

San José State University
College of Science / Department of Computer Science
CS-116A, Introduction to Computer Graphics, Section 1, Fall 2017

Course and Contact Information

Instructor:	Robert Bruce
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Office Hours:	Mondays and Wednesdays, 4pm-5pm, or by appointment
Class Days/Time:	Monday and Wednesday, 6pm - 7:15pm
Classroom:	SCI-311
Prerequisites:	MATH 31, MATH 129A, CS 146 (with a grade of "C-" or better in each) and previous programming experience in C/C++, or instructor consent.

Course Format

Technology Intensive, Hybrid, and Online Courses

This class is technology intensive. You will need an Intel x86 or compatible laptop or desktop machine. We will be working in a Linux development environment. You will be using command line tools such as Make, gcc, etc. You will need an internet connection to access materials on the course website and Canvas. I will be providing a blank 120GB solid state drive with a USB3.1 interface for you to install and configure GNU/Linux for this class. All software and software development tools we will be using are open source. You are expected to program in the C or C++ programming languages for this course.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on [Canvas Learning Management System course login website](http://sjsu.instructure.com) at <http://sjsu.instructure.com>. You are responsible for regularly checking with the messaging system through [MySJSU](http://my.sjsu.edu) at <http://my.sjsu.edu> to learn of any updates.

Course Description

Vector geometry, geometric transformations and the graphics pipeline. Basic raster graphics algorithms for drawing discrete lines, clipping, visible surface determination and shading. Display of curves and surfaces. Graphics data structures. Prerequisite: MATH 31, MATH 129A, CS 146 (with a grade of "C-" or better in each) and previous programming experience in C/C++, or instructor consent.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

1. Describe different color spaces.
2. Describe the impact of shading in computer graphics.
3. Compare and contrast vector and bitmap graphic file formats.
4. Describe different techniques used in image compression.
5. Explain how linear transformations are used in computer graphics.
6. Create a three-dimensional OBJ file format visualizer.
7. Create two-dimensional primitives including line segments, rectangles, ellipses, and bezier curves using OpenGL.

Required Texts/Readings

Textbook

Computer Graphics with OpenGL (4th Edition) by Donald Hearn, M. Pauline Baker, and Warren R. Carithers. ISBN 0-13-605358-0

I've put one copy of this book on course reserves for twenty-four hour checkout from the SJSU King Library. Alternately, you may purchase this book from a bookstore such as Amazon, Barnes and Noble, etc.

Other technology requirements / equipment / material

You will be provided with a blank 120GB solid state drive with a USB3.1 interface. On this drive, you will configure and install Linux Mint in a graphical X-windows environment along with a host of GNU development and programming utilities. Once configured, you will be able to use this drive specifically for this class with all the tools necessary to create a computer vision pipeline.

Library Liaison

Anamika Megwalu, anamika.megwalu@sjsu.edu

Course Requirements and Assignments

There are four programming projects in this course. Detailed instructions and specifications for each programming assignment will be posted to [Canvas Learning Management System course login website](http://sjsu.instructure.com) at <http://sjsu.instructure.com>. Students are strongly encouraged to ask the instructor for clarification on each programming assignment specification.

There will also be one midterm and one final examination. Exams are closed note and closed book. Mobile phones or other electronic device usage will not be allowed during the exams.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

Final Examination or Evaluation

There will be a final exam on **Wednesday, December 13 in SCI-311 at 5:15pm**. The final exam will be based on in-class lecture material and material from our book. The final exam will be comprised of 15 multiple choice questions. The final exam is worth 15% of your overall grade.

Grading Information

Each programming assignment will include detailed specifications. I expect each of your assignments to compile without syntax errors or logic errors. Points will be deducted for programs that do not meet the specifications and/or programs containing syntax errors.

Determination of Grades

There will be four programming projects:

- Programming assignment 1: Drawing Mandelbrot fractals (10 points)
- Programming assignment 2: Simulated flying over surface (15 points)
- Programming assignment 3: A visualizer for OBJ files (20 points)
- Programming assignment 4: A 2D paint and draw program (25 points)

Midterm exam: 15 points

Final exam: 15 points

The total points possible for this class are 100. This means programming assignment 1 is worth 10% of your overall grade, programming assignment 2 is worth 15% of your overall grade, programming assignment 3 is worth 20% of your overall grade, programming assignment 4 is worth 25% of your overall grade, the midterm exam is worth 15% of your overall grade, and the final exam is worth 15% of your overall grade.

As noted above, programs that are submitted after the due date will be subject to a minimum 50% point loss. For example, programming assignment 1 submitted late would be worth a maximum 5 points.

