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.

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	✓	✓	✓	✓

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.

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.

The table below outlines the lab activities (subject to minor adjustments as we progress through the coursework.

Week	Dates	Planned Lab Activities (Subject to Change)
1	1/13—1/17	Visualization Examples for Introduction
2	1/20—1/24	Installation of R and RStudio, R practices
3	1/27—1/31	Data Processing with R
4	2/3—2/7	Basic Data Visualization with R/RStudio
5	2/10—2/14	More Data Preprocessing/Visualization with R/RStudio
6	2/17—2/21	Case Studies
7	2/24—2/28	RMarkdown
8	3/3—3/7	ggplot2 and other R packages
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	Applications
15	4/21—4/25	Scientific Visualization
16	4/28—5/1	**Reviews**

Lab Exercise Submission:

For each lab exercise, **a lab report** is required for submission in the format of Word/PDF document or in other formats—check the lab requirement description for detail. In addition, the report must contain the following:

- A short paragraph (several sentences about 30~150 words in length) of short description of the lab (***what*** about the lab and ***how*** to solve the problem);
- A screenshot of the computer system time when you have completed the lab—this timestamp must come from the computer system you have used for the completion of the lab.

Most of the labs are coding related exercises; in such cases, you must submit the following **additional items**:

- In the same report, screenshots or output results from the executions of the lab programs (i.e. the running of R programs.
- R program files or all corresponding code files.

Do ***not*** zip or compress the submission files.

Ensure that the contents of your screenshots or visual results are **clear and easy to read**. Avoid capturing entire monitor screens or full IDE windows; instead, focus on the specific required content. As for the visual output results, they should have a "proper" size (dimensions). If the screenshots or the visualization results are not legible, you may receive *zero* points for the lab.

Lab Grading Procedures:

1. Submit your solution (source code files, lab report) for the lab assignment to Canvas by the deadline;
2. Show/test your solution in the lab hours;
3. Have the instructor test your code in the lab hours;
4. Answer the questions provided by the instructor correctly during the testing.

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.

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**.