ENV6932 – Fall 2018

Imaging Spectroscopy and Hyperspectral Image Analysis with Environmental Applications

Instructor: Professor Paul Gader

Class Times: MWF **Period 4** (10:40 - 12:35) * Hope to modify*

Office: Weil Hall 575L

Office Hours: MWF, Period 7 (1:55 PM – 2:45 PM) Room: Weil 575L

Email: pgader@.ufl.edu

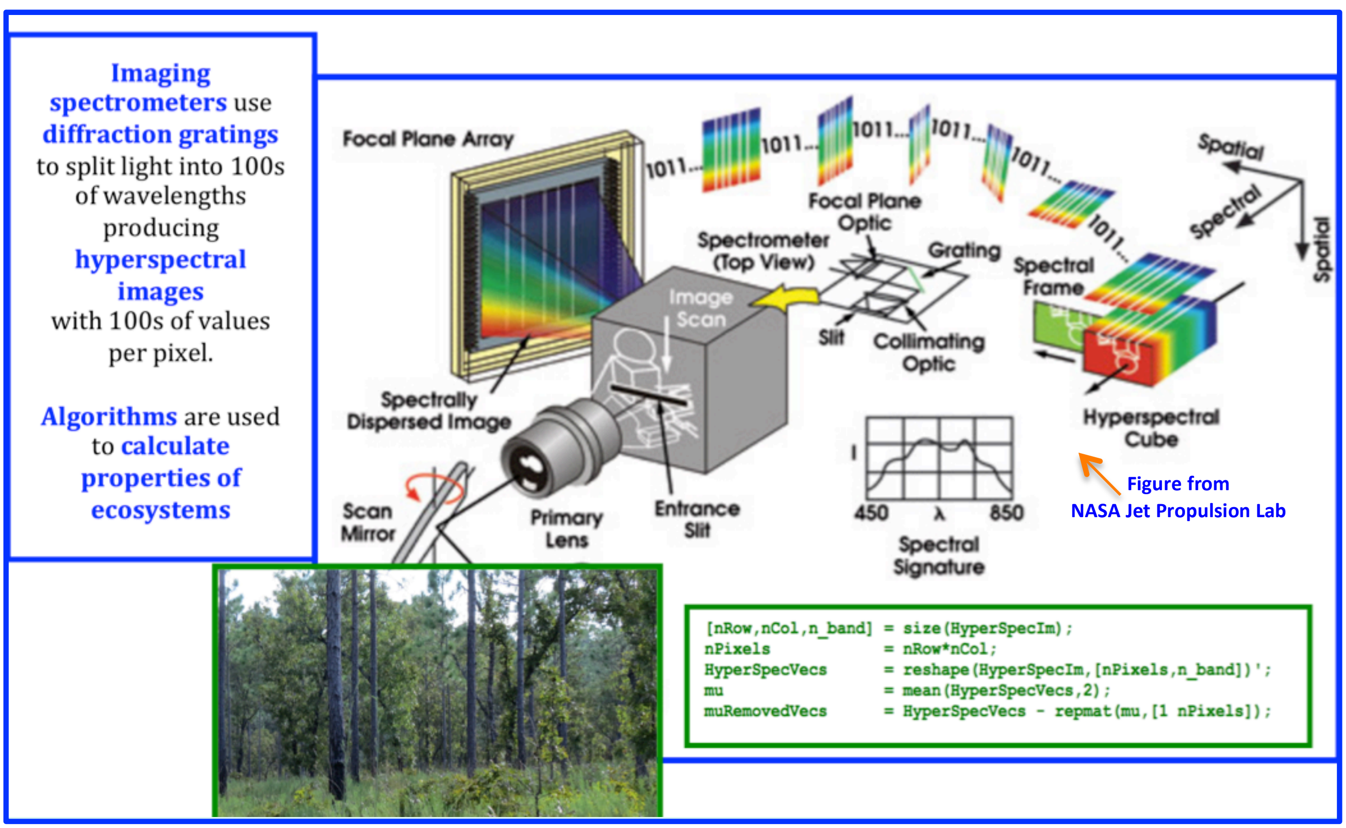
Phone: 352-294-1629 (Please do not call my cell phone unless it is an emergency)

URL: Canvas will be used

Textbook: Instructor Notes and other Online Resources will be used (no cost)

Topics: Imaging spectroscopy can be used to evaluate health of terrestrial and marine ecosystems as well as agricultural crops. It is also used to detect invasive species, fires, methane leaks and to map species, chemicals, and organisims in an environment.

Imaging spectrometers produce images, referred to as hyperspectral image, that have usually have anywhere from about 70 to about 450 bands of "color" at each pixel, including Ultra-Violet, Visible, and Infra-Red bands, most of which are not visible to the human eye. Therefore, each pixel represents a spectrum so spectral analysis can be performed, even down to the sub-pixel level! This course will focus on algorithms for extracting useful information from hyperspectral images. Students will work with real hyperspectral data sets.



Prerequisites. Since the focus is on processing, some **programming** experience is required. MATLAB will be the preferred programming environment. Knowledge of material from courses in **Linear Algebra**, and **Calculus** are also required because many algorithms will be modeled using Linear Algebra and derived using differential

Calculus. Finally, an undergraduate course in **Statistics** is required because solving many of these problems requires statistical estimation of model parameters. An assessment test will be given on the first day of class. The exam will not count towards the grade but will be to determine how much background material to cover.

Evaluation and Grading:

There will be 2 tests and 3 computer projects. Each test will cover a subset of the material. Homework problems will be assigned. Some of the homework will require writing simple MATLAB and/or Python scripts. Your knowledge of the homework will be evaluated by asking questions in class and putting problems identical or very similar to homework problems on the tests.

MATLAB or Python will be the preferred implementation environment for computer projects. Each project will involve implementing a hyperspectral image analysis program, running it on some data, writing a report, making a short presentation and possibly demonstrating your program. The reports, presentations, and programs will be turned in to the instructor who will try to run your programs on data. The programs you turn in should achieve the same results as those described in your report. Projects will be performed by teams and the members of the teams will be randomly selected. There will be different teams for each project. Grades will be determined as follows:

Projects,	20% each x 3 projects	= 60%
Tests,	20% each x 2 tests	= 40%