Computer Science Department
cs.salemstate.edu

SYLLABUS **Spring, 2025**

CSC 246 Information Visualization **4 cr.**

Instructor: Beifang Yi **Office**: MH 208B **Phone**: (978) 542-7246
email: byi@salemstate.edu **Hours**: W-F (1:30-4:00pm) **Website**: http://weblab.salemstate.edu/~byi/

Section	Time	Room	Final Exam
01	W & F 8:00-9:15am	MH 202	**May 6, Tuesday 8:00am-10:00am MH 202**
L21	W & F 9:25-10:40am	MH 202	
Office Hours (MH208B)		Wednesday & Friday (1:30-4:00pm)	

Catalog Description:

This course presents the basic science and techniques behind information visualization, introducing the latest visualization techniques and tools including programming languages used for analyzing and visualizing data. The course describes the principles of visual perception and information data types and focuses on the study, design, and development of visualization techniques for the analysis, comprehension, explanation, and visualization of large collections of datasets from the real world. The state-of-the-art visualization tools including programming language(s) will be applied and the course to help understand the subject and to design and generate visual interpretation of complex data from diverse areas. Exercises throughout the course provide a hands-on experience in using relevant programming libraries and software tools and students will form teams to participate in group projects. Three lecture hours and three hours of scheduled laboratory per week, plus additional project time outside class.

Prerequisites: CSC 115

Course Goals:

The purpose of this course is to introduce basic concepts of scientific visualization and to apply the latest visualization techniques to the real-world problems encountered in science, engineering, and business. The goals of this course are:

- CG01: to develop an appreciation for the latest developments in information visualization;
- CG02: to understand the concepts of analyzing, manipulating, and presenting complex data in an intuitive form;
- CG03: to understand the visualization techniques of producing insightful visual content;
- CG04: to give students experience in collecting, analyzing, processing, interpreting, and presenting data;
- CG05: to give students experience in applying visualization techniques and tools in real-world quantitative problems.

Course Objectives:

Upon successful completion of the course, a student will have:

- CO01: demonstrated basic knowledge of human visual perception, cognitive issues, and color vision;
- CO02: demonstrated basic knowledge of visualization design and visualization techniques;
- CO03: described characteristics of datasets and experienced with real data in a broad view of the rich world of information visualization;
- CO04: demonstrated knowledge of and skills in collecting, analyzing, interpreting, processing, and presenting data;
- CO05: evaluated the effectiveness of particular elements of visualizations;
- CO06: described visualization methodologies and techniques used in the manipulation of complex data and higher-dimensional data, etc.
- CO07: demonstrated the creation of quality data visualizations and showed efficient communication of data results;
- CO08: applied visualization principles and techniques in projects (using visualization tools/API/library and/or one programming language) which are related to at least two different areas, for example, business, economics, political and social studies, and scientific research such as biomedical studies, geosciences, physics, chemistry, meteorology, etc.

Course Topics:

A detailed topics list and a general course bibliography can be found on the Computer Science Department website at http://cs.salemstate.edu/courses/course-information-documents (or at http://cs.salemstate.edu/courses and then select "Degrees & Courses") and select "CSC 246 Information Visualization" to access a PDF document.

Texts (Required):

- **Data Visualization: A Practical Introduction**, by Kieran Healy. Princeton University Press, 2018 (ISBN: 978-0-691181-62-2).
  - An **online FREE version draft** available at: **https://socviz.co/**
- **Murach's R for Data Analysis**, by Scott McCoy. Mike Murach & Associates, Inc, 2022 (ISBN: 978-1-943873-03-6).

Course Materials & Software:

Thumb (flash) drive, 64 GB minimum or online storage (for saving your projects and coursework) in addition to your personal computer/laptop (Windows, MacBook, or Linux machines).

Download R programming language and RStudio (i.e., an IDE for R) at https://posit.co/download/rstudio-desktop/.

You will need to use Microsoft Word or similar software packages to complete some assignments.

It is expected that you work on your laptop for the lab/coding exercises during the lab hours. If you need technical help regarding your computer configuration or setup issues including software installation, please contact Information Technology Service (ITS) (at https://www.salemstate.edu/offices-and-services/information-technology-services).

Additional references:

- Course teaching materials: http://weblab.salemstate.edu/~byi/CSC246_Info_Visual/index.html
  - This website is password-protected and ask the instructor for the password (or log into Canvas for it).
- Course online system (Canvas): https://elearning.salemstate.edu/.
  - Access to this site via the username and password given/assigned by SSU.

Class/Lab Attendance:

Regular attendance in both class and lab sessions contributes significantly to your coursework and particularly to your final grade. Lab exercises will be evaluated and graded during designated lab periods, with ***no*** exceptions for late submissions.

Class and lab time will be allocated for a variety of activities, including detailed explanation of the course topics, comprehensive review of course material, in-depth exploration of R and RStudio visualization implementation details beyond textbook coverage, practical application exercises, troubleshooting project-related issues, and assessment of assignments and homework.

