

# Spacecraft Design Lab

AA136/236

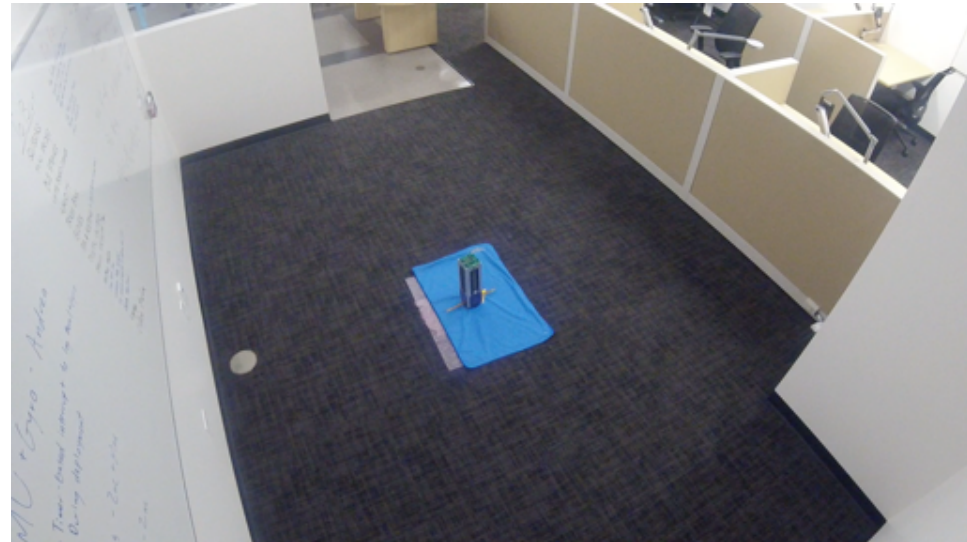


Course Logistics

# Teams: Mechanical/Mechanisms

## Responsibilities:

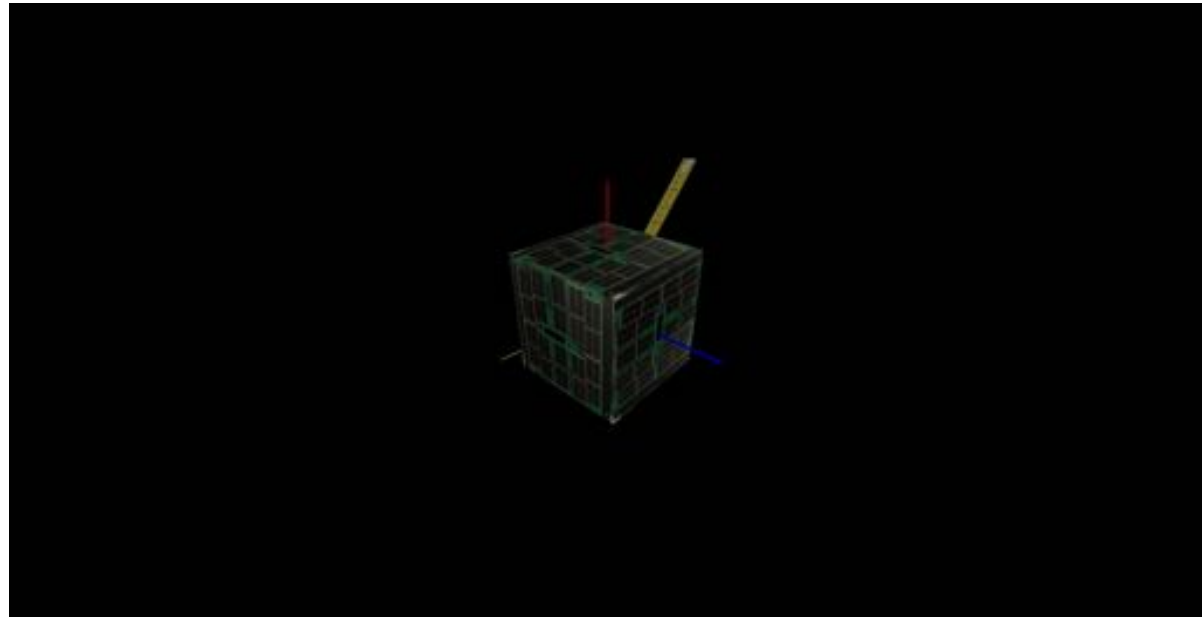
- Spacecraft Structure
- Deployment mechanisms
- Batteries
- Thermal
- Vibration
- Materials Selection
- Mass/Inertia Properties



