

SYLLABUS

Spring, 2026

CSC 425 Computer Graphics and Games

4.0 credits

Prerequisite(s): MAT 108 or MAT 110 or any MAT course numbered 208 or above except MAT 247, plus CSC 260

Instructor: Beifang Yi
email: byi@salemstate.edu

Office: MH 208B
Hours: WF (1:30-3:45)

Phone: (978) 542-7246
Website: <http://weblab.salemstate.edu/~byi/>

Section	Time	Room	Final Exam
01	W & F 9:00am-10:40am	MH 210	May 6, Wednesday, 11:00am-1:00pm MH 210
Office Hours		1:30—3:45pm (Wednesday, Friday), MH208B	
Communication Policy		I will reply to student emails within 24 hours.	

Catalog description

This course covers fundamental principles and applications underlying computer graphics and computer games. The course presents key aspects of computer graphics including graphics pipeline, scene graphs, 2D/3D geometric objects and transformations, viewing, shading, and modeling. Topics related to computer game development include game engines, animation, and behavior and interaction. The course will also introduce basic concepts of collision detection, illumination, game design and implementation, and will emphasize the application of the topics in game-related computer graphics programming projects with the use of graphics libraries and game engines and toolkits. Four lecture hours per week, plus programming work outside of class.

Course Goals

The purpose of this course is to develop students' understanding of modern computer graphics and game development. The goals of this course are:

- CG01: to develop an appreciation for the modern computer graphics and game design;
- CG02: to understand the basic mathematics behind computer graphics;
- CG03: to understand the fundamental concepts in creating graphical contents;
- CG04: to present the design issues for game development;
- CG05: to give students experience in the construction of visual elements and environment (including games).

Course Objectives

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

- CO01: demonstrated knowledge of the mathematical foundations of computer graphics;
- CO02: demonstrated knowledge of the rendering pipeline in computer graphics;
- CO03: described scene graphs, 2D/3D transformations, 2D/3D viewing, lighting, and clipping;
- CO04: utilized at least one graphics library and at least one programming language to construct 2D/3D graphical objects and apply transformations, material properties, illuminations, and camera models to the objects to create a graphical environment;
- CO05: identified texturing, shading, curves and surfaces, rasterization, and z-buffer;
- CO06: become acquainted with basic game programming theory and tools, game engine, game GUI and input devices, collision detection;
- CO07: demonstrated the ability to design and develop an interactive game with the application of computer graphics techniques.

Course Topics

A detailed topics list and a general course bibliography can be found on the Computer Science Department website at [Salem State](http://weblab.salemstate.edu/~byi/)

[Computer Science Department](#) (click on “Degrees & Courses”, choose “Computer Science Major”, Click on “Course Descriptions”, and then select “CSC 425 Computer Graphics and Games” to access a PDF document.).

Texts

(Required) Computer Graphics from Scratch: A Programmer’s Introduction to 3D Rendering, by Gabriel Gambetta, No Starch Press, 2021 (ISBN-13: 978-1718500761). (refer to <https://gabrielgambetta.com/computer-graphics-from-scratch/> for more info.)

(Required) Unity in Action, 3rd Edition: Multiplatform Game Development in C#, by Joseph Hocking, Manning, 2022 (ISBN-13: 978-1617299339). (refer to <https://www.manning.com/books/unity-in-action-third-edition> for more info.)

Course Materials & Software

Students are required to have access to a personal computer or laptop (Windows, macOS, or Linux). In addition, students must have a **USB flash drive (minimum 64 GB)** or reliable **online/cloud storage** for saving and backing up projects and coursework.

The course will primarily use **Unity game development software** and the **C# programming language**. Additional computer graphics software, libraries, and tools may also be introduced. Students will also use **Java (JDK)** and a modern, widely used **Integrated Development Environment (IDE)** of their choice.

Because the course uses the **latest version of Unity**, which can be computationally demanding, students are **expected** to have a **reasonably powerful and up-to-date computer system**. Students should check and ensure that their systems align with **Unity’s official recommended system specifications**. In general, systems are expected to include:

- A relatively recent **multi-core CPU**
- Adequate **RAM** (16 GB recommended; 8 GB minimum)
- A capable **GPU** that supports modern graphics APIs (a dedicated GPU is strongly recommended)
- A **current, supported operating system** (Windows or macOS) running at acceptable performance

Students whose systems do not meet these expectations may encounter performance limitations when working with Unity and related graphics tools. It is the student’s responsibility to ensure that their hardware and software environment is sufficient to complete all course requirements.

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>).

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

Additional references

- Course website: <http://weblab.salemstate.edu/~byi/CSC425/index.html>.
 - This website is password-protected and ask the instructor of 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.
- *Computer Graphics Using Java 2D and 3D*, by H. Zhang & Y. Liang. Pearson & Prentice Hall, 2007.
- *Interactive Computer Graphics: A Top-down Approach with Shader-based OpenGL, 7th Edition*, by Edward Angel and Dave, Pearson, 2014.

