**Project title:** Autonomous Control of UAV to Measure Solar-Induced Fluorescence and Reflectance of Crops

**Brief Description of Design Project Goals:**

**Overview:** Working with researchers in the Cornell School of Integrative Plant Sciences, Soil and Crop Sciences Section (SIPS-SCS), develop autonomous flight control for drone based measurements. Drone flights will be used to access the development of specific crops at a variety of Cornell locations. Autonomous control for the drone originates with a Raspberry Pi that will direct the flight path by interfacing with the drone controller. At a set of prescribed ‘stops’, the system will interface with spectrometers to perform crop measurements. Also required will be an on-screen operator interface and on-board logging, both designed to inter-operate with existing Agriculture system requirements.

**Specific MEng Contribution:** Expand and develop new protocols for Raspberry Pi to drone controller and spectrometer instruments. Update existing Python scripts to enable plug and play combinations of QEPRO and FLAME spectrometers (e.g. 1 QEPRO only; 1 FLAME only; 1 QEPRO + 1 FLAME; 2 FLAMEs) and synchronize measurements with on-board camera and GPS. With initial prototypes, develop simple autonomous flight control (that is, 2-stop and return to launch capabilities). For additional prototypes, straightforward operator path entry will be developed in addition to testing for expanded flights. Emergency procedures must also be considered (for example, return to home on low power, emergency landing on critical power).

For this project, ECE MEng students will be working with researchers from SIPS-SCS. Plan on weekly meetings with lab researchers, prototype demo, design for outdoor operation and robustness, and visits to field locations.

This team will work closely with SIPS researchers as well as other teams working on SPIS based MEng projects.

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Project Web Site:  This project will build on the groundwork described here:  

Number of MEng Students Needed:  2

Required Skills:  Microcontroller systems, Python and/or C, drone flight systems, device interfacing, sensors, image processing, robust project design skills, willing to deploy and test systems outdoors

Estimated Project Time Frame:  2018-19 Academic Year, Two (2) Semesters