

**SYLLABUS**

**Spring, 2022**

**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 211A/Zoom  
**Hours:** TR (12:00-1:40)  
WF (1:40-2:30)

**Phone:** (978) 542-7246  
**Website:** <http://cs6.salemstate.edu/~byi/>

Section	Time	Room	Final Exam
01	W/F 2:40-4:20	<p><b>Zoom MH210</b></p> <p>Zoom Meeting ID: <b>952 3021 3714</b> Passcode: <b>163037</b></p> <p><a href="https://salemstate.zoom.us/j/95230213714?pwd=K0VVbGRDaGs5YzV1Q253cVF0VnVzQT09">https://salemstate.zoom.us/j/95230213714?pwd=K0VVbGRDaGs5YzV1Q253cVF0VnVzQT09</a></p>	<p><b>Friday 5/6</b> <b>2:00pm-4:00pm</b> <b>(Zoom MH210)</b></p>
<p><b>Important Notes:</b> Classes/Labs/Office Hours will be through <b>online/Zoom (starting on 1/18/2022)</b> and will be switched to the indicated <b>classrooms/office later</b>. The university/department/instructor will inform of <b>WHEN</b> to switch to classrooms/office. Also please log in to Canvas at <a href="https://elearning.salemstate.edu/">https://elearning.salemstate.edu/</a> and select the course for more information or send email to the instructor (the email address is listed above).</p>			

**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 <http://cs.salemstate.edu/dept/index.php?page=184>. Select CSC 425 to access a PDF document.

### Text(s):

- **Computer Graphics Using Java 2D and 3D**, by H. Zhang & Y. Liang. Pearson & Prentice Hall, 2007.
- **Killer Game Programming in Java**, by A. Davison. O'Reilly Media, 2005.

### Required Material:

(**Required**) Thumb (flash) drive, 16 GB minimum or online storage (for saving your projects and coursework) in addition to your personal computer/laptop.

### Additional references (optional):

- *Introduction to Game Design, Prototyping, and Development: From Concept to Playable Game with Unity and C#, 2<sup>nd</sup> Edition*, by Jeremy Gibson Bond. Addison-Wesley, 2017.
- *Hands-On Unity 2021 Game Development: Create, customize, and optimize your own professional games from scratch with Unity 2021, 2<sup>nd</sup> Edition*, by Nicolas Alejandro Borrromeo. Packt Publishing, 2021.
- *Computer Graphics for Java Programmers, 3<sup>rd</sup> Edition*, by Leen Ammeraal and Kang Zhang, Springer, 2017.
- *Interactive Computer Graphics: A Top-down Approach with Shader-based OpenGL, 7<sup>th</sup> Edition*, by Edward Angel and Dave, Pearson, 2014.
- *The Complete Guide to Blender Graphics: Computer Modeling and Animation, 7<sup>th</sup> edition*, by John Blain. A K Peters Press, 2022
- *Fundamental 2D Game Programming with Java, 1st edition*, by Timothy Wright. Cengage Learning PTR, 2014.
- *Game Programming Patterns, 1<sup>st</sup> edition*, by Robert Nystrom. Genever Benning, 2014.
- *Pro Java 6 3D Game Development: Java 3D, JOGL, JInput, and JOAL APIs*, by A. Davison. Apress, 2007.
- <https://unity.com/>
- <http://www.java3d.org/index.html>
- <http://www.blender.org/>
- Java Media APIs at <https://www.oracle.com/technetwork/java/javase/media-141984.html>
- JavaFX at <https://docs.oracle.com/javafx/2/>
- WebGL at <https://www.khronos.org/webgl/> and [https://developer.mozilla.org/en-US/docs/Web/API/WebGL\\_API](https://developer.mozilla.org/en-US/docs/Web/API/WebGL_API)

### Cell phones:

Turn the ringer off, or, better yet, *turn the phone off*.

### Lecture/Lab Attendance:

Class attendance is highly recommended. You are responsible for all materials presented in class, examinations, and other announcements. No excuses of any nature will be construed as relieving you from the responsibility for completion of the work assigned. Each student is responsible for completing all course requirements and for keeping up with all that goes on in the course (whether or not the student is present).

We will use SSU's online course management system, Canvas (<https://elearning.salemstate.edu/>) to post assignments and

announcements regarding the course topics and progress. You will need to visit Canvas (with your SSU Navigator use-name and password) for the course activities. Canvas uses your *SSU-stored email* box for the communication between you and the instructor and thus you **must use that email** address.

Some portion of class/lecture hours will be focused on some “lab exercises” which will be used to review or present software tools, to discuss and investigate Java implementation details about computer graphics algorithms, graphics libraries/functions, implementation specifics of some graphics features, in order to assist with design and debugging problems that arise in programming/project exercises.

**Final Grade:**

Final grade will be determined using the following grading weights:

assignments/projects	45%
semester project and presentation	25%
final examination	30%

Attendance is not used to calculate the final grade: *however*, note that you are at all times responsible for assignments and materials presented in class.

