SYLLABUS

1. **Number and Name: 11:117:296 – HONORS SEMINAR IN BIOENVIRONMENTAL ENGINEERING: BUILDING AND USING SENSORS**

2. **Credits and contact hours:** 3 credits, 1 three-hour lab period per week

3. **Instructor:** A.J. Both

4. **Text:** None. Students are encouraged to use their cell phones and laptop computers to access information and how-to instructions from the internet.

5. **Specific Course Information**

   a. **Catalog Description:** *Students enrolled in this course will use the Raspberry Pi computer platform to develop sensing systems that can operate autonomously based on pre-programmed software instructions. They will receive a set of hardware components and will be tasked to design and construct their own sensing systems. They will be writing their own software programs using the Python programming language. There will be an opportunity to fly the sensing systems on a drone allowing for aerial data collection.*

   b. Prerequisites: None (non-honors students can enroll with special permission)

   c. Course Type: Elective

6. **Course Goals**

   a. Specific Instructional Outcomes: Students will receive a hands-on experience with data acquisition, processing, and display. They will learn how to program a Raspberry Pi computer using the software language Python.

   b. Specific Student Outcomes addressed by the course include:

   a. Ability to apply knowledge of mathematics, science and engineering.
   Instructional Activity: Students use the programming language Python to design a mobile data acquisition system capable of measuring several environmental parameters. In addition to programming, they build circuitry to collect data and process it with software they developed.
   Assessment Activity: Classroom participation and final project report.

   b. Ability to design and conduct experiments, as well as to analyze and interpret data
   Instructional Activity: Teams of 2-3 students design and build a sensing platform including a temperature, relative humidity and air quality sensor, a GPS unit and a camera. Data collected with the sensing systems are processed and reported in tables and figures.
   Assessment Activity: Classroom participation and final project report.

c. Ability to design a system, component, or process to meet desired needs
Instructional Activity: Each student team completes an environmental sensing system capable of recording and processing environmental data (Temperature, relative humidity, air quality, as well as GPS coordinates and digital images).
Assessment Activity: Classroom participation and final project report.

7. Topics:

Lab	Topic
1	Introduction to the Course, Assembling the Raspberry Pi computer system
2	Controlling LEDs using self-written Python programming code
3	Collecting temperature data I (single measurement)
4	Collecting temperature data II (multiple measurements and data storage)
5	Collecting temperature data III (data graphing/display)
6	Collecting other environmental parameters
7	Optimizing your sensing platform
8	No Class: Spring Break
9	Introduction to the drone
10	Readying the sensing system for deployment
11	Data collection I (drone flights and/or field deployment)
12	Data collection II (drone flights and/or field deployment)
13	Data analysis and display I, preparation of final report
14	Data analysis and display II, submission of final report

Grading: Classroom participation, team work, supporting team and class members – 30%
Final report – 70%

Prepared by: A.J. Both 04/12/18