# Teams: Software/GNC

## Responsibilities:

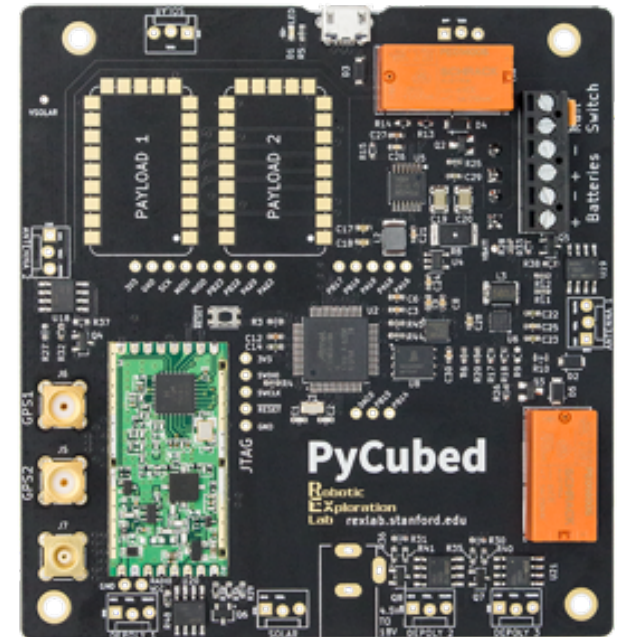
- Main flight software state machine
- Spacecraft simulation
- Attitude determination filter
- Controller implementation
- Hardware in the loop testing



# Teams: Flight Computer/Sensors

## Responsibilities:

- PyCubed PCB layout + fabrication
- Torque coil drive electronics
- Camera
- Radio
- Low-level hardware-interface code



# Teams: Electrical/Actuators

## Responsibilities:

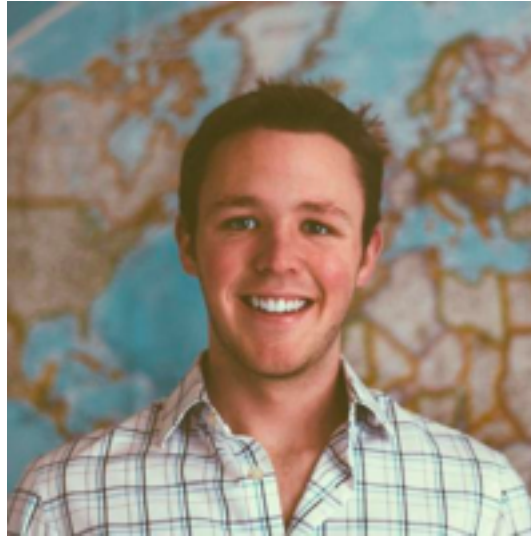
- Solar panel design + fabrication
- Magnetic torque coil design + fabrication
- Antenna design + fabrication
- Power budgets
- RF link budgets
- Radio testing



# Teaching Team



Zac Manchester  
Assistant Professor  
Lead Instructor



Max Holliday  
Grad Student  
Avionics/Electrical Lead



Andrew Gatherer  
Grad Student  
Mechanical/GNC Lead

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# First Assignment

1. Join the course Slack workspace (SpacecraftDesignLab) and briefly introduce yourself in the #introductions channel.

# First Assignment

The screenshot shows a Slack interface on a desktop. On the left is a dark purple sidebar with the workspace name 'SpacecraftDesi...' and a user list under 'Direct Messages'. The main area on the right shows the '#introductions' channel. At the top of the channel, it says 'You created this channel today. This is the very beginning of the #introductions channel. Purpose: Say hello to the rest of the class (edit)'. Below this, a message from 'Zac Manchester' at 4:09 PM says 'joined #introductions.' and another message from 'Zac Manchester' at 4:09 PM says 'set the channel purpose: Say hello to the rest of the class'. The bottom of the screen shows a text input field with the placeholder 'Message #introductions'.

