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 commands, 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: Wednesdays, 4 – 8 pm in Library Room 166 (Zoom as needed)

INSTRUCTOR: Brice Loose
bloose@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. Class meets in person (or by Zoom if mandated) for discussion and lab. Class will begin with 30-60 minutes instructor-guided discussion to help students begin the laboratory activity of that week. Some weeks will be devoted exclusively to assignments or 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. Explore coding in several environments including, Unix/Linux Shell, Arduino IDE, etc.
4. Design an instrument prototype based upon measurement goals.
5. Learn to use and program microcontrollers.
6. Use algorithms and sensor networks to study and analyze problems in marine, geo and environmental sciences.
7. 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. 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.

LEARNING MODALITIES:
Curriculum is oriented around in-person meetings in Library Room 166, subject to URI COVID decisions. Each student will receive a hardware kit with prototyping materials. Lab space can be scheduled for access to additional tools. Every effort will be made to record lectures, but this format may not be able to capture all the discussion that takes place in the room.

BRIGHTSPACE
There is a Brightspace site for this class.
https://brightspace.uri.edu/d2l/le/content/100884/Home. 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 fifth week of the semester. Students will hand in progress updates 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.

COVID-19

The class will closely follow URI COVID guidelines in an effort to mitigate risk to ourselves and our community. **Masks must be worn in the classroom at all times.** If you feel unwell or have cold/flu/COVID-like symptoms, please do not attend class. I will work with you to complete the semester, in the event that you are unable to attend or keep up with the work, due to illness. If you have concerns about being put at risk through class activities, please do not hesitate to contact me, I am open to discussing any issues that arise. First and foremost, we want everyone in the class to feel safe and stay healthy, and it is up to all of us to ensure our campus stays that way.

As members of the URI community, students are required to comply with standards of conduct and take precautions to keep themselves and others safe.
Visit web.uri.edu/coronavirus/ for the latest information about the URI COVID-19 response.

- Universal indoor masking is required by all community members, on all campuses, regardless of vaccination status. If the universal mask mandate is discontinued during the semester, students who have an approved exemption and are not fully vaccinated will need to continue to wear a mask indoors and maintain physical distance.
- Students who are experiencing symptoms of illness should not come to class. Please stay in your home/room and notify URI Health Services via phone at 401-874-2246.
- If you are already on campus and start to feel ill, go home/back to your room and self-isolate. Notify URI Health Services via phone immediately at 401-874-2246.

If you are unable to attend class, please notify me prior to the start of class at 874-6676 or bloose@uri.edu or through the medium we have established for the class.