FLORIDA POLYTECHNIC UNIVERSITY

CAP 4730 – Computer Graphics

Course Information

- **Course Number and Title**: CAP 4730 – Computer Graphics
- **Credit Hours:** 3 (Lecture)
- **Academic Term: Spring 2026**

Instructor Information

- **Instructor**: Dr. Bradford A. Towle Jr.
- **Office**: BARC 2230
- **Office Hours**: M,W,F 11 – 12:45* Also by appointment
- **Email**: btowle@floridapoly.edu
- **Office** Phone Number: 1 (863) 874-8529

Course Delivery and Course Description

- Course Website: https://floridapolytechnic.instructure.com/courses/6911
- Course will be in person and meet three times a week.
  - M,W,F in IST-1032 from 10 – 10:50
- Official Catalog Course Description:

  The objective of this course is to establish a foundation in two- and three-dimensional computer rendering algorithms and display devices. Topics included: Geometric transformations, homogeneous coordinates, anti-aliasing, color vision, ray tracing, surface modeling, texture mapping, polyhedral representations, and reflectance models.
  - Course Pre and/or Co-Requisites: COP 3415 Data Structures
  - OR Computer Engineering majors: COP 3530 - Data Structures & Algorithms
- Communication/Computation Skills Requirement (6A-10.030): N
- Required Texts:
  - **None**
- Recommended Text:
  - **Interactive Computer Graphics 7th Edition (Angel, Edward)**
- Equipment and Materials
  - Students will require a laptop with Notepad ++ and a modern web browser.

Course Objectives and Outcomes

- **Course Objectives**:
  - use of textures, lighting and the mathematics employed for transformations.
  - Use 2D Graphics
  - Proficient in application development with JavaScript
  - Initialize WebGL from Scratch
  - Understand the math theory behind graphics
  - Learn how textures are implemented
  - Learn how lighting is implemented
  - Create an interactive graphical application

- **Course Learning Outcomes**:

CLO	Learning Levels	ABET Criteria
Develop a WebGL application from scratch and write their own vertex/fragment shaders	Create	(2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
Apply and recite mathematics behind transformation and viewing	Apply	(2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
Apply and recite the Phong model for lighting as well as identify the limitation of said model	Apply	(1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
Apply texturing capabilities on their application while still applying lighting	Apply	(1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
Develop a 2D graphical application with JavaScript and HTML 5	Create	(1) Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Peer Learning Strategists (PLS)**: Are specially trained student leaders who help their peers strategize approaches to course content and work through solution methods. PLS work in collaboration with the courses they support so the content and methods are aligned with your instructors' expectations. Students can meet with a PLS in The Learning Center, which is located on the first floor of the Innovation, Science and Technology (IST) building in room 1019.
- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit https://floridapoly.edu/writingcenter.

Civility and Collegiality (optional statement)

Faculty and students come to the university for the same reason, which is to participate in a highly professional educational environment. To that end, both students and faculty are expected to treat each other with mutual regard and civility. Communication, written, oral and behavioral, between faculty and students must remain respectful. Within and outside of the classroom, students must refrain from derogatory comments toward the faculty member and their fellow students, and faculty as well must refrain from derogatory comments toward their students. Faculty and students should address each other with respect, in accordance with the wishes of the faculty and the students: for example, no one should be addressed by their last name alone.

Faculty from the outset of a course can and should specify what constitutes activities and behavior that take away from, that diminish, the educational environment. An individual student's distracting behavior impedes the education of fellow students, which itself is a form of disrespect. Civility and collegiality also include respecting each other's time: for example, neither students nor faculty should arrive late to class (unless unforeseen, pressing circumstances prevail); faculty should be present at the posted office hours; and students and faculty should be punctual when meeting times are scheduled. In more general terms, collegiality means respecting the right of both faculty and students to participate fully and fairly in the educational enterprise.

Course Policies

Attendance

See also University Policy, which reads "Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor." Attendance in this environment does not, of course, mean actual physical attendance in the classroom, although it may include that.

