

## 2D ANIMATION & INTERACTION COURSE

### WEEK 1: A STRONG FOUNDATION

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Week 1 is all about building a good foundation. I'm sure you want to be writing exciting programs right away, but it's important to have the basic ideas solidly in place, or you can find yourself getting stuck over and over again in places where you should be sailing easily. So we'll start out slowly, but within a few weeks we'll be zooming along!

This week we get Processing downloaded and installed, and we learn the basics of graphics: how to talk about locations on the screen, how to specify colors, and how to draw lines, boxes, and ellipses in a variety of styles.

Each video is prefixed by numbers identifying its week, group, and position in that group. So this week all sketch names begin with W1 for Week 1, followed by G and a number for the group, and then V and a number for the video. Some videos are in multiple parts to make them easier to watch; these parts all have the same video number but have a suffix of a, b, and so on. In general, it's best to watch the videos in order, from the first video of the first group to the last video of the last group.

Many of the videos have Processing sketches (or programs) associated with them. These files end with the extension .pde, which stands for Processing Development Environment. The sketches listed here fall into two categories:

**Example sketches** are meant for you to look at now, because they illustrate the points we're talking about. You can see how I do things, and you use these programs as starting points for your own work, simply by copying and pasting the code. These sketches appear in a green section, like this.

**Support sketches** are programs that I wrote to create demonstrations and other visuals for the course videos. They frequently use advanced techniques that we haven't covered yet. They're not written for you to understand or make use of at this point. I've included them in case you'd like to take a peek behind the scenes, or you're curious for any reason. These sketches appear in a gray section, like this.

**GROUP 1:  
OVERVIEW**

We start by looking at this week's context, so you have an overview of where we're going and how the pieces all fit together.

**W1 G1 V1 Week 1 Overview (7m46s)**

A brief survey of what we'll be discussing this week: installing Processing, how to name and use colors, how to draw some important shapes, and how to put it all together to make a program and draw a picture.

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**GROUP 2:  
INSTALLING AND  
USING PROCESSING**

We start out by preparing for the journey, making sure we have the right attitude and expectations. Then we install Processing, take a tour of the interface, and make our first picture.

**W1 G2 V1 Processing Tour (11m23s)**

A tour of the sorts of animations and interactive program that you'll be able to write with the tools we'll cover in this course.

**W1 G2 V2 Programming As A Medium (4m18s)**

Writing a program on the computer is a creative act in a particular medium, just like painting with watercolors or sculpting with clay. Success in any medium depends on having a good understanding of its strengths and weaknesses, so you're using your time and energy wisely.

**W1 G2 V3a Installing Processing on Windows (7m28s)**

How to download and install Processing on a Windows-based computer.

**W1 G2 V3b Installing Processing on Mac (7m0s)**

How to download and install Processing on a Mac.

**W1 G2 V4a The Processing Window Part 1 (7m43s)**

**W1 G2 V4b The Processing Window Part 2 (9m28s)**

The Processing Window is the on-screen interface where you write, debug, and run your programs. These videos survey the window so you can use it comfortably.

**W1 G2 V5 Creating A Picture (12m35s)**

We jump right in and write a program to create a simple picture.

**FirstPicture.pde**

Create a little picture of two boxes.

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**GROUP 3:**  
**COLOR**

Color is essential to everything we draw. Processing offers a couple of different ways to specify colors.

**W1 G3 V1a Color Systems Part 1 (8m44s)**

**W1 G3 V1b Color Systems Part 2 (5m50s)**

There are many different ways to organize and name colors. We look at the color systems that will be important to us when using Processing.

**W1 G3 V2 RGB (8m21s)**

Unlike pigment, the three primaries of light are red, green, and blue. We can identify any color of light as a point in a cube with sides labeled red, green, and blue (or RGB).

**RGB01.pde**

An interactive visualization of the RGB color cube. Use the keyboard to turn on and off various drawing options.

**W1 G3 V3 HSB (8m53s)**

Another useful color space describes colors using the qualities hue, saturation, and brightness. We can identify any color as a point in a cone defined by hue, saturation, and brightness (or simply HSB).

**HSB01.pde**

An interactive visualization of the HSB color cone. Use the keyboard to turn on and off various drawing options.

**HSBCube01.pde**

An interactive visualization of the HSB color space drawn as a cube (for comparison with the RGB cube). Use the keyboard to turn on and off various drawing options.

**W1 G3 V4 Color Pickers (11m21s)**

A survey of some interactive tools for choosing colors.

**W1 G3 V5 Defining HSB Colors (9m42s)**

How to specify a color in HSB.

#### W1 G3 V6 **Using Colors** (4m36s)

Graphics objects are drawn using two colors, one each for its stroke (a line around its outer edge) and its fill (the color that makes up its insides).

#### W1 G3 V7 **Transparency** (9m51s)

By making colors transparent, objects drawn with those colors are transparent as well. You can draw objects that are fully opaque (and hide anything behind them), fully transparent (and thus invisible), or anywhere in between.

##### **BoxTransparency.pde**

Demonstrate transparency of stroke and fill using the mouse to control the transparency of boxes.

##### **HSBCube01.pde**

Demonstrate transparency using the mouse to control the transparency of two ellipses.

#### W1 G3 V8 **Grays** (3m45s)

We can use shortcuts for naming colors that are shades of gray.