**SpacecraftDesi...**

Zac Manchester

Jump to...

Threads

**Channels**

- # general
- # introductions**
- # physics-model-learn
- # random

+ Add a channel

**Direct Messages**

- Slackbot
- Zac Manchester (you)
- Allan Shiofenmakher
- Andrew Gatherer
- Andrew Gatherer, Max ...
- Brian Jackson
- Jan Bruedigam
- Kunal Menda, Jayesh, Je...
- Laura Lee
- matthew\_robert\_poole
- Max Holliday
- Nathan Kau
- Remy Deroillez

**#introductions**

1 0 Add a topic

**#introductions**

You created this channel today. This is the very beginning of the **#introductions** channel. Purpose: Say hello to the rest of the class ([edit](#))

[+ Add an app](#) [Add people to this channel](#)

Today

**Zac Manchester** 4:09 PM  
joined #introductions.

**Zac Manchester** 4:09 PM  
set the channel purpose: Say hello to the rest of the class

Message #introductions



# First Assignment

1. Join the course Slack workspace (SpacecraftDesignLab) and briefly introduce yourself in the #introductions channel.
2. Make sure you are a member of the GitHub organization “spacecraft-design-lab-2019”
3. Take a look at the issues on the Kanban

# First Assignment

The screenshot shows a web browser window with the URL `github.com/orgs/spacecraft-design-lab-2018/projects/1`. The page displays the 'Spacecraft Design Lab' GitHub project board. The top navigation bar includes links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. Below the navigation bar, the project name 'Spacecraft Design Lab' is shown, along with tabs for 'Repositories', 'Packages', 'People', 'Teams', 'Projects', and 'Settings'. The 'Projects' tab is active, showing a Kanban board for the project 'PyCubed-1', which was updated 2 hours ago. The board has three columns: 'To do', 'In progress', and 'Done'. The 'To do' column contains a large task card about reading documentation and adding items to a requirements wiki, followed by four smaller cards for 'Attitude Sensor Survey', 'Radio Survey', 'Battery Survey', and 'Solar Cell Survey'. The 'In progress' and 'Done' columns are currently empty. A search bar labeled 'Filter cards' is located at the top right of the board area, and a '+ Add column' button is at the bottom right.

PyCubed-1  
Updated 2 hours ago

Filter cards

+ Add cards    Fullscreen    Menu

**To do**

- Read the AlbaPod ICD and the PocketQube specification in the documentation repo. Look at the Requirements wiki page and add anything you can think of to the section for your team. We will refine these next week.  
Added by zacmanchester
- Attitude Sensor Survey  
documentation#1 opened by zacmanchester
- Radio Survey  
documentation#3 opened by zacmanchester
- Battery Survey  
documentation#4 opened by zacmanchester
- Solar Cell Survey  
documentation#5 opened by zacmanchester

**In progress**

**Done**

+ Add column

# First Assignment

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3. Take a look at the issues on the Kanban
4. Each team has a component selection survey assigned. Do some research and fill in the corresponding wiki page.

# First Assignment

The screenshot shows a web browser window displaying a GitHub Wiki page. The browser's address bar shows the URL `github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey`. The GitHub navigation bar at the top includes a search bar and links for Pull requests, Issues, Marketplace, and Explore. Below the navigation bar, the repository path `spacecraft-design-lab-2019 / documentation` is shown, along with buttons for Watch, Star, and Fork. A secondary navigation bar contains links for Code, Issues, Pull requests, Projects, Wiki (which is highlighted), Security, Insights, and Settings. The main content area features the title 'Battery Survey' with an 'Edit' button and a green 'New Page' button. Below the title, it states 'Zac Manchester edited this page 16 hours ago · 2 revisions'. A section titled 'Requirements:' contains a bulleted list with one item: '• Must have no dimension larger than 45mm'. Below this is a table with six columns: Link, Dimensions, Mass, Voltage, Capacity, and Max Discharge Rate. At the bottom of the main content area is a button that says '+ Add a custom footer'. On the right side, there is a 'Pages' sidebar with a search bar and a list of links: Home, Attitude Determination Sensor Survey, Battery Survey, Radio Survey, Requirements, Solar Cell Survey, and Vacuum Exposed Materials List. At the bottom of the sidebar is a button that says '+ Add a custom sidebar'. At the very bottom of the page, there is a section titled 'Clone this wiki locally' with a text input field containing the URL `https://github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey` and a button with a download icon.

