Oregon State University
Ecampus

**Course Name: Data Visualization**
**Course Number: ST537**
**Term Offered: Spring 2025**
**Credits: 3**
**Instructor Name: Katherine (Katie) McLaughlin**
**Instructor Email:** Katherine.McLaughlin@oregonstate.edu
**Teaching Assistants:** Gavin Tovar, tovarg@oregonstate.edu
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**Course Description**
Perceptual principles for displaying data; critique and improvement of data visualizations; use of color in visualization; principles of tidy data; strategies for data exploration; select special topics. **PREREQS:** ST 412/512 [C] or ST 517 [C] or ST 552 [C] or at discretion of instructor (students should be familiar with linear regression and using R).

**Communication**
Please post all course-related questions in the General Discussion Forum so that the whole class may benefit from our conversation. Please email me (Katherine.McLaughlin@oregonstate.edu) for matters of a personal nature. I will reply to course-related questions and email within 24-48 hours. I will strive to return your assignments and grades for course activities to you within seven days of the due date.

**Course Credits**
This course combines approximately 90 hours of instruction, online activities, and assignments for 3 credits.

**Canvas**
This course will be delivered via Canvas where you will interact with your classmates and with your instructor. Within the course Canvas site, you will access the learning materials, such as the syllabus, class discussions, assignments, projects, and quizzes. To preview how an online course works, visit the Ecampus Course Demo. For technical assistance, please visit Ecampus Technical Help.

**Technical Assistance**
If you experience computer difficulties, need help downloading a browser or plug-in, assistance logging into the course, or if you experience any errors or problems while in your online course, contact the OSU Help Desk for assistance. You can call (541) 737-3474, email osuhelpdesk@oregonstate.edu or visit the OSU Computer Helpdesk online.

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**Course Content**

This course will give you the tools to critique, create and improve visualizations of statistical data.

Through readings and discussion of seminal work, you will learn the principles of graphical perception and the visual encoding of quantitative information and learn how to use these principles to evaluate an effective visualization. Through exposure to famous and infamous visualizations, you'll explore what makes graphical representations of data successful or unsuccessful and gain an appreciation of the different goals of visualization.

A key part of the class will be critiquing other's visualizations and, as your visualization creation skills develop, your own and your classmates' visualizations.

**Measurable Student Learning Outcomes**

After completing this class, you will be able to:

- Deconstruct a graphic into the data displayed and how it is mapped to visual properties.
- Describe the order of accuracy of perceptual tasks and how this affects the choices made in constructing a visualization.
- Critique a visualization based on its purpose and use or abuse of perceptual principles.
- Suggest improvements of a visualization to enhance its effectiveness.
- Use color in visualization appropriately for the variable it is encoding and with sensitivity to visually impaired viewers.
- Translate an image or description of a graphic to a specification of the graphic using ggplot2.
- Rapidly prototype visualizations using ggplot2 in R to answer a question about data.
- Develop a strategy for exploration of a dataset and document the results.
- Combine tools for data manipulation and visualization, to collect, tidy and manipulate data to create visualizations to answer your own questions of interest.
- Polish a visualization to publication-ready standards.

**Learning Resources**

The course is composed of 10 week-long modules. The **learning materials** for a module may consist of:

- **Readings** (see Assigned Reading section below)
- **Video Lectures** that cover the topics for the week and important concepts from the readings
- **Computer labs** Self-paced exercises in R

In addition, a module will have a collection of *Activities* (see Evaluation of Student Performance below) that you complete for credit.

*Assignments* (see Evaluation of Student Performance below) are larger assessments that will cover concepts from multiple modules.

### Recommended Approach

Each module begins with an overview and a list of all resources and activities in the module. The remainder of the module progresses through these resources and assessments in the **suggested order of completion**.

You'll want to review the due dates of activities and whether activities are group or individual. Group activities will require some planning to coordinate your work, so touch base with your group early in the week to plan meetings and deadlines.

### Assigned Readings

There is no assigned textbook for the class. Readings will be assigned from publicly available materials, materials available through the Oregon State University library, or provided in canvas.

Readings are an integral part of the course and unless specifically marked optional, you are expected to read them. A complete reading list will be provided in the first week, then also referenced at the appropriate place in each module.

### Computing Resources

For the computing component of the course, you will use R (a programming language and environment for data analysis) and RStudio (a program we will use to interact with R). You must have access to R and RStudio to complete the labs, homeworks and some quizzes. R and RStudio are both free. You have two options for accessing R and RStudio:

1. Use the Data Science @ OSU Hub for this course (general information: https://arcs.oregonstate.edu/data-science) provided by DS@OSU. Launch the external tool from Canvas, log in with your ONID ID and password, and then click on "RStudio" in the "Notebook" section to open a window with RStudio Server. You don't need to install anything, and your session is available from any computer within a web browser. This service is integrated with Canvas.

   *Data Retention:* Please note that long-term data storage and management is not supported at this time. Any data or code you want to keep must be downloaded within 2 weeks after the end of the course.

2. Or, install R (https://www.r-project.org/) and RStudio (https://www.rstudio.com/products/rstudio/download/) on your own computer.