Class Attendance

Regular attendance and active engagement in all class sessions are expected and are essential for successful course completion. Class time is used not only for presenting course topics, but also for in-depth explanation of computer graphics and game concepts; discussion of implementation techniques, algorithms, and design choices involved in creating graphical features; review and clarification of assignments; answering questions—particularly those related to course projects; and coverage of required topics that may not be fully addressed in the textbook.

Class sessions begin promptly at the scheduled time. Students are expected to arrive on time, remain for the full duration of the class, and participate actively in discussions, demonstrations, and in-class activities.

All course materials, assignments, grades, and official announcements are delivered through Canvas (<https://elearning.salemstate.edu/>). Students are responsible for accessing Canvas using their SSU credentials, regularly monitoring course communications, and ensuring that their SSU email address is current and functional.

Students are responsible for completing all course requirements and staying current with course content, assignments, and announcements, regardless of attendance at class sessions. Absences do not excuse missed work or missed deadlines. Students who miss a class are responsible for obtaining notes, instructions, and updates from Canvas or from classmates.

Consistent attendance and participation contribute significantly to understanding course material and to overall academic success in this course.

Student-Instructor Communication

For the most effective assistance with course material, particularly programming assignments, please consult with the instructor

during class 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 via email.

Grading Policy & Course Assessments

Final grade will be determined using the following grading weights:

assignments	15%
projects	45%
semester project	20%
final examination	20%

The final numeric grade will be converted into a letter grade according to the grading scale below, and this letter grade will be submitted as the official course grade.

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:

	Assignments/Projects	Examinations
CO01	✓	✓
CO02	✓	✓
CO03	✓	✓
CO04	✓	✓
CO05	✓	✓
CO06	✓	✓
CO07	✓	

Reading/Writing Assignments

These assignments are designed to help students understand course topics and algorithms, prepare for projects, and develop the knowledge and skills needed for the final examination. Many test questions will be similar in format and content to the questions included in these assignments.

Readings from the required textbooks and related study materials posted on Canvas will be assigned regularly. Many assignment questions are directly based on these readings.

The course will include various types of questions designed to assess students' understanding of key concepts and their ability to apply knowledge in preparation for projects and the final exam. Each assignment has a specified deadline, and penalties will be imposed for late submissions (see **Due Dates/Time** below).

Projects

Throughout the semester, students will be assigned projects. The point value of each project may vary depending on its difficulty and workload. To receive full credit, all projects must be submitted through Canvas (<https://elearning.salemstate.edu/>).

Each project includes specific technical, formatting, and submission requirements. Students must carefully read and follow all project specifications and instructions before beginning work and before submitting the final project. Projects that do not meet the stated requirements and specifications will receive significant grade reductions and may receive a grade of zero.

Students are responsible for verifying that the correct and complete project files have been submitted. Students may resubmit projects prior to the deadline; however, grading will be based on the **last submission**, and each resubmission must include the **entire, complete project solution** and all required components.

Each project has a specified deadline, and penalties will be imposed for late submissions (see **Due Dates/Time** below).

Semester Project and Presentation

The course includes one required semester project, with project results presented at the end of the semester. Students will select a computer graphics– or game-related topic for their semester project, subject to instructor approval.

The following materials must be submitted by their respective due dates:

1. **Semester Project Proposal** – A brief description of the project, including the project goals, tools/libraries, programming language(s), development environment (IDE), and expected outcomes.
2. **Semester Project Progress Report** – A status report describing work completed to date, work remaining, and any preliminary or intermediate results.
3. **Semester Project Portfolio** – A complete project package that includes a formal written report, source code, all supporting project materials (e.g., documents, images, audio, video), and presentation materials.

The semester project and presentation are a major component of the coursework and constitute a significant portion of the final course grade. Students are strongly encouraged to begin work on the semester project as soon as the instructor posts the project announcement.

Exceptional semester projects may be eligible for **bonus credit**, which typically involves presenting the project at a conference, workshop, or other venue approved by the instructor.

AI Policy and Coding Assignment Grading

Online resources and generative AI tools (such as ChatGPT) may be used to support learning of course topics and concepts and as auxiliary aids when working on projects. These tools should be used only as **supplementary resources**, not as replacements for independent thinking, design, or implementation.

Submitting solutions that are copied directly from online sources or generated by AI tools—either in whole or in part—without substantial original contribution is considered **plagiarism** and will be handled in accordance with university academic integrity policies.

Students must be able to clearly explain, modify, and justify all submitted code and project work.

Final Examination

The course includes a comprehensive final examination. The relative weight of the final exam in determining the course grade is outlined in the grading policies above. As with other assessments, a significant portion of the exam questions will be similar in format and content to the reading/writing assignment questions.

Make-up Examinations

Make-up examinations are generally not permitted and will be granted only in cases of documented emergencies. Students requesting a make-up exam must notify and arrange approval with the instructor within **one week** of the original exam date.

Any approved make-up for the final examination will be administered during the university-designated **Make-up Exam Period**.

