Second Semester of the LaACES Program (2025)

2nd Semester Tasks

- Develop a student lead team organization with defined roles, responsibilities, and rules
  - These will be formalized in a "Team Contract"
- Learn the basic Project Management skills to manage the payload development
  - Requirements Development, System Design, Tasks and Scheduling, Flowcharts, Risk Management
- Develop a functioning payload based on the MegaSAT stack
  - This includes all electronics, software, and mechanical requirements
- Design, Fabrication, Calibrate, and Testing Payload to meet all program and payload requirements
  - Documenting this via the PDR, CDR and FRR Documents
- Complete Thermal Vacuum System Testing
- Prove payload is worth flying at Flight Readiness Review
- Analyze and present flight results

LaACES Program Payload Requirements

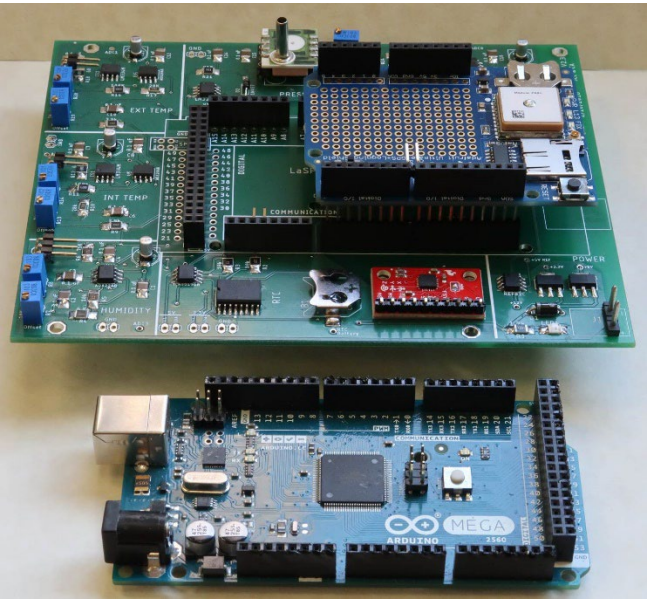
YOUR PAYLOAD SHALL:

- Weigh less than 500 Grams
- Have a weight/area ratio of > 13 g/cm^2 (This means a max weight payload sides must be larger than 39 cm^2)
- Be housed in a soft semi-rigid foam container (such as R3 insulation foam)
- Have two unobstructed vertical penetrations, 17 cm apart, large enough to pass kite string through
- Penetrations shall be sufficiently reinforced to prevent rip-out with 50lbs of force perpendicular to the axis of the penetration
- Have sufficient power for 4 hours of operation
- Have sufficient data storage for 4 hours of operation
- Operate at pressures down to 10 mBar
- Operate with outside temperatures of -50C
- Operate with outside temperatures of 50C

Payload mechanical interface

LaACES MegaSat Core

- The core of the payload will be the LaACES MegaSat which includes
  - Two temperature sensors, one humidity sensor, one pressure sensor, 3-axis accelerometer, a 3-axis gyroscope, and a real-time clock with a backup battery
- The payload controller will be the Arduino Mega.
- Will have the Adafruit Ultimate GPS Logger shield for GPS data throughout the flight and recording NMEA data on an SD card.



LaACES MegaSat payload stack

- The prototype area on the Adafruit GPS shield or a separate proto-shield board can interface with other sensors.
- Construction of MegaSat shield is done in parallel with other required activities
- During payload development teams should ensure:
  - MegaSAT systems are considered and included In design documents
  - To budget the time needed to construct the MegaSat shield

Payload Development Requires Team Cohesion

- The activity for the Project Management unit is to have each team produce its own “Team Contract”
  - Students need to identify and write down their “rules of engagement” for how they will operate as a project team
  - The Team Contract should include items such as meeting schedule, document management, roles, task management, as well as joining and leaving a team

Payload Development Requires Management

- Project Management lectures and materials are in Part II, Units 21 through 26
  - https://laspace.lsu.edu/laaces/student-balloon-course/
- These lectures and materials include the following cover the basics of project management necessary to develop a payload and complete the design reviews
- These materials will be covered in January

Supplemental Materials: Payload Structure and Design

- Payload design lectures are in Part II, Units 27 through 30
  - https://laspace.lsu.edu/laaces/student-balloon-course/
- Units 27 and 28 are concerned with the fabrication, testing, and use of the MegaSAT
  - Include a highly detailed assembly manual
- Units 29 and 30 include supplemental materials covering specific aspects of payload development (ie building a box, calculating a power budget)
- These lectures and materials available for reference (These will not be covered in a formal session)

The Project Reviews

- There are at least three major reviews during a project
  - Preliminary Design Review (PDR)
  - Critical Design Review (CDR)
  - Flight Readiness Review (FRR)
  - Teams will make 15 minute oral presentations covering these materials in addition to submitting their written documents
- The Pre-PDR and Pre-CDR divide the reviews into more manageable sections
- Each review has a somewhat different objective and emphasis and provides a check on project progress for all stakeholders
- Templates are provided for all review documents. Read all instructions contained within the template carefully!
- The required documents will be rated as Pass / Fail. A “Fail” on any document means the team will very likely not fly
- Teams should expect to revise and resubmit their reviews

The Project Reviews Document Templates

- The templates provide a sequence of payload documentation from the initial organization and justification to the final defense of the payload flight worthiness
- Each template ADDs to the previous template so it is important for a student team to fully complete one document before moving on to the next.
  - Pre-Preliminary Design Review (Pre-PDR) template
  - Preliminary Design Review template (PDR)
  - Pre-Critical Design Review (Pre-CDR) template
  - Critical Design Review (CDR) template
  - Flight Readiness Review (FRR) template
- These templates can be found on the LaACES Document Center at https://laspace.lsu.edu/laaces/laaces-document-center/
- Will talk about these reviews and expectations in the Project Management overview lecture.

Deliverables Schedule for LSU LaACES Spring 2025

	Deadline
Team Contract	January 21, 2025
Pre - PDR	January 31, 2025
PDR	February 14, 2025
Presentation	February 18,2025
Pre - CDR	March 14, 2025
CDR	April 11, 2025
Presentation	April 15, 2025
Thermal / Vacuum Test (at LSU)	April 25, 2025
FRR	May 15, 2025
LaACES Launch Trip	May 18, 2025 – May 23, 2025
FRR Defense Presentation (at CSBF)	May 19, 2025