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## Evaluation of Student Performance

### Assignments (100 points)

There will be four large graded assignments worth 20, 20, 30, and 30 points respectively. Roughly, they will be due at the end of weeks 3, 5, 8 and finals week. The fourth assignment will require you to source your own data, so you may want to begin thinking about that.

### Other activities (100 points)

Graded activities for the week will be posted at the start of the week. They could consist of discussion board posts, completing a lab activity, submitting R code, or submitting a written document. They may be individual or group submissions, and they may be graded or Complete/Incomplete. **Read the instructions** for each activity carefully.

### Final grade

Your final score will be out of 200 points (allocated between assignments and other activities as above). Your numerical score will be converted to percentage, then to a letter grade based on the following table:

| Percent | Grade | Percent | Grade |
|---|---|---|---|
| 95-100 | A | 65-69.9 | C+ |
| 88-94.9 | A- | 60-64.9 | C |
| 80-87.9 | B+ | 55-59.9 | C- |
| 75-79.9 | B | 45-54.9 | D |
| 70-74.9 | B- | 0-45 | F |

## Tentative Topic Schedule

- Module 1: Introduction – good and bad graphics
- Module 2: Deconstructing and constructing graphics
  **Assignment 1 - Construction**
- Module 3: Perception
- Module 4: Color and Scales
  **Assignment 2 - Critique**
- Module 5: Principles of Tidy data
- Module 6: Data manipulation
- Module 7: Exploration
  **Assignment 3 - Exploration**
- Module 8: Polishing
- Module 9: Interactive and dynamic visualization
- Module 10: Special topics
  **Assignment 4 - Putting it all together**

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## Course Policies

### Discussion Participation

Students are expected to participate in all graded discussions. While there is great flexibility in online courses, this is not a self-paced course. Keep a close eye on due dates for discussions, they sometimes require a post by mid-week.

### Proctored Exams

There are **no** proctored exams for this course.

### Late Policy

Assignments and activities that are submitted late will be given zero credit, unless organized with the instructor prior to the due date. In unexpected or emergency situations, where prior organization is not possible, please let the instructor know as soon as possible that work will be late.

### Incompletes

From the *Registrar's Incomplete Policy*:

> "A student may request an instructor give an incomplete grade for a course that has not been completed if:
>
> - the reasons for the incomplete are acceptable to the instructor;
> - the student is passing the course at the time of the request."

If you would like to request an Incomplete, please contact me as soon as possible.

### Guidelines for a Productive and Effective Online Classroom

Students are expected to conduct themselves in the course (e.g., on discussion boards, email) in compliance with the university's regulations regarding civility.

Civility is an essential ingredient for academic discourse. All communications for this course should be conducted constructively, civilly, and respectfully. Differences in beliefs, opinions, and approaches are to be expected. In all you say and do for this course, be professional. Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Active interaction with peers and your instructor is essential to success in this online course, paying particular attention to the following:

- Unless indicated otherwise, please complete the readings and view other instructional materials for each week before participating in the discussion board.
- Read your posts carefully before submitting them.
- Be respectful of others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
- Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.

**Academic Calendar**
All students are subject to the registration and refund deadlines as stated in the Academic Calendar: https://registrar.oregonstate.edu/osu-academic-calendar

**Reach Out for Success**
University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success. Ecampus students are always encouraged to discuss issues that impact your academic success with the Ecampus Success Team. Email ecampus.success@oregonstate.edu to identify strategies and resources that can support you in your educational goals. If you feel comfortable sharing how a hardship may impact your performance in this course, please reach out to me as your instructor.

**If you are in immediate crisis**, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255)

**Financial Hardship**
Any student whose academic performance is impacted due to financial stress or the inability to afford groceries, housing, and other necessities for any reason is urged to contact the Director of Care for support (541-737-8748).

**Student Bill of Rights**
OSU has twelve established student rights. They include due process in all university disciplinary processes, an equal opportunity to learn, and grading in accordance with the course syllabus: https://asosu.oregonstate.edu/advocacy/rights

**Statement Regarding Students with Disabilities**
Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

**Accessibility of Course Materials**
All materials used in this course are accessible. If you require accommodations, please contact Disability Access Services (DAS).

Additionally, Canvas, the learning management system through which this course is offered, provides a vendor statement certifying how the platform is accessible to students with disabilities.

**Expectations for Student Conduct**
Student conduct is governed by the university's policies, as explained in the Student Conduct Code (https://scs.oregonstate.edu/). Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

**Academic Integrity**
Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit Student Conduct and Community Standards, or contact the office of Student Conduct and Mediation at 541-737-3656.

OAR 576-015-0020 (2) Academic or Scholarly Dishonesty:

a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student's own efforts or the efforts of another.

b) It includes:

(i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.

(ii) FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.

(iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).

(iv) TAMPERING - altering or interfering with evaluation instruments or documents.

(v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.

c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University's Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.

**OSU Student Evaluation of Teaching**
Course evaluation results are extremely important and are used to help me improve this course and the learning experience of future students. During Fall, Winter, and Spring term the online Student Evaluation of Teaching system opens to students the Wednesday of week 8 and closes the Sunday before Finals Week. Students will receive notification, instructions and the link through their ONID email. They may also log into the system via Online Services. Responses are anonymous (unless a student chooses to “sign” their comments, agreeing to relinquish anonymity) and unavailable to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.