

## **CPE 123: Introduction to Computing – Computational Art and Animation**

**Professor:** Zoë Wood

**Office:** Building 14, room 209

**Phone:** 756-5540

**office hours:** T/Th 11-12, T. 4:30-5:30pm & W/F by apt

**lecture:** TTh 9:40-11:00 (20-139) **lab:** TTh 12:10-1:30 (20-127)

**email:** zwood@calpoly.edu

**Course Description:** “The high-level objectives of all sections of CPE123 are to engage incoming freshmen, especially those which have no prior experience in computer science, with authentic problems and demonstrate the relevance of computing to the world around them. The course highlights the role of computers in both solving problems and constructing problems, and to challenge students with creative, constructivist challenges that are relevant to their own lives.” (Z. Peterson)

*In this section of CPE 123 we will use computer programming, logic and mathematics to create visual artifacts.* Students will explore the creative and fun process of producing static and dynamic two-dimensional interactive artistic software artifacts via writing computer programs. Students will be exposed to topics typically reserved for advanced courses in computer graphics. To ground students visual work, this course will cover fundamentals of art: color, shape, curves, composition, relationships, perspective, texture, light, and animation principles and timing – all examined via six distinct art movements: expressionism, surrealism, art nouveau, impressionism, pop art and cubism. Students will create multiple artistic pieces inspired by these principles. In addition, students will learn fundamental computer programming concepts to power their creations. Specifically, students will create interactive visual art projects using P5.js (a javascript version of Processing). The global course topics include, the computational creation of static 2D art (generative and designed), image processing, interactive 2D art, dynamic 2D art and animation. **No prior programming experience is assumed.**

“The hidden agenda of the class is to make you fall in love with the ability to translate thoughts into reality—also known as computer science.” (J. Clements)

**Course Objectives:** By the end of the quarter students will:

### **Computer Science Learning Objectives**

1. Be exposed to the interdisciplinary nature of computer science, and some of the related professional opportunities.
  2. Begin to see how computer science, as a discipline, can be creative, meaningful, socially relevant, and change the world for the better.
  3. Develop an ability to think “computationally,” allowing students to analyze and create solutions to computational problems.
- Be provided with the core programming and problem solving skills to be successful in follow-on CSC coursework, Learn the basic of computational thinking (data representation, logic, Javascript syntax, control structures, etc.), build a community of peers, and have fun!

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### Computational art/CG objective

- Learn and master creating and manipulating shapes in a 2D coordinate system (including exposure to coordinate transforms)
- Learn how to and use (some) mathematics to define shape(s)/curves (and the relationship of computational tool (loops/ conditionals) in constructing shapes and curves
- Create an animated scene (and understand the relationship of variables changing over time to this process)
- Learn some basics about how images are digitally represented
- Learn very simple concepts of art (basic color, composition, texture, light)
- Practice being creative: create individual expressions via building computational art

### Assignments/Grade breakdown:

- 2 mid-term exams (14% of final grade) (7% each)
- 1 final exam (11% of final grade)
- ~10 Lab exercises (20% of final grade) (2-4% each)
- 3-4 smaller projects (25% of final grade)
- One larger final project (20% of final grade)
  - of your choice with instructors consent
  - small group or individual
- Participation (10% of final grade)
  - In class group exercises
  - Pop quizzes
  - attend class/ talk in class or office hours interaction (I have the right to fail you if you miss more than 3 classes) / class questionnaires

Please see each program description for final grading/rubric details. **There is a strict late policy for all assignments** – no late projects are allowed.

**Recommended Text:** Getting Started with Processing by C. Reas and B. Fry

### Class style and logistics

I expect you to participate in class and engage with the class material (studies suggest that taking longhand notes is one of the better ways to guarantee your engagement with the material in class)<sup>1</sup> I also expect you to form a community of scholars for the duration of the quarter (and hopefully longer). My teaching style is very interactive – if you want to know more about why see (<sup>2</sup>).

Laptops have been shown to be distracting in lecture<sup>3</sup> and are not allowed unless specified (or a specific exception is negotiated) -- same for cell phones.

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<sup>1</sup> <http://www.theatlantic.com/technology/archive/2014/05/to-remember-a-lecture-better-take-notes-by-hand/361478/>

<sup>2</sup> "Applying the Seven Principles for Good Practice in Undergraduate Education" (1991) Chickering and Gamson

<sup>3</sup> <http://www.yorku.ca/ncepeda/laptopFAQ.html>

**Lecture and Lab Attendance:** Attendance and participation in the course is mandatory. Participation includes responding to questions in class, lab or office hours and making observations or discussing course material in class, lab or office hours. Bi-weekly group exercises are also required.

**Lab and Lab Exercises:** Regular and frequent labs will be assigned and collected each week and, together; will comprise 20% of your course grade. The three hours of scheduled lab time each week is the primary time your instructor will be available for questions and assistance – **make wise use of this resource!** You are expected to work on the lab exercises during your scheduled lab time plus as much additional time as necessary to complete them. The lab exercises are designed to familiarize you with some of the concepts necessary to complete your projects and to help you do well on quizzes and exams. You may work on your projects in lab **after** completing all currently assigned labs.  
**IMPORTANT:** No late labs will be accepted.