Participation

Students are expected to participate in the classroom experience. The use of earbuds/headphones during class is specifically not allowed and students who engage in this behavior may be asked to leave the class for the day (noting exceptions for authorized accommodations). In addition, students who routinely do not bring materials to class that are required for participation, will not be given credit for class attendance, and if this becomes a pattern of behavior, may be asked to leave the class for the day. Persistent problems with participation may result in a code of conduct referral.

Late Work/Make-up work

I do NOT accept late homework, but I do believe in partial credit. Turn in what you have! Medical and School authorized absences will be excluded from the above policy. Circumstantial situations may be addressed case-by-case.

Grading Scale

A >= 93	77>C>=73
93>A->=90	73>C->=70
90>B+>=87	70>D+>=67
87>B>=83	67>D>=63
83>B->=80	63>D->=60
80>C+>=77	60>F

Assignment/Evaluation Methods

Knowledge will be tested by demoing labs, quizzes, and exams.

Professionalism and Participation	5%
Labs – Week long take home assignments that will be demoed in class.	35%
Quizzes	20%
Midterm	20%
Final	20%

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The University, through the Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations.

If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive.
If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible.

The Office of Disability Services (ODS):
DisabilityServices@floridapoly.edu
(863) 874-8770
The Access Point
ODS website: www.floridapoly.edy/disability

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. You may speak to your professor, but your professors have an obligation to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discussion resources and options available.

Academic Integrity

The faculty and administration take academic integrity very seriously. Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in an academic integrity hearing and sanctions against the accused student if found in violation. Sanctions range from receiving a zero on the exam or assignment, to expulsion from the university. Repeat offenders are subject to more severe sanctions and penalties.

There should be no copying of code in any form. Students may work together and help debug each other's code. However, no code should be copied from one student to another. Code given in class may be distributed to fellow students.

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidently, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action).

Recording class activities other than class lectures, including but not limited to lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is ***prohibited****.*

Course Schedule

Academic Calendars and Exam Schedules | Florida Polytechnic University

Week	Topic Schedule	Lab*
1	Welcome and Review of JavaScript -About this class -What you need to memorize -Basic Syntax	Simple Practice Problems
2	JavaScript and OOP -Creating your own framework for JavaScript -Classes -Inheritance	Slot Machine
3	2D Graphics -State machines -Setting properties -Creating a path -Filling or outlining	2D adventure / Quiz
4	Getting WebGL up and Running -A simple fragment and vertex shader -Monolithic example	WebGL Demo
5	Getting WebGL up and Running -Taking the monolithic example and organizing it with objects -Expanding on the fragment shader to allow for different color	WebGL Initials /Quiz
6	Input and Animation (Rigid body movement) -Mouse input -Keyboard input -Organizing graphical entities as objects	Paint Program
7	Transforms and Placing Objects -Review of linear algebra -Affine space -Vector Space -Transformation Matrix	Bouncing Triangles
8	Transforms and Placing Objects / Midterm -Transformation Matrix (Rotation) -Finding forward, right and up	Midterm
9	Simple Game Engine (Physics) -Creating a convention for game objects -Update cycle -Render cycle	
10	Simple Game Engine (Physics) -Collisions with simple physical response -Triggering code with non-physics collision	Simple Tank
11	Viewing, Camera Movement, and the Perspective Matrix -Camera Movement -Order of operations with the camera	Quiz
12	Viewing, Camera Movement, and the Perspective Matrix -Perspective matrix -The different coordinates	Asteroids

13	Lighting -Phong -Specularity -Ambient -Point	Quiz
14	Lighting -Adv. Lighting examples -Shadows	Dark Cavern Quiz
15	Textures -Creating textures -Applying textures -Modifying the fragment shader	
16	Textures -Bump maps -Environmental mapping	Escape the Maze Final

*Labs are tentative and subject to change.

Example of Lab Rubric:

5. Lab Rubric

	Perfect	Letter unreadable, or color not different	Syntax Errors	Not attempted
Three letters	10	10	5	0
Three different colors	10	10	5	0
Total	/20			