

Syllabus
CSC321 Computer Graphics
Professor Leon Tabak
Block 3
October 22, 2018 to November 14, 2018

1 Our meeting times and places

- My office is in Law 206C.
- You may call me in my office at (319) 895-4294.
- You may send me electronic mail at l.tabak@ieee.org.
- I will be in my office and available to meet with you Monday through Friday from 3:00 p.m. until 3:30 p.m.
- We will all meet together in the classroom in the mornings and in the laboratory in the afternoons.

	Where	When
Laboratory	Law Hall 113	9 a.m. to 11 a.m. and 1 p.m. to 3 p.m.

2 Textbooks/Resources

You need not purchase a textbook for this course. We will make use of resources that are available online.

2.1 HTML, CSS, and JavaScript

- [HTML Tutorial \(w3schools\)](#)
- [CSS Tutorial \(w3schools\)](#)
- [JavaScript Tutorial \(w3schools\)](#)
- [Intro to JavaScript \(Udacity\)](#)
- [Object-Oriented JavaScript \(Udacity\)](#)
- [ES6-JavaScript Improved \(Udacity\)](#)

2.2 POV-Ray

- [POV-Ray The Persistence of Vision Raytracer](#)

2.3 Scalable Vector Graphics (SVG)

- [SVG \(Adobe\)](#)
- [SVG Tutorial \(w3schools\)](#)
- [Scalable Vector Graphics \(W3C\)](#)
- [SVG on the Web—A Practical Guide \(Jake Giltsoff/Breaking Borders\)](#)

2.4 WebGL and three.js

- [three.js](#)
- [WebGL Overview \(Khronos Group\)](#)
- [WebGL Fundamentals](#)

3 Etiquette for the Classroom

Please show respect to your classmates, to me, and to the seriousness of our enterprise by exercising the following courtesies:

- Please give your attention to whomever is speaking. You cannot view unrelated pages on the Web and be part of our class' discussion at the same time.
- You learn from your classmates. Be generous in offering help to classmates in the laboratory. Take interest in your classmates' work. Encourage them. Compliment them for work that is well done. Give them a good audience when they stand at the front of the room to present their work. Show these courtesies to all of your classmates.
- Please do not interrupt the class by late entries or early departures. If you anticipate a need to be absent from all or part of one of our meetings, please notify me in advance of your anticipated absence.
- You may listen to music while working in the laboratory so long as you are still able to hear your name when called and you do not disturb neighbors.

- Please refrain from bringing food or drink into the classroom or laboratory. We can make reasonable exceptions for eating that is not noisy and foods that do not have strong smells.

Acceptable beverages and foods include water, tea, and granola bars. Bringing breakfast to class is not courteous.

Please clean up crumbs and spills. Please dispose of empty containers and leftovers.

- Please dress as you might for an employer in the software engineering industry.

Software engineers dress casually, but neatly. You do not have to purchase new clothes!

Please keep your shoes on. Wearing hoods, hats, or sunglasses (except when there is a medical reason for shielding the eyes) that hide your face is not courteous.

- Imagine that you are seeking employment. How will you present yourself to your prospective employer?

Imagine that you are now employed in a software engineering firm. How will you speak to your teammates, the head of your team, and your company's clients?

Imagine that your grandmother has purchased the company for which you work. She has joined you in the company's conference room to hear and see you walk through the code that you have written for the company (her company).

Are there some words that you will keep out of your vocabulary during this hour?

4 Policies

Cornell College is committed to providing equal educational opportunities to all students. If you have a documented learning disability and will need any accommodation in this course, you *must* request the accommodation(s) from the instructor of the course and no later than the third day of the term. Additional information about the policies and procedures for accommodation of learning disabilities is available on [Cornell College's Web site](#).

Please also familiarize yourself with the college's statement on [academic honesty](#) and its [policies for dropping courses](#).

5 Goals

We will give special attention to three of Cornell College’s **Educational Priorities and Outcomes**:

Knowledge You will learn how to use mathematics to describe geometry, transformations of geometry, color, and the interaction of light with physical objects. You will learn how to use popular Application Program Interfaces (APIs) to create images on a computer’s screen.

Communication You will present your work to your peers and you will learn from your peers. You will learn more about how to meet the special challenges that arise when we try to share technical content. This practice will serve you well wherever you go.

Vocation In this project-oriented course you will have opportunities to create work that you can include in applications for internships, employment, and admission to programs of advanced study. Visitors to our class will acquaint you with opportunities in business and with opportunities for graduate study.

6 Grades

You can earn all the points for “Daily Work” by arriving on time for each of our meetings, arriving prepared, keeping your focus on the work before us, and staying until the end of each meeting. Of course, there might sometimes be good reasons for an absence (for example, illness)—in those cases, just notify me of your need to be absent. There is no competition for these points—I would like to award every student 20 points for daily work!

Experience presenting work to peers will be a central part of the course. Practice asking your teammates questions during their presentations, critiquing their decisions, and suggesting improvements to their code will also be an important part of your education during this term.

You will learn more if you draw upon the knowledge of classmates and generously share what you know with your classmates. Ask questions. Offer suggestions and help. Work together.

In each graded exercise, you will demonstrate your understanding of the concepts that we have introduced during the week by answering questions. You will also share the project that you will have developed during the week.

Effort counts. Each student will be starting from a different place. How far you go from your starting point will determine your score for projects. The quality of your presentation, as much as the quality and sophistication of your images

and software, will determine your score. Earn points by explaining clearly what you have learned. Earn points by explaining what we can learn by studying your work.

Develop projects in this order:

Week 0 two-dimensional image

Week 1 three-dimensional image

Week 2 animation

Week 3 Web site / portfolio

Activity	Points
Daily work	20
Graded exercise 1 (Friday, 26 October 2018)	20
Graded exercise 2 (Friday, 02 November 2018)	20
Graded exercise 3 (Friday, 09 November 2018)	20
+ Graded exercise 4 (Wednesday, 14 November 2018)	20
	100

7 Topics

We may edit this list during the term.

- introduction/review of basic skills with Linux, HTML, CSS
- programming with JavaScript
 - scopes of variables and functions
 - objects
 - prototypes
 - functional programming
 - models of object-oriented design and programming
 - preferred style
 - documentation
 - unit testing
- vector and matrix arithmetic
 - sum of two vectors
 - difference of two vectors
 - product of a scalar (number) and a vector

- dot product of two vectors
 - cross product of two vectors
 - normalization of a vector
 - product of a vector and a matrix
 - product of two matrices
- geometric transformations
 - rotation
 - scaling
 - translation
 - perspective
- geometric modeling
 - points, line segments, rectangles, ellipses, arcs, cubic curves
 - splines
 - quadric surfaces
 - surfaces of revolution
 - extrusions
 - meshes
 - composition with unions, intersections, and differences—constructive solid geometry
- color
 - RGB—red, green, blue
 - HSV—hue, saturation, value
 - additive versus subtractive color
 - transparency
 - CIE diagram
- models of illumination
 - ambient light
 - diffuse—Lambertian reflection
 - specular highlights
 - Gouraud shading
 - Phong shading
 - shadows
 - ray tracing

- texture mapping and bump mapping
- viewing
 - synthetic camera
 - projections
 - hidden surface removal
- animation