Orbital:

* Obtained key from Matt Bourassa for Systems Tool Kit to start on the tutorials

ADCS:

* Determined that a GPS unit would be required to properly filter out the Earth’s albedo when taking photodiode readings.
* Selected a GPS unit with Cubesat flight heritage.
* Contacted Skyfoxlabs which will be able to design a custom patch antenna to fit on the Cubesat end plates.

Solar panels:

* Created a specifications document containing detailed info on individual components, solar panel specs, and BOM and estimated cost.
* Created comprehensive document on the entire design and assembly of the solar panels.
* Physical design
  + Determined the proper shape and dimensions of the panels to fit on the Cubesat structure.
  + Tentatively chose a set of design specifications for the solar panel PCB to follow (material, copper ground planes, etc.).
  + Determined suitable locations for mounting holes where they would not conflict with other components.
  + Chose a placement for the solar cells where 4 cells could be fit on the panel.
  + Determined optimal placement for sensors on the panels (photodiodes on ends, temperature sensor near middle, etc.).
  + External connector locations were chosen so that they were easily accessible, while the internal connectors would have enough room for their cable’s required bend radius.
  + Provided a temporary antenna mount model, and specifications of how a proper design should work.
  + Chose an RBF switch and plug that fit in the panels with a height from the surface that did not violate the Cubesat design specifications for RBF switches.
  + Provided bypasses through the solar panels that would be able to access internal components once the solar panels are attached (e.g. OBC, EPS, accelerometers).
  + Provided tentative design for the end-plate sensor panels.
  + Created a CAD model of all the variants of the solar panels, and all of their subcomponents.
  + Made changes to the overall Cubesat model in order to place sufficient mounting holes for the solar panels where space was available.
* Sensor design
  + Selected appropriate photodiodes that are suitable for the space environment with flight heritage.
  + Chose a temperature sensor that was suitable with flight heritage.
  + Decided upon an antenna release sensor that would meet the operating temperature requirements.
  + Wrote a MATLAB program where the facing vector of the photodiodes could be continuously modified to find an optimal facing vector for the photodiodes. This was used in the temporary design of the photodiode mount with the angled pads. The analysis is summarized in Photodiode\_angle\_analysis.docx. The code is in **Code/MATLAB/PPD\_coverage.m**.
  + Wrote Arduino code to test the electrical design of the photodiode, op-amp, and ADC circuit and its SPI interface. The results are summarized in **Testing\_results.docx**. The code is in **Code/Arduino/Photodiode\_ADC (\_Averaged).**
* Electrical design
  + Researched and chose solar cells that met the size and the power requirements given in the power subsystems document.
  + Using the chosen photodiodes, an overall electrical design for the photodiodes was created using op-amps to produce a usable output.
  + An ADC was found that would be appropriate for the outputs of the photodiode circuits.
  + The electrical setup for the RBF switch was decided upon.
  + Bypasses for the OBC, JTAG pins, EPS, and accelerometers was decided upon.
  + Appropriate connectors were chosen for the various electrical features, taking into account local internal space inside the Cubesat.
  + Exposed pins for JMP1 and JMP2 of the EPS, to have control over the EPS self-locking and battery charging features.
  + Tentatively decided an electrical setup for the ±Z end plates and a radiation-hardened voltage reference.
* Overall design
  + Research and communication with Endurosat in order to properly interface all relevant features of the solar panel with their OCB and EPS.
  + 3 panel variants (EPS/RBF/JMP, OBC/JTAG, accelerometers) were created to be attached to specific faces of the Cubesat. These take into account the location of connectors of the internal components.
  + A rough final estimate of cost was found, only including the base cost of the products (not including ±Z end-plate components). The estimate is in **specifications.xlsx.**
  + Provided overall electrical diagrams for the mounted sensors and the solar cells.
  + Provided labelled images showing the various components of each variants of the solar panels.
* Assembly
  + Proposed possible modifications to the solar cells to make mounting easier and provided steps to do so.
  + Created a list of environment requirements.
  + Produced a list of all the required materials and equipment needed to assemble the solar panels.
  + An overall assembly and testing process was created, and other possible assembly processes were given as references in **Solar panel info and assembly.docx**.