This syllabus serves to establish the rules of the course and a sense of what material will be covered. Note that some aspects may evolve as the semester progresses.

**Course Description:** The goal of this course is to build a strong foundation for scientific computation. With a particular emphasis on data science applications, we will cover tools and techniques useful for conducting computationally demanding science.

**Prerequisite(s):** None.

**Credit Hours:** 4

**Required Text:** None. We will draw on an array of online resources throughout the course. A list of useful resources will be maintained on canvas.
Learning Goals: In this course we develop a strong foundation for you to be successful in pursuing computationally demanding science. With an emphasis on data science applications, we will make use of many tools commonly used in academic research and industry.

The course will begin by establishing proficiency with the core tools we will use for the rest of the course. From there we will explore a range of data science concepts (e.g., model development, regression, optimization, Bayesian inference, machine learning) and their application to real-world data sets. The exact topics we cover will depend on the interest of the class.

Target Audience: This course is targeting upper division undergraduates as well as beginning graduate students. We’ll begin with a brief refresher, but students will generally be expected to have some proficiency with Python at the start of the course.

Example Topics:

- Data Manipulation and Visualization
- Numerical Integration
- Linear Regression
- Outlier Classification
- Rejection Sampling
- Markov-Chain Monte Carlo
- Logistic Regression
- Multi-class Classification
- Neural Networks
- Convolutional Neural Networks
- Autoencoders
- Data Augmentation
- Signal Processing

Grade Distribution:

Homework 25%
Midterm Project 35%
Final Project/Exam 40%
Letter Grade Distribution:

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<thead>
<tr>
<th>Grade</th>
<th>Range</th>
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<tbody>
<tr>
<td>A</td>
<td>≥ 90</td>
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<tr>
<td>B</td>
<td>&lt; 90 and ≥ 80</td>
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<tr>
<td>C</td>
<td>&lt; 80 and ≥ 70</td>
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<tr>
<td>D</td>
<td>&lt; 70 and ≥ 60</td>
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<tr>
<td>F</td>
<td>&lt; 60 and ≥ 50</td>
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Note that + and − beyond the letter grades will be assigned as appropriate. I reserve the right to curve grades up if I feel it is warranted.

Course Policies:

- General
  - We will often spend time actively working with data in class. Make sure to join class with your laptop.
  - Installation of new tools can often take time. Please have things installed before class, when requested.

- Homework Assignments
  - Problem sets exist to aid you in understanding and reasoning. The point of the homework is to demonstrate that you have a sound understanding of basic principles and that you are able to clearly articulate it. All problem set solutions should be in the form of fully explained, well-written English, or fully commented source code.
  - Each question will be graded out of 15 points total, 10 points for scientific correctness of your answer and 5 points for the clarity and quality of your writing. This means that I expect a well developed logical argument and explanation of your solution.
  - Homework will typically be collected electronically as Jupyter notebooks uploaded to Canvas.
  - No late assignments will be accepted, unless prearranged under extenuating circumstances.
  - The final homework will be assigned during dead week.
  - It is highly recommended that you work on the homework together in groups (but you must turn in your own work unless otherwise stated).

Academic Honesty:

Cheating is not acceptable. In particular, you might find solutions to the assigned problems online. Use of any of these solutions is not allowed. If it becomes clear that your homework is derived from the online solutions then disciplinary action will be taken.

The UO policy on academic honesty can be found here: https://uodos.uoregon.edu/StudentConductandCommunityStandards/AcademicMisconduct.aspx