EE 491 Spacecraft Instrumentation

Course title:
Spacecraft Instrumentation

Office hours:
TBD

Class hours:
MW 8:30-9:45

Laboratory hours:
by arrangement

Credit hours:
Variable

Instructor:
Dr. Anders M. Jorgensen
Workman 227
Phone: 505-835-5450
e-mail: anders@nmt.edu

Classroom location:
Workman 116

Laboratory location:
by arrangement

Textbook:

- No textbook required

Learning objectives:

1. Learning about spacecraft instrumentation and the space environment
2. Learning teamwork, work planning, critical thinking, negotiation
3. Learning to work in a larger diverse team with interfacing needs, while meeting deadlines
4. Applying your existing skills to a real-world problem and working with team mates with complimentary skills.

Prerequisites:

Consent from instructor. A variety of skills are useful for contributing to this class. Please discuss with the instructor how you feel you can contribute.

Topics covered:
In this course we will learn about satellite instrumentation and build an experiment intended for the Swedish satellite QuadSat-PnP. The instrument is called a Langmuir probe, and measures the density of space plasmas in the top-side ionosphere where most low-Earth orbit satellites are found. It functions by applying a voltage between the satellite body and a probe protruding from the satellite, and then measuring the resulting current which flows through the space plasma.

To perform this task we will make use of any relevant knowledge which we have from other classes, be it about physics, analog or digital electronics, software development, or mechanical systems. Some of the specific problems which we must address are

1. Understanding the space environment in which the instrument will operate.
2. Specification of the instrument performance.
3. Mechanical and electrical design of the probe.
4. Mechanical design of the instrument enclosure.
5. Electrical design of power supply, variable voltage supply, current measurement system, CPU, software, and communications.
6. Selection of components.
7. Instrument assembly.
8. Test and verification of hardware, software, and system performance.
9. Delivery.

Course work:

1. Participation. You should participate in weekly meetings in which we discuss progress and agree on next steps.
2. Independent work. Between meetings you work on problems as agreed in the weekly meetings.
3. Leadership. Take actively charge of the tasks which you are leading.
4. Deadlines. You should be aware of the deadlines associated with your tasks and how those are affected by other parts of the project.
5. Delivery. The team delivers the final instrument by the end of the semester.

Grading policy:

EE 491

1. Active participation in weekly meetings 25%.
2. Meeting deadlines 50%
3. Successful delivery 25%

EE 491L

1. Successfully completing assigned hardware or software work 50%
2. Meeting deadlines 50%

Approximate Schedule (subject to change, see website for actual schedule):

Time period	Project phase
January-February	Specification and Design
February-March	Construction and Assembly
March-April	Test and verification
May	Delivery

Week of	Topic