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

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

**Assignments/Projects:**

There will be a series of assignments for this course: question-answering, calculations, and (programming) projects. There is a deadline to each assignment and **penalty** will be imposed for late submissions (see the Due Dates/Time below).

All the assignments must be submitted at Canvas (<https://elearning.salemstate.edu/>) unless otherwise noted.

For each project, a write-up should be submitted which describes the problem, solutions, and other requirements (usually, there are additional requirements for the assignments). For a programming project, it should provide the following: (a) instructions on how to compile and run the program, (b) testing results, (b) source code, and (d) input data (if applicable).

Each assignment may have different full score points, depending on the difficulty and the amount of the work of the exercises.

Readings will be assigned from the text on a regular basis: for the maximum benefit from reading, do the readings before the material is covered in class. Supplementary material will be distributed on a regular basis, and will be the primary focus of class discussions.

**Semester Project and Presentation:**

There will be one semester project and the project result will be presented at the end of the semester. Students choose computer-graphics-games-related topics as their semester projects *upon the instructor’s permission*. For this assignment, the

following materials should be submitted by their indicated due times respectively : (1) semester project proposal (a brief description of the project, which tools/libraries/programming language/IDE are to be used, and what would be the expected results), (2) semester project progress report (of what has been done and what will be done and temporary results), and (3) semester project portfolio including a formal project write-up/report, programming code, all project documents/audios/videos, and presentation documents.

Semester project and presentation is an important portion of the course work and constitutes a significant portion of the course grade. Please start on the semester project once the instructor posts the project announcement. *Excellent work on the semester project may have chance of earning bonus credits*, which is usually presenting the project in a conference or workshop or in other forms the instructor permits.

#### **Examinations/Tests:**

There will be one final (comprehensive) examination.

#### **Missed Tests:**

Missed tests will be made up *only under extreme conditions/emergency with the proper documentation*. Makeup work will be permitted *only when* the instructor is presented with acceptable documentation for acceptable absences. It is your responsibility to notify your instructor of any excused absence as far in advance as possible.

#### **Due Dates/Time:**

- Late submission of assessed coursework will result in penalties defined in the following:
  - **25 percentage** points will be deducted for being late, up to 24 hours.
  - **50 percentage** points will be deducted for being late, more than 24 hours and up to 48 hours.
  - **75 percentage** points will be deducted for being late, more than 48 and up to 72 hours.
  - **100 percentage** points will be deducted for being late more than 72 hours (i.e., a grade of **zero** will be given).
  - A grade of **zero** will be given for any assignments/labs/projects which are submitted after the final examination time. That is: **no assignments/labs/projects will be accepted after the final examination**.
- Should there be an emergency that prevents you from completing/submitting your assignments/projects on time, you will need to send an *email request* for the extension on the coursework submission. The instructor will reply to this request email with a specific number of days for the extension period or a new deadline for the assignment and you will need to keep *this email as a record of the extension approval*. Sending only a request email does **not** guarantee the extension approval.
- **Please double-check** your submissions (since your assignment submissions are usually graded after their deadlines): to guarantee your successful submissions, you would need to download your submissions and examine the downloaded materials; as for the projects, you would need to check the downloaded programs and then compile/run the code.

#### **Study Groups:**

While I strongly encourage study groups, I require that each student hand in his/her answers in her/his own words - if two answers are highly similar to each other, neither will receive credit.

When working on your programming projects, you may discuss with others the project topics, the algorithms and methodologies related to the project; but when you work on writing the code, this coding work should be 100% of your own work. **If two answers/written code segments come out exactly the same or highly similar, neither will receive credit and/or further actions will be taken** (such as reporting to the department and/or university).

#### **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](http://catalog.salemstate.edu/content.php?catoid=13&navoid=1295#Academic_Integrity)). The formal regulations are extensive and detailed - familiarize yourself with them if you have not previously done so. A concise summary of and direct quote from the regulations: "Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts". *Submission of other's work as one's own without proper attribution is in direct violation of the University's Policy* and will be dealt with according to the University's formal Procedures.

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All students are expected to be familiar with the academic regulations, including those regarding Academic Integrity, for Salem State University as published in the college catalog. In addition, each student is responsible for completing all course requirements and for keeping up with all that goes on in the course (whether or not the student is present).

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.

Students must comply with the Covid-19 Health and Safety Protocols for the 2020-2021 Academic Year. This includes wearing masks in class and on campus in public spaces, practicing physical distancing where possible, including in class, engaging in a daily symptom check, notifying Counseling and Health Services at 978-542-6413 if they have any symptoms associated with COVID-19, and not coming to campus or to an in-person class if they have any of the symptoms related to COVID-19, until cleared by the Student Life Wellness Area. Students who have documented disabilities that may prevent them from complying with these policies are required to contact the Disability Services office.

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 15<sup>th</sup>**.

**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/>).