UNIVERSITY OF RHODE ISLAND
SCHOOL OF OCEANOGRAPHY

COURSE NUMBER: CSC 593, OCG, NRS, GEO 404

COURSE TITLE: Intro to Scientific Computing, Environmental Data Acquisition, and Analysis

COURSE DESCRIPTION

Introduction to Python, Processing, Unix Shell scripting, and instrument prototyping and measurements in environmental science. Hands-on with data collection; programming microcontrollers, interfacing hardware and software, wireless sensor networks. Data analysis in Python.

PREREQUISITES: MTH 131, MTH 141 or permission of instructor.

NUMBER OF CREDITS: 3

CLASS TIMES AND LOCATION: TBD based on URI COVID learning mode.

INSTRUCTOR: Brice Loose
brice@gso.uri.edu
401.874.6676
321 CACS Building

COURSE SYLLABUS:

The course will follow a problem-based approach, with focus on topics in environmental science. A short selection of presentations will serve to support the hands' on work with software and hardware. will help us observe the week's process. Class meets in person or by WebEx for discussion and lab. The lab will begin with 30-60 minutes instructor-guided discussion to help students begin the laboratory activity of that week. Some weeks will be devoted to work on the term project.

COURSE GOALS:

1. Learn basic principles of algorithm design, efficient coding practices, and good documentation habits.
2. Learn Python for data acquisition, analysis and visualization.
3. Design an instrument prototype based upon measurement goals.
4. Learn to use and program microcontrollers.
5. Use sensors and sensor networks to study and analyze problems in marine, geo and environmental sciences.
6. Apply this knowledge and Open Source tools to a problem that interests you.

STUDENT LEARNING OUTCOMES:

Upon satisfactory completion of the course, students will be able to:

1. Read and write large data sets in the Python programming environment for further analysis.
2. Display and visualize data from a wide variety of sources.
3. Gain a thorough understanding of the hardware and software resources that are available on the Internet under open source license.
4. Design an instrument prototype based upon observational goals.
5. Incorporate sensor-based observations into the physical environment.
6. Connect instrumentation to networks and generate live or network accessible measurements.
7. Explore how networked observations can lead to discovery and insight in the environmental sciences.

TEXTS: There are no required texts for this course, but we will read and refer to the resources below, which are available for free Online:

1. "Real World Instrumentation with Python" by J.M. Hughes. O'Reilly Media In, Sebastopol CA. 2011.
2. Murray, R. David. "Python Documentation". 2001-2015 Python Software Foundation, URL: http://docs.python.org.
3. "Arduino Libraries". 2015 Arduino Corporation. URL: http://arduino.cc/en/Reference/Libraries
4. "Python for Data Analysis" by Wes McKinney. O'Reilly Media Inc., Sebastopol, CA. 2013.
5. "Python Pocket Reference" by Mark Lutz. O'Reilly Media Inc., Cambridge, MA 2014.

REQUIRED RESOURCES:

Access to a computer (preferably laptop) for programming and code execution.

DISTANCE LEARNING:

Curriculum will be adapted to either distance or in-person learning modes, depending on URI COVID decisions. Each student will receive a hardware kit with prototyping materials. Lab space can be scheduled for access to additional tools.

BRIGHTSPACE

There is a Brightspace site for this class. Laboratory and in-class assignments will be submitted through Brightspace. Copies of any slides from presentations will be posted. The Brightspace site will be used to conduct communications and discussions outside of class, as needed.

CLASSROOM PROTOCOL

Participate – You will be expected to be an active participate in class or virtual discussions and in-class group activities.

GRADING METHOD:

Each week will include an in-class activity (25%), practicum activities (35%), quizzes (10%) and completion of an observation-based term project (30%). Students will meet individually

with instructor to develop their term project idea by the third week of the semester. Students will hand in regular progress reports on term project.

CSC593 students will complete more advanced data analysis practicum problems to meet the requirements of a graduate level course.

GRADING SCALE:

A: 94-100, A- 90-93, B+ 87-89, B 83-86, B- 80-82, C+ 77-79, C 73-77, C- 70-72, D+ 67-69, D 60-66, F < 60.

ACCOMODATIONS FOR SPECIAL NEEDS:

Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with Disability Services for Students Office at 330 Memorial Union, 401-874-2098.

ACADEMIC HONESTY:

All submitted work must be your own. If you consult other sources (class readings, articles or books from the library, articles available through internet databases, or websites) these MUST be properly documented, or you will be charged with plagiarism and will receive an F for the paper. In some cases, this may result in a failure of the course as well. In addition, the charge of academic dishonesty will go on your record in the Office of Student Life. If you have any doubt about what constitutes plagiarism, visit the following website: http://gervaseprograms.georgetown.edu/hc/plagiarism.html, the URI Student Handbook, and UNIVERSITY MANUAL sections on Plagiarism and Cheating at http://www.uri.edu/facsen/8.20-8.27.html - cheating. Any good writer's handbook as well as reputable online resources will offer help on matters of plagiarism and instruct you on how to acknowledge source material. If you need more help understanding when to cite something or how to indicate your references, PLEASE ASK.

RELIGIOUS HOLIDAYS

It is the policy of the University of Rhode Island to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students desiring to observe a holiday of special importance must provide written notification.