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: Applies statistics to practical data analysis, data-based decision making, model building, and the design of experiments. Emphasizes factorial designs.

Prerequisite(s): None.
Credit Hours: 4

Required Text: *Doing Bayesian Data Analysis, a tutorial with R, JAGS, and Stan, 2nd Edition*  
Author: John Kruschke  
ISBN: 978-0-12-405888-0
Course Objectives:
In this course we will explore approaches to the design of experiments, and how to extract meaningful results from the data collected. We will cover many statistical techniques and make extensive use of computational tools.

The course will begin with an introduction to Bayesian inference. We will cover some core statistical concepts, and develop proficiency with some computational tools, that will form the foundation for the rest of the course. From there we will expand to more advanced concepts in modeling, optimization, and uncertainty estimation.

As a scientist you will need to bring together physical understanding and intuition, sound statistical techniques, and analytical thinking to conduct novel and meaningful research; this course aims to help you develop those skills. Moreover, the computational tools we will be using (e.g., Python and R programming languages, git) are used extensively in science and industry.

Grade Distribution:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Homework</td>
<td>25%</td>
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<tr>
<td>Midterm Project</td>
<td>35%</td>
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<tr>
<td>Final Project/Exam</td>
<td>40%</td>
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Letter Grade Distribution:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
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<tbody>
<tr>
<td>A</td>
<td>≥ 90</td>
</tr>
<tr>
<td>B</td>
<td>&lt; 90 and ≥ 80</td>
</tr>
<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 bring your laptops.
  - 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 about physics. 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 for computational assignments.

- 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. An example of how to write a problem set solution in plain English can be found at [http://phasmid.uoregon.edu/wp-uploads/2013/01/HWExample.pdf](http://phasmid.uoregon.edu/wp-uploads/2013/01/HWExample.pdf).

- Homework will typically be collected electronically via 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](https://uodos.uoregon.edu/StudentConductandCommunityStandards/AcademicMisconduct.aspx)