Determination of Grades

Grade breakdown

Percent range	Grade
97% to 100% inclusive	A+
93% to 96% inclusive	A
90% to 92% inclusive	A-
87% to 89% inclusive	B+
83% to 86% inclusive	B
80% to 82% inclusive	B-
77% to 79% inclusive	C+
73% to 76% inclusive	C
70% to 72% inclusive	C-
67% to 69% inclusive	D+
63% to 66% inclusive	D
60% to 62% inclusive	D-
Below 60%	F

Grade breakdown

ASSIGNMENT OR EXAM	POINT VALUE
Programming assignment 1	10
Programming assignment 2	15
Programming assignment 3	20
Programming assignment 4	25
Midterm exam	15
Final exam	15
TOTAL POINTS	100

Incomplete assignments

Points will be deducted for incomplete or partially working solutions. Point penalties vary with each assignment but are listed in the programming assignment.

Late assignments

Programming assignments submitted after their specified due date will be considered late and subject to minimally 50% loss in points (additional points will be deducted for incomplete projects as noted above).

Classroom Protocol

Regular class attendance is highly recommended. Please plan to arrive early or on-time. Arriving to class late is disruptive to students and the instructor. Students are responsible for knowing all materials covered through in-class lectures and assigned readings. Please be mindful of fellow students and the instructor by not talking on mobile phones during instruction. Students are expected to leave the class quietly in the event they must use their mobile phones.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' [Syllabus Information web page](http://www.sjsu.edu/gup/syllabusinfo/) at <http://www.sjsu.edu/gup/syllabusinfo/>.

CS-116A / Intro. to Computer Graphics, Fall 2017, Course Schedule

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	Wednesday, August 23	Introduction and course objectives.
1	Monday, August 28	Introduction to OpenGL and GLUT. Readings: pp. 35-50 of Computer Graphics with OpenGL.
2	Wednesday, August 30	Fractals. Readings: pp. 695-722 of Computer Graphics with OpenGL.
2	Monday, September 4	NO LECTURE TODAY. CAMPUS CLOSED.
3	Wednesday, September 6	Splines. Readings: pp. 411-461 of Computer Graphics with OpenGL. <i>Note: Last day to drop course is September 6!</i>
3	Monday, September 11	Mesh: Vertices, Edges, and Faces.
4	Wednesday, September 13	Event driven programming, capturing keypresses and mouse clicks. DUE: Programming Project 1
4	Monday, September 18	Camera and clipping plane. (Talk about Interactive program to adjust frustum, near, and far clipping planes.) Readings: pp. 307-357 of Computer Graphics with OpenGL.
5	Wednesday, September 20	Animating the camera.
5	Monday, September 25	Light and Color (part 1 of 2). Readings: pp. 579-597 of Computer Graphics with OpenGL.
6	Wednesday, September 27	Light and Color (part 2 of 2). Readings: pp. 507-529 of Computer Graphics with OpenGL.
6	Monday October 2	Graphics File Formats. Readings: pp. 767-782 of Computer Graphics with OpenGL. DUE: Programming Project 2
7	Wednesday, October 4	Creating mouse-driven menus in GLUT.
7	Monday, October 9	Developing Graphical user interface widgets with OpenGL.
8	Wednesday, October 11	Question and Answer session / review for midterm exam.
8	Monday, October 16	MIDTERM EXAM
9	Wednesday, October 18	Hidden surface removal. Readings: pp. 479-503 of Computer Graphics with OpenGL.
9	Monday, October 23	GLSL: OpenGL Shading Language (part 1 of 2). Readings: pp. 665-694 of Computer Graphics with OpenGL.
10	Wednesday, October 25	GLSL: OpenGL Shading Language (part 2 of 2).
10	Monday, October 30	Accelerated Graphics Hardware (GPU). Readings: pp. 9-33 and pp. 803-812 of Computer Graphics with OpenGL.
11	Wednesday, November 1	Metaballs and Blobbies.
11	Monday, November 6	Linear transformations. Readings: pp. 279-305 of Computer Graphics with OpenGL. DUE: Programming Project 3

Week	Date	Topics, Readings, Assignments, Deadlines
12	Wednesday, November 8	Coordinate systems in OpenGL.
12	Monday, November 13	Introduction to Blender.
13	Wednesday, November 15	Algorithmic animation and modelling (part 1 of 2).
13	Monday, November 20	Algorithmic animation and modelling (part 2 of 2).
14	Wednesday, November 22	NO LECTURE TODAY. I will be in my office during office hours.
14	Monday, November 27	Squash, Stretch, and Bounce: The twelve principles of animation.
15	Wednesday, November 29	Character Rigging for animation.
15	Monday, December 4	Augmented Reality and Virtual Reality.
16	Wednesday, December 6	Introduction to WebGL.
16	Monday, December 11	Question and Answer session / review for final exam. DUE: Programming Project 4
Final Exam	Wednesday, December 13	FINAL EXAM at 5:15pm in SCI-311