Battery Survey - spacecraft-design-lab-2019

GitHub, Inc. [US] | github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey

Search or jump to... Pull requests Issues Marketplace Explore

spacecraft-design-lab-2019 / documentation Watch Star Fork

Code Issues Pull requests Projects Wiki Security Insights Settings

## Battery Survey

Edit New Page

Zac Manchester edited this page 16 hours ago · 2 revisions

### Requirements:

- Must have no dimension larger than 45mm

Link	Dimensions	Mass	Voltage	Capacity	Max Discharge Rate
+ Add a custom footer					

#### Pages

Find a Page...

- Home
- Attitude Determination Sensor Survey
- Battery Survey
- Radio Survey
- Requirements
- Solar Cell Survey
- Vacuum Exposed Materials List

+ Add a custom sidebar

Clone this wiki locally

https://github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey

# First Assignment

1. Join the course Slack workspace (SpacecraftDesignLab) and briefly introduce yourself in the #introductions channel.
2. Make sure you are a member of the GitHub organization “spacecraft-design-lab-2019”
3. Take a look at the issues on the Kanban
4. Each team has a component selection survey assigned. Do some research and fill in the corresponding wiki page.
5. Each team must also think about and fill in some subsystem-level requirements on the wiki.

# First Assignment

The screenshot shows a web browser window displaying the GitHub Wiki page for the repository 'spacecraft-design-lab-2019'. The page title is 'Requirements', and it was last edited by 'Zac Manchester' 16 hours ago. The page content is organized into sections: 'Mission Level', 'Mechanical/Structure/Batteries', 'Flight Computer/Sensors', 'Solar Panels/Torque Coils/Antennas', and 'GNC/Flight Software'. The 'Mission Level' section contains a list of seven requirements. On the right side, there is a 'Pages' sidebar with a search bar and a list of links to other wiki pages. At the bottom right, there is a section for cloning the wiki locally.

Requirements

Zac Manchester edited this page 16 hours ago · 3 revisions

[Edit](#) [New Page](#)

## Mission Level

1. The spacecraft shall achieve a pointing accuracy of 10 degrees or better.
2. The spacecraft shall be capable of executing an arbitrary 180 degree slew in under 10 minutes.
3. The spacecraft shall capture color photos with at least VGA (640x480) resolution.
4. The spacecraft shall be capable of downlinking at least one full image per ground station pass.
5. The spacecraft shall support over-the-air software updates.
6. The spacecraft shall conform to the [1p PocketQube specification](#).
7. The spacecraft shall be compatible with the [AlbaPod deployer ICD](#).

## Mechanical/Structure/Batteries

## Flight Computer/Sensors

## Solar Panels/Torque Coils/Antennas

## GNC/Flight Software

**Pages**

Find a Page...

- [Home](#)
- [Attitude Determination Sensor Survey](#)
- [Battery Survey](#)
- [Radio Survey](#)
- [Requirements](#)
- [Solar Cell Survey](#)
- [Vacuum Exposed Materials List](#)

+ Add a custom sidebar

Clone this wiki locally

<https://github.com/spacecraft-design-lab-2019>

# First Assignment

1. Join the course Slack workspace (SpacecraftDesignLab) and briefly introduce yourself in the #introductions channel.
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3. Take a look at the issues on the Kanban
4. Each team has a component selection survey assigned. Do some research and fill in the corresponding wiki page.
5. Each team must also think about and fill in some subsystem-level requirements on the wiki.
6. Everyone must make at least one git commit.