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### GROUP 4: BASIC GRAPHICS

To draw something on the screen, we need to tell Processing where it's located, and what shape it has. In this group we see how to draw three important basic shapes: lines, rectangles (including squares), and ellipses (including circles).

#### W1 G4 V1 **Coordinates** (6m0s)

To draw objects on the screen, we need to tell Processing where to put them. The *coordinate system* is the tool that lets us do that.

##### **coordsDemo.pde**

Demonstrate coordinates by letting the user move a point around in a coordinate system, and printing out that point's coordinates.

#### W1 G4 V2 **fill and stroke** (11m55s)

Every object can have a stroke (a colored line around its outer edge) and a fill (a color that floods its interior).

#### W1 G4 V3 **Style** (10m21s)

By changing the stroke color, the stroke thickness (or weight), and the fill color, we can create many different visual styles.

##### **stylesDemo.pde**

Show different drawing styles side by side, altering the fill color, stroke color, and stroke weight. The screen starts out blank. Press the space bar to add in the next one in the sequence.

#### W1 G4 V4 **Lines** (2m38s)

To draw a line, we give Processing the x and y values for each of the two endpoints.

##### **lineExplorer.pde**

Demonstrate how lines are drawn. Click and drag on the big circles to move the endpoints around. Press space to toggle the circles on and off.

#### W1 G4 V5 **Rectangles** (8m31s)

Rectangles are described (by default) with the x and y values of one corner, followed by the width and height measured from that corner.

##### **rectExplorer.pde**

Demonstrate how rectangles are drawn. Click and drag on the upper-left point to move it around. Drag the upper-right point to change the width, and the lower-left point to change the height. Press space to toggle the circles on and off.

#### W1 G4 V6 **Ellipses** (7m39s)

Ellipses are described (by default) by the x and y of the center, and the width and height of the box, centered at that point, that just encloses the ellipse.

##### **ellipseExplorer.pde**

Demonstrate how ellipses are drawn. Click and drag on the center point to move it around. Drag the handles at the far right or bottom to change the shape of the ellipse. Press space to toggle the circles on and off.

GROUP 5:  
PUTTING IT  
TOGETHER

We take everything from above and use it to write a *sketch*, or program, to draw a picture.

W1 G5 V1 **Putting It Together Part 1** (8m17s)

W1 G5 V1 **Putting It Together Part 2** (7m45s)

We gather together everything we've seen and write a program to produce a picture made up of several graphics objects.

**drawing01.pde**

A minimal Processing program. All it does is create a graphics window and tell it to draw things smoothly, but it doesn't actually draw anything. zYou can use this as a starting point for your own projects.

**drawing04.pde**

A simple Processing program. Open a graphics window and tell it do draw things smoothly. Fill it with a background color. Tell Processing to draw black, 1-pixel thick strokes around objects (these are the defaults, and therefore we don't have to set them, but they're here to show how it's done so you can change these qualities). Then we draw a bunch of ellipses and boxes, each of a different color.

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GROUP 6:  
RECAP AND  
HOMEWORK

We summarize this week's material so it's all in one place, and then it's time for you to put it into practice in your first homework assignment.

W1 G6 V1 **Week 1 Recap** (4m3s)

A recap of everything we've seen this week. Remember that there's a PDF that summarizes this information.

W1 G6 V2 **Week 1 Homework** (8m55s)

Homework for week 1. Also summarized in the PDF handout.

**onerect.pde**

An example of a very simple sketch to draw a box in a graphics window.

**simple\_composition.pde**

A very simple composition in Processing. We change the fill and stroke colors along the way.

**GROUP 7:**  
**SUPPLEMENTS**

The videos in this section are optional supplements. They're here to illuminate interesting ideas, answer some questions you might have wondered about, and generally flesh out some of the topics we've seen.

**W1 G7 V1 Processing On Windows (3m58s)**

A survey of the minor differences between where things appear in the Processing environment on Macintosh computers (where the videos were made) and on Windows.

**W1 G7 V2 Why 255 (12m51s)**

The number 255 (and the number 256) pop up all the time when we use colors. Where did this strange number come from?

**Why255.pde**

Interactive demo showing 256 shades of color.

**W1 G7 V3 Color Displays (12m19s)**

A survey of the different types of color displays that are popular today, and how they work to produce seemingly smooth fields of color.

**W1 G7 V4 Color Blending (8m52s)**

When you blend colors, the results depend on which of Processing's two colors spaces you're using (RGB and HSB). We look at where these differences come from, and when you might want one or the other.

**blendHSB.pde**

Interactive demo to show blending in HSB space.

**blendRGB.pde**

Interactive demo to show blending in RGB space.

**lerpColor.pde**

Demonstrate color blending in both RGB and HSB at once.

**lerpColorWithWheel.pde**

Blend in RGB and HSB at once, with a color wheel in the corner.

W1 G7 V5 **Stroke Caps** (8m38s)

When you draw thick lines, you can control how the ends are drawn.

Processing offers you several different styles for these end “caps.”

**strokeCapDemo.pde**

Interactive demo to show different stroke caps on different lines.

**strokeCapTrio.pde**

Show the three different types of stroke caps at once.

**strokeJoin.pde**

Show the three different types of stroke joins at once.