EDS 221: Scientific Programming Essentials
Course Syllabus (Summer 2023)

Instructor: Allison Horst
Email: ahorst@ucsb.edu

EDS 221 Learning Objectives: The goal of this course is to build key scientific programming skills essential for environmental data analysis and problem solving. Topics include data representation, data structures, functions and objects, iteration, conditionals, documentation, testing and troubleshooting, tidy data structure, and an introduction to data wrangling and visualization. This course uses R, RStudio, Quarto, git, GitHub and GitHub Desktop.

By the end of the course, students should be able to:

- **Design, implement, test and document algorithms** in R (including functions with iteration, conditionals, messages and warnings)
- **Understand, create, convert, and work with different data structures** (e.g. vectors, data frames, lists) and **types** (e.g. numeric, character, factor, logical, datetimes)
- **Perform basic data wrangling and visualization** with real world environmental data in R
- **Employ troubleshooting and debugging strategies** (tools, mindsets, strategies, resources)
- **Use basic (non-collaborative) project-oriented workflows** with reproducible code (R scripts, R Markdown) and version control (git/GitHub basics)

Course prerequisites: None

Required textbook / reader: Assigned readings (no textbook purchase required)
**Bring to class:** All students should bring their laptop (with all necessary software pre-installed) and charger to class every day. Students should also bring a notebook and pens/pencils to each session.

**Course materials:** Materials are accessed through the course GitHub site.

**Course communication:** Course communication will be through Slack workspace.

**Assignments:** Given the course intensity (4-units, 10 days), all aspects of EDS 221 coursework should be completed within the scheduled course times (9am - 4:30pm M-F) with the exception of daily reading assignments. Students will complete assignment tasks and group work during interactive sessions scheduled throughout the day. In other words, students will not have additional take-home work beyond assigned readings. Students will be assessed based on activities and tasks assigned during interactive sessions, sometimes with peer- and self-review.

**Assessment and grading:**

Grades will be based on three components:
1. Participation (30%)
2. Interactive session tasks & problem sets (50%)
3. Daily group challenges (20%)

**Access and Accommodations:** Please submit requests for accommodations often and early. It is never too late to apply for DSP accommodations. If you have any kind of disability, whether apparent or non-apparent, learning, emotional, physical, or cognitive you may be eligible to use formal accessibility services on campus. To arrange class-related accommodations, please contact DSP. DSP will initiate communication about accommodations with faculty. By making a plan through DSP, appropriate accommodations can be implemented without disclosing your specific condition or diagnosis to course instructors.

**Code of Conduct:** All course participants (instructor, guests, students) are expected to adhere to the Bren School and UCSB Codes of Conduct.
**Expected daily schedule (Monday - Friday, August 14 - 18, 2022):**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>10:00am - 11:00am</td>
<td>Lecture 1 (60 min)</td>
</tr>
<tr>
<td>11:00am - 11:15am</td>
<td>Break 1 (15 min)</td>
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<tr>
<td>11:15am - 12:30pm</td>
<td>Lab 1 (60 min)</td>
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<tr>
<td>12:30pm - 1:30pm</td>
<td>Lunch (60 min)</td>
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<tr>
<td>1:30pm - 2:15pm</td>
<td>Lecture 2 (45 min)</td>
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<tr>
<td>2:15pm - 3:00pm</td>
<td>Lab 2 (45 min)</td>
</tr>
<tr>
<td>3:00pm - 4:30pm</td>
<td>Activities</td>
</tr>
</tbody>
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