# First Assignment

The screenshot shows a web browser window displaying a GitHub Wiki page. The browser's address bar shows the URL `github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey`. The GitHub navigation bar at the top includes a search bar and links for Pull requests, Issues, Marketplace, and Explore. Below this, the repository path `spacecraft-design-lab-2019 / documentation` is shown, along with buttons for Watch, Star, and Fork. A secondary navigation bar contains links for Code, Issues, Pull requests, Projects, Wiki (which is highlighted), Security, Insights, and Settings. The main heading of the page is 'Battery Survey', with a subtext indicating it was edited 16 hours ago. To the right of the heading are 'Edit' and 'New Page' buttons, with the 'Edit' button circled in red. The content area features a 'Requirements:' section with a single bullet point: 'Must have no dimension larger than 45mm'. Below this is a table with headers: Link, Dimensions, Mass, Voltage, Capacity, and Max Discharge Rate. At the bottom of the content area is a button to 'Add a custom footer'. On the right side, there is a 'Pages' sidebar with a search bar and a list of links: Home, Attitude Determination Sensor Survey, Battery Survey, Radio Survey, Requirements, Solar Cell Survey, and Vacuum Exposed Materials List. At the bottom of the sidebar is a button to 'Add a custom sidebar'. The footer of the page includes a link to 'Clone this wiki locally' and a URL `https://github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey`.

Battery Survey - spacecraft-design-lab-2019

GitHub, Inc. [US] | github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey

Search or jump to... Pull requests Issues Marketplace Explore

spacecraft-design-lab-2019 / documentation Watch Star Fork

Code Issues Pull requests Projects Wiki Security Insights Settings

## Battery Survey

Zac Manchester edited this page 16 hours ago · 2 revisions

**Requirements:**

- Must have no dimension larger than 45mm

Link	Dimensions	Mass	Voltage	Capacity	Max Discharge Rate
+ Add a custom footer					

**Pages**

Find a Page...

- Home
- Attitude Determination Sensor Survey
- Battery Survey
- Radio Survey
- Requirements
- Solar Cell Survey
- Vacuum Exposed Materials List

+ Add a custom sidebar

Clone this wiki locally

<https://github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey>



# First Assignment

Editing Battery Survey · spacex · X

Viewing a wiki's history of changes · X

GitHub, Inc. [US] | github.com/spacexcraft-design-lab-2019/documentation/wiki/Battery-Survey/\_edit

## Editing Battery Survey

Page History New Page Delete Page

Battery Survey

Write Preview

M H2 H3 Edit mode: Markdown

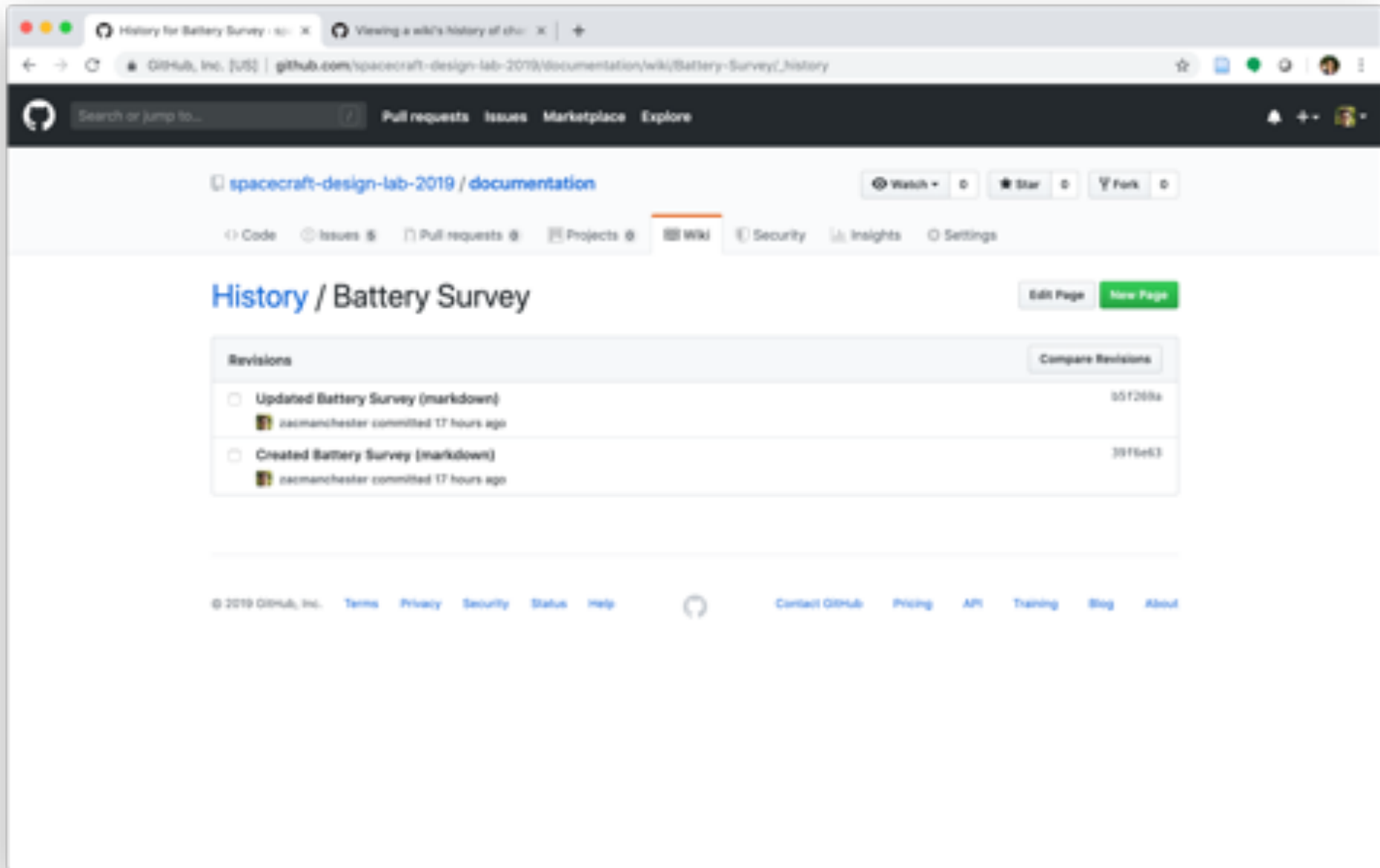
```
### Requirements:  
* Must have no dimension larger than 45mm  
  
| Link | Dimensions | Mass | Voltage | Capacity | Max Discharge Rate |  
|-----|-----|-----|-----|-----|-----|
```