Lectures will commence promptly at the scheduled time, and students are expected to arrive on time. All course content, including assignments, grades, and announcements, will be accessible through Salem State University's online course management system, Canvas (https://elearning.salemstate.edu/). Students must use their **SSU Navigator credentials** to access Canvas and ensure their SSU email address is current for communication with the instructor.

It is the student's responsibility to complete all course requirements and stay informed about course content, regardless of attendance.

Student-Instructor Communication:

For the most effective assistance with course material, particularly R programming and visualization practices, please consult with the instructor during class, lab, or office hours.

While Canvas is used for assignment submission and grade posting, it is not the primary method for seeking academic support. To ensure timely responses, please direct questions to the instructor during class or lab or via email.

Grading Policies & Course Assessments:

Final grade will be determined using the following grading weights:

reading/writing assignments	15%
lab exercises	30%
projects	25%
midterm examination	10%
final examination	20%

Although attendance is not factored into the final grade, lab and project testing and grading will take place during lab hours. You are always responsible for completing all assignments and for understanding the materials presented in class.

The numeric final overall grade will be converted to a letter grade based on the following grading system and this letter grade will be submitted as the official grade for the course.

Overall Final	Letter Grade
94-100	A
90-93	A-
87-89	B+
84-86	B
80-83	B-
77-79	C+
74-76	C
70-73	C-
67-69	D+
64-66	D
60-63	D-
0-59	F

The following table shows how the course work is assessed against the course objectives:

	Exam Questions	Homework Problems	Projects	Papers
CO01	✓	✓		✓
CO02	✓	✓	✓	
CO03	✓	✓		
CO04	✓	✓	✓	
CO05	✓	✓		
CO06	✓	✓	✓	
CO07	✓	✓	✓	
CO08	✓	✓	✓	✓

Reading/Writing Assignments:

These assignments are designed to help you understand the course topics, prepare for data analysis and visualization, particularly with R programming practices.

Readings from the textbook will be assigned regularly. To get the most out of these readings, complete them before the material is covered in class. You'll find that many assignment questions are based on the textbook readings. After completing labs and projects related to the reading topics, reviewing these materials will be especially beneficial and rewarding.

Lab Exercises:

Lab exercises are designed not only to help you understand the course topics but also to prepare you for the visualization projects. Lab exercises must be completed, tested, and graded by the instructor during lab hours. Submitting your lab work to Canvas by the deadline alone does ***not*** guarantee credit—you must have it tested and answer questions given by the instructor to receive a grade. Details can be found in Lab Syllabus document.

Lab exercises must be submitted on time by the specified deadlines; late submissions will receive a grade of zero.

Please note that lab exercises and projects are separate assignments, and the credits earned from projects do not count toward your lab assignment grades, even though some labs may be part of projects.

Projects:

Throughout the semester, you will be assigned projects in the area of data processing and visualization. Most projects will involve preparatory lab activities. These assignments will require dedicated practice time outside of scheduled lab hours.

To receive full project credit, all projects must be submitted through Canvas (https://elearning.salemstate.edu/) and then tested and reviewed with the instructor during your lab hours.

For each course project, you must:

1. Submit/upload the following materials to Canvas by the specified deadline.
    - Your original "program" code files (e.g., **. R** program files and other "markdown" files);
    - Raw and processed data files (if applicable);

- A **Word or PDF document Project Report** containing:
  - An introduction of the project—what it is or does;
  - about the data to be used (what, data size, structure…);
  - data processing/cleaning/analysis (if applicable);
  - visualization of the data: process and results;
  - screenshots showing the above data preprocess and visualization results.
    - Ensure that the contents of your screenshots are **clear and easy to read**. Avoid capturing entire monitor screens or full IDE windows; instead, focus on the specific required content. If the screenshots are not legible, you may receive ***zero*** points for the assignment.

2. Show the instructor your visualization processes (including data processing) during lab hours.
3. Correctly answer the instructor's questions during the testing process.

Due to the extensive testing process, timely submission of your solutions is crucial. If you cannot adequately explain your visualization process or answer related questions during the in-lab testing, your project grade will be significantly impacted, potentially resulting in a score of ***zero***.

AI Policy and Coding Assignment Grading:

Online sources and generative AI tools (e.g., ChatGPT) may be used to supplement your study of course topics and concepts. However, the primary approach to learning programming should involve reading the assigned textbook, engaging with class lectures, completing lab exercises during lab hours, and following the provided examples when working on coding assignments. Online sources and AI tools should **only serve as supplementary aids**.

Submitting solutions (i.e., programs) found online or generated by AI tools as your own work for coding assignments (e.g., labs, projects, etc.) is considered plagiarism**.**

Please be aware that online "solutions," especially those generated by AI tools, may incorporate "advanced programming techniques" that have not been introduced in the course by the assignment deadline. You are ***only*** permitted to use programming techniques that have been taught up to that point or the ones you do understand. Failure to adhere to this requirement may result in significant grade reductions or a grade of zero for coding assignments.

Tests (midterm and final examinations):

Midterm examination will be administered in the middle of the semester, along with a comprehensive final exam scheduled following the university final test agenda. The weight of each assessment in determining your final grade is outlined in the grading policies above.