**Grading:** For every assignment (projects and labs), your score will be broken down 75% for meeting the technical requirements and 25% for aesthetics. This means that your projects will be graded on how they looks - this grade is predominantly decided based on effort - i.e. did you attempt to make a visually pleasing sketch that fits the specifications or did you do the bare minimum?

**Honesty:** Although I encourage you to have lively discussions with one another, **all work you hand in must be your own work, unless otherwise specified.** If your program or parts of your program are plagiarized from another student or unapproved source, you will fail the course and a letter will be put in your file with Cal Poly Judicial Affairs.

The following schedule for the lectures and assignments is tentative.

<b>Week 0</b>	9/22/16	Introduction & orientation, what is computation Basic shapes, order, and color	
	<b>Lab 1:</b>	<i>Make a creature (expressionism)</i>	
<b>Week 1</b>	9/27/16	Composition: shapes and color (variables)	
	<b>Lab 1:</b>	<i>Make a creature (expressionism)</i>	
	9/29/16	Transforms	(DWA)
	<b>Lab 2:</b>	<i>Composition - Blexbolex</i>	
<b>Week 2</b>	10/4/16	Transforms	
	<b>Lab 2:</b>	<i>Composition - Blexbolex</i>	
	10/6/16	into interaction, random numbers, functions in brief	
	<b>Lab 3:</b>	<i>Surrealism interaction</i>	
<b>Week 3</b>	10/11/16	Interaction - conditionals	<b>Project 1 – Blexbolex remix</b>
	<b>Lab 3:</b>	<i>Surrealism interaction</i>	
	10/13/16	Vectors and 2D space + Variable and loops	

		<b>P1 demos</b>	
<b>Week 4</b>	10/18/16	<b>Midterm 1</b>	*GH
	<b>Lab 4:</b>	<i>Curves - parametric Art nouveau</i>	
	10/20/16	Curves – loops and conditionals	*GH
	<b>Lab 4:</b>	<i>Curves - parametric Art nouveau</i>	
<b>Week 5</b>	10/26/16	loops of loops	
	<b>Lab 5:</b>	<i>Generative – structured and random+ implicit</i>	
	10/27/16	Arrays and loops	<b>Project 2 – Art nouveau curves</b>
	<b>Lab 5:</b>	<i>Generative – structured and random</i>	
<b>Week 6</b>	11/1	Space and time and change – implicit functions	
	11/3	Space and time and change	
	<b>Lab 6:</b>	<i>Impressionist scene defined by implicit shapes and time</i>	
<b>Week 7</b>	11/8	<b>Midterm 2</b>	
	11/10	Animation: functions and objects and arrays	
	<b>Lab 7:</b>	<i>Animating multiple characters Tant de Forets</i>	
<b>Week 8</b>	11/15	Images – 2D arrays, indexing	<b>Project 3 – self portrait</b>
	<b>Lab 8:</b>	<i>Image processing – pop art Warhol filter</i>	
	11/17	Functions and Animation - control	<b>Final proj. proposals due</b>
	<b>Lab 9:</b>	<i>Image processing – cubism – reality broken apart</i>	
<i>Week ?</i>	11/21-27	<b>THANKSGIVING HOLIDAY</b>	
<b>Week 9</b>	11/29/17	Animation hierarchy and recursion	<b>Final project check-in</b>
	<b>Lab 10:</b>	<i>Hierarchical animation</i>	
	12/2	Animation hierarchy and recursion	
	<b>Lab 10:</b>	<i>Hierarchical animation</i>	
<b>Week 10</b>	12/6	Animation principles overview	<b>Final project check-in</b>
	12/9	exam	
<b>Final</b>	12/15	<b>Thursday: 10:10am-1:00pm</b>	<b>Final demo</b>

## More about why computational art and computer science:

- “you are not your code” (industry adage) <https://blog.codinghorror.com/egoless-programming-you-are-not-your-job/>
- As Steve Jobs said: "...technology alone is not enough -- it's technology married with liberal arts, married with humanities, that yields us the results that make our heart sing.." and ``John Lasseter, the chief creative officer at Pixar, describes the equation this way: “Technology inspires art, and art challenges the technology.””( <http://www.newyorker.com/news/news-desk/steve-jobs-technology-alone-is-not-enough>)

- “What is Creative Computing? (from <https://creative-computing.appspot.com/faq>)

Creative computing is about **creativity**. Computer science and computing-related fields have long been perceived as being disconnected from young people's interests and values. Creative computing supports the development of personal connections to computing, by drawing upon creativity, imagination, and interests.

Creative computing is about **computing**. Many young people with access to computers participate as consumers, rather than designers or creators. Creative computing emphasizes the knowledge and practices that young people need to create the types of dynamic and interactive computational media that they enjoy in their daily lives.

Engaging in the creation of computational artifacts prepares young people for more than careers as computer scientists or as programmers. It supports young people's development as computational thinkers – individuals who can draw on computational concepts, practices, and perspectives in all aspects of their lives, across disciplines and contexts.”

- “I have slowly come to realize that the analytic, quantitative approach I had been taught to regard as the only respectable one for a scientist is insufficient,” British metallurgist Cyril Stanley Smith once wrote. “The richest aspects of any large and complicated system arise from factors that cannot be measured easily, if at all. For these, the artist’s approach, uncertain though it inevitably is, seems to find and convey more meaning.” <http://priceconomics.com/the-correlation-between-arts-and-crafts-and-a/>