Edit Message

Write a small message here explaining this change. (Optional)

Save Page

# First Assignment



The screenshot shows a web browser window displaying a GitHub repository page. The address bar shows the URL: `github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey/_history`. The page title is "History / Battery Survey". The repository name is "spacecraft-design-lab-2019 / documentation". The page shows a list of revisions for the "Battery Survey" wiki page. The first revision is "Updated Battery Survey (markdown)" with commit hash "351269a" and the second is "Created Battery Survey (markdown)" with commit hash "39f6e63". Both revisions were committed by "zacmanchester" 17 hours ago. The page also includes a "Compare Revisions" button and a "New Page" button.

History for Battery Survey · 10 · X · Viewing a wiki's history of changes · X · +

GitHub, Inc. [US] | github.com/spacecraft-design-lab-2019/documentation/wiki/Battery-Survey/\_history

Search or jump to... Pull requests Issues Marketplace Explore

spacecraft-design-lab-2019 / documentation Watch Star Fork

Code Issues Pull requests Projects Wiki Security Insights Settings

## History / Battery Survey

Edit Page New Page

### Revisions

Compare Revisions

<input type="checkbox"/> Updated Battery Survey (markdown)	351269a
zacmanchester committed 17 hours ago	
<input type="checkbox"/> Created Battery Survey (markdown)	39f6e63
zacmanchester committed 17 hours ago	

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5. Each team must also think about and fill in some subsystem-level requirements on the wiki.
6. Everyone must make at least one git commit.
7. Each team will present their component survey results and requirements at the next meeting on Monday.

# Course Logistics

- All-hands meetings will be Mondays at 4:30 in Skilling
- Sub-team meetings will be scheduled on Mondays and/or Wednesdays during the allotted class time.
- There will occasionally be lectures on selected topics after the Monday all-hands meeting (within the designated class time).

# Course Policies

- Attendance at all-hands and sub-team meetings are mandatory and everyone is expected to participate.
- The Kanban will be used to keep track of what individual team members are working on. We will go through it every Monday and everyone will give a quick update on the status of their tasks (what was done last week, what is getting done this week).
- Documentation on the wiki will be used in lieu of a final report.
- Git commit history will be used to help evaluate each person's contributions.

# Grading

- 25% Individual weekly meeting participation
- 25% Individual technical contributions as gauged by git commit history and team surveys.
- 50% Completeness and quality of wiki documentation

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# Questions?

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