 8-10 hours/week
<table>
<thead>
<tr>
<th><strong>Job Title:</strong></th>
<th>Science Lead</th>
<th><strong>Position #:</strong></th>
<th>R03</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project:</strong></td>
<td>RocketSat-13</td>
<td><strong>Available Positions:</strong></td>
<td>1</td>
</tr>
</tbody>
</table>

**Description:**
The Science Lead is responsible for ensuring science mission goals are met and all tasks are completed by launch. Science is responsible for hardware selection and testing, data analysis for both test and flight data, and developing methods for verification of deployment. A member of the science team is expected to have proficient MATLAB and programming skills.

**Required Skills**
- MATLAB proficiency
- Programming experience
- Math proficiency
- Understanding of dynamics and mechanics
- Leadership experience

**Time Commitment:** 10 hours/week
<table>
<thead>
<tr>
<th>Job Title: Science Team Member</th>
<th>Position #: R04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project: RocketSat-13</td>
<td>Available Positions: 1-2</td>
</tr>
</tbody>
</table>

**Description:**
Science is responsible for hardware selection and testing, data analysis for both test and flight data, and developing methods for verification of deployment. A member of the science team is expected to have proficient MATLAB and programming skills.

**Required Skills**
- MATLAB proficiency
- Programming experience
- Math proficiency
- Understanding of dynamics and mechanics

**Time Commitment:** 8-10 hours/week
Releasable Seal for a Reusable Stratospheric Balloon

Project Description:

The National Weather Service launches over 60,000 stratospheric sounding balloons every year in the U.S. alone. These balloons carry radiosondes. The data is used to predict storms, natural disasters and basic weather information used to make forecasts. These systems are one-time use, only allow for data capture on ascent, and litter over 75,000 lbs. of rubber and electronics onto the ground each year. This project will help develop a fully reusable, small, self-terminating stratospheric balloon that becomes its own parachute on descent. The addition of controlled, reduced velocity descent would allow the NWS to collect double the amount of sounding data for weather forecasts (on both ascent and descent) while also providing a fully reusable balloon that will significantly reduce cost and environmental waste.

<table>
<thead>
<tr>
<th><strong>Job Title:</strong> Stratospheric Test Engineer</th>
<th><strong>Position #:</strong> SB_01</th>
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</thead>
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<tr>
<td><strong>Project:</strong> Releasable Seal for Balloon</td>
<td><strong>Available Positions:</strong> 1-3</td>
</tr>
</tbody>
</table>

**Description:** To develop the world's first self-terminating reusable stratospheric balloon, a unique seal is required that releases when it encounters a certain pressure. This project will be to produce a concept for a seal that releases when it pressurizes. The test engineer will build a prototype of the seal and iteratively test that seal to verify its functionality and reliability. The project will culminate in a stratospheric test flight where the prototype tube will be sent to the stratosphere and allowed to pressurize under natural conditions to show it function in its intended environment.

**Useful Skills**
- Test fixture design, assembly and use
- Soft goods fabrication (sewing and sealing of fabrics)

**Required Skills**
- Basic fabrication
- Component testing

**Time Commitment:** 4 hours/week

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That concludes Spring 2020 postings. Please keep an eye out for updates as the semester progresses.