The final exam will be a comprehensive evaluation of all course material.

Missed Tests:

Make-up exams are generally ***not*** permitted unless there is documented proof of an emergency. If you need to reschedule a midterm test you need arrange this with the instructor within one week of the original test date. The final exam make-up will be done in the university designated Make-up Exam Period.

Due Dates/Time:

- Lab exercises must be submitted on time by the specified deadlines; late submissions will receive a grade of zero.
- For **all other coursework**, late submissions will incur the following penalties:
  - Up to 24 hours late: A deduction of 25 percentage points.
  - More than 24 hours and up to 48 hours late: A deduction of 50 percentage points.
  - More than 48 hours and up to 72 hours late: A deduction of 75 percentage points.
  - More than 72 hours late: A grade of zero will be assigned.
  - After the final examination: No assignments, labs, or projects will be accepted after the final exam, and a grade of zero will be given for any submissions made after this time.
- In case of an emergency that prevents you from completing or submitting your assignments/projects on time, you must email a request for an extension. The instructor will respond with a specific extension period or a new deadline for the assignment. Be sure to keep this email as proof of the extension approval. Note that sending the request email alone does **not** guarantee approval.
- Always **double-check your submissions**, as assignments are typically graded after the deadline. To ensure successful submission, download your submitted files and review them carefully. For projects and lab exercises, verify the downloaded programs by running the code to confirm everything is in order.

Study Groups:

While I strongly encourage study groups, each student must submit their answers in their own words or solutions. If two submissions are highly similar, neither will receive credit.

When working on your programming projects, you may discuss project topics, algorithms, and methodologies with others. However, the coding must be entirely your own work. If two code submissions are identical or very similar, neither will receive credit, and further action may be taken, such as reporting the incident to the department or university.

Collaboration is encouraged for discussing project topics, algorithms, and methodologies. However, all code must be your original work. Identical or highly similar code submissions will result in ***zero*** credit for both parties and may lead to further disciplinary action.

Academic Integrity:

Academic Integrity Policy and Regulations can be found in the University Catalog and on the University's website (http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic_Integrity). The University has established comprehensive regulations governing academic integrity. Please familiarize yourself with these guidelines if you haven't already. A concise summary and direct quote from the regulations states: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts." Submitting someone else's work as your own without proper attribution is a direct violation of the University's policy and will be addressed according to the University's formal procedures.

Equal Access Statement:

Salem State University is committed to providing equal access to the educational experience for all students in compliance with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act and to providing all reasonable academic accommodations, aids and adjustments. Any student who has a documented disability requiring an accommodation, aid or adjustment should speak with the instructor immediately. Students with Disabilities who have not previously done so should provide documentation to and schedule an appointment with Disability Services and obtain appropriate services.

University Emergency Statement:

In the event of a university declared critical emergency, Salem State University reserves the right to alter this course plan. Students should refer to Salem State for further information and updates. The course attendance policy stays in effect until there is a university declared critical emergency. In the event of an emergency, please refer to the alternative educational plans for this course located at Canvas (https://elearning.salemstate.edu/). Students should review the plans and gather all required materials before an emergency is declared.

Coursework Expectations and Schedule:

Students enrolled in this four-credit course should plan to spend approximately three hours per week attending class and three hours in lab attendance. Additionally, **a minimum of seven hours per week outside of class and lab** is required for course-related work, beyond the six hours spent in class and lab sessions.

Students are responsible for adhering to Salem State University's academic regulations, including those pertaining to academic integrity, as outlined in the college catalog. It is essential that students complete all course requirements and keep up with course content, even in absences. The following table outlines the course schedule, including the topics covered each week of the semester and the final examination time.

Week	Dates	Contents (textbook chapters and others)
1	1/13—1/17	Introductions
2	1/20—1/24	R & RStudio Basics
3	1/27—1/31	Data Processing with R
4	2/3—2/7	Basic Data Visualization with R
5	2/10—2/14	More Visualization Skills with R
6	2/17—2/21	Case Studies
7	2/24—2/28	RMarkdown—Presentations

8	3/3—3/7	ggplot2
9	3/10—3/14	More R packages
10	3/17—3/21	**Spring Recess**
11	3/24—3/28	Perception, Color, Visuals
12	3/31—4/4	Choropleth Maps
13	4/7—4/11	Interactions & Animation
14	4/14—4/18	Application I
15	4/21—4/25	Application II
16	4/28—5/1	Information Visualization vs Scientific Visualization **Reviews**
17	5/5—5/12	**Final Examination** **May 6 (Tuesday), 8:00am-10:00am, MH202**

Please remember that if, for any reason, you decide to drop this course, you MUST do so officially through the Registrar's office. The last day to withdraw from a course this semester is **April 4th**, **Friday**.

Note: This syllabus represents the intended structure of the course for the semester. If changes are necessary, students will be notified in writing and via all regular class communication mechanisms (class discussion, emails, and/or the course link at Canvas https://elearning.salemstate.edu).