Policy on Late Work

- Late submission of assessed assignments (projects) will incur the following penalties:
 - A **20%** deduction if submitted within 24 hours after the deadline.
 - A **40%** deduction if submitted more than 24 hours and up to 48 hours late.
 - A **60%** deduction if submitted more than 48 hours and up to 72 hours late.
 - An **80%** deduction if submitted more than 72 hours and up to 96 hours late.
 - A **100%** deduction (grade of zero) if submitted more than 96 hours late.
 - In addition, **no** assignments (including and projects) will be accepted *after the final examination*. Any work submitted

after that time will receive a grade of **zero**.

- In the event of an emergency that prevents you from completing or submitting your assignments/projects on time, you must send an *email* request for an extension. The instructor will respond with either the number of days granted for the extension or a new deadline. You should keep this email as proof of the extension approval. Please note that sending a request email does **not** automatically guarantee an extension.
- Please **double-check your submissions**, as they are typically graded after the deadlines. To ensure successful and correct submissions, download and review your submitted materials. For programming projects, download the programs and verify that the code compiles and runs correctly.

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

Salem State University assumes that all students come to the University with serious educational intent and expects them to be mature, responsible individuals who will exhibit high standards of honesty and personal conduct in their academic life. All members of the Salem State University academic community have a responsibility to ensure that scholastic honesty and academic integrity are safeguarded and maintained. Cheating and plagiarism are unfair, demoralizing, and demeaning to all of us. Cheating, plagiarism, and collusion in dishonest activities are serious acts that erode the University's educational role and cheapen and diminish the learning experience not only for the perpetrators, but also for the entire community. It is expected that Salem State University students will understand and subscribe to the ideal of academic integrity and that they will be willing to bear individual responsibility for their work. Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts.

Equal Access Statement

Salem State University celebrates and welcomes diverse learners of all types. Salem State University is committed to providing equal access to the educational experience for all students and to providing all reasonable academic accommodations, aids and adjustments.

Students who qualify for accommodations, aids or adjustments who have not previously done so should provide documentation to and schedule an appointment with the [Center for Accessible Academic Resources](#) and obtain appropriate services at caar@salemstate.edu. Any student who has a documented need for accommodations, aids or adjustments should share their accommodation letter with their instructors. We encourage students to communicate with their instructors as early in the semester as possible.

Salem State University complies with Section 504 of The Rehabilitation Act and The Americans with Disabilities Act.

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 four hours per week attending class attendance or practice. Additionally, **a minimum of eight hours per week outside of class** is required for course-related work, beyond the four hours spent in class session.

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 (subject to some adjustments or minor changes as the class goes on), including the topics covered each week of the semester and the final examination time. Detailed course requirements and advancements can be found at Canvas (<https://elearning.salemstate.edu/>).

Week	Dates	Contents (textbook chapters and others)
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1	1/20—1/23	U3-Ch1 & Ch2: Unity startup (Other sources: Using Unity)
2	1/26—1/30	U3-Ch3 (Unity 3D game-startup) CGS-Ch1 & Others (CG basics/introductions)
3	2/2—2/6	U3-Ch4 (Unity 3D game) CGS-Ch2 (Raytracing basics) (Others: basic CG mathematics)
4	2/9—2/13	U3-Ch5 (Unity 2D functionality) CGS-Ch3 (Light) (Others: basic CG mathematics)
5	2/16—2/20	U3-Ch6 (Unity 2D games) CGS-Ch4 (Shadows and reflections) (Others: J3D, OpenGL,...)
6	2/23—2/27	U3-Ch7 (Unity GUI to games) CGS-Ch5 (Raytracer) (Others: J3D, OpenGL,...)
7	3/2—3/6	U3-Ch8 (Unity 3D game and animation) CGS-Ch6 (Lines) (Other source: Geometry)
8	3/9—3/13	U3-Ch9 (Unity interaction) CGS-Ch7 (Filled triangles) (Other source: Geometry and Transformation)
9	3/16—3/20	Spring Recess
10	3/23—3/27	CGS-Ch8 & Ch9 (Shaded triangles & perspective projection) (Other source: Shading, Transformations, Viewing)
11	3/30—4/3	CGS-Ch10 (Rendering a scene) (Other source: Viewing, Pipeline) U3-Ch10 11 12 13 (Unity Semester Project)
12	4/6—4/10	CGS-Ch11 & Ch12 (Clipping, HSR) (Others: Viewing, Z-Buffering,...) U3-Ch10 11 12 13 (Unity Semester Project)
13	4/13—4/17	CGS-Ch13 & Ch14 (Shading and Textures) U3-Ch10 11 12 13 (Unity Semester Project)
14	4/20—4/24	CGS-Ch15 & Other Sources (Advanced Shadowing) U3-Ch10 11 12 13 (Unity Semester Project)
15	4/27—4/29	Semester Project Presentations
		Reviews
16-17	5/4—5/11	Final Examination May 6 (Wednesday), 11:00am-1:00pm, MH210
<p>(1). Detailed course contents are available on Canvas at https://elearning.salemstate.edu/; visit the instructor's homepage at http://weblab.salemstate.edu/~byi/ for more information.</p> <p>(2) U3/CGS refer to textbooks: U3: Unity in Action, 3rd Ed.; CGS: Computer Graphics from Scratch</p>		

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 10th**.

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>).