

Camera Fundamentals

The camera is an incredible invention. If you know how to use it, you can make some amazing stuff. We've made a career out of understanding how cameras work. Including how we use it to document our travels and tell stories from around the world. Now we want to teach you everything we know about how cameras work and how to take great-looking photos and videos. In this course, we will be going over the foundational concepts of a camera. It turns out that these concepts are the same whether you want to make a video or take photos. You'll learn how a camera works and how to find the right camera for you. Then, we will teach you how to use different settings to make your photo or video look good. We'll talk about lenses and how different lenses can make your photo or video look and feel totally different. In the final chapter, we'll talk about some settings and concepts that only apply when shooting video.

Photography and videography cannot only be learned theoretically. You HAVE to go out and apply the things we're going to talk about. We're going to be showing you as much real-world application as we can. But, that is not a replacement for you going out and playing with your camera. All these concepts will fade from your brain if you don't go out and use your camera. So please, pair this course with a lot of practice!



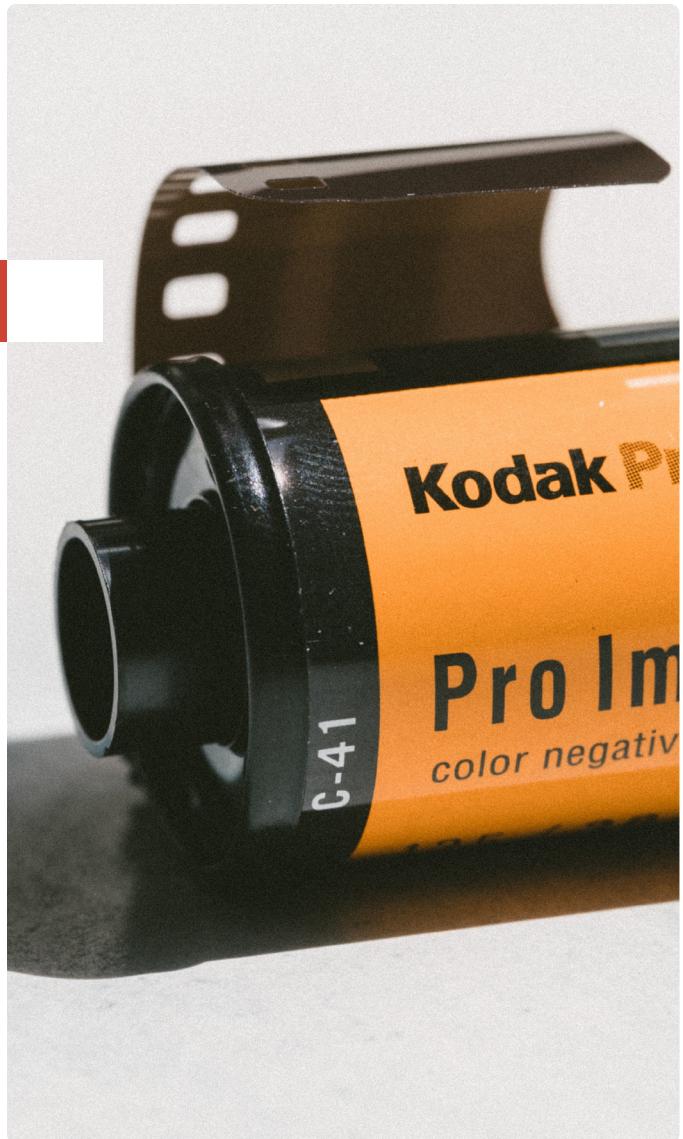
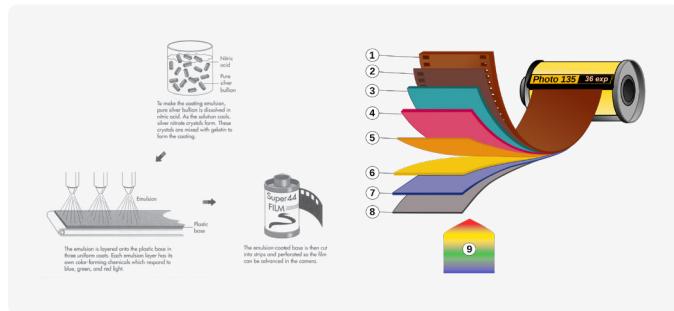
This PDF will be a cheat sheet for the course. It will serve as a summary of the tips, tricks, and foundational concepts we talk about. The goal would be that you download and print it to have on-hand for as a reference.

Chapter 1

Camera Overview

Cameras

- A camera is a tool that allows light to travel through a small hole, and be recorded.
- The way it used to be recorded was on strips of plastic that were coated with light-sensitive crystals called film.



- In the late 90s, some geniuses found a way to record light onto an image sensor. It's the same size as a piece of film, but it's really just a piece of electronic wizardry. THIS is the heart of digital photography and videography.
- This sensor has a bunch of little squares that can record the intensity and color of light. Zoom far enough into a digital photo you'll see these squares.
- The light that hits this sensor is recorded as a file onto a memory card that you can upload to a computer and edit.
- Not all sensors are created equal and the type of sensor you have will determine how your photos/videos look.



Different Kinds of Cameras

- The sensor determines the quality of a camera.
- If you have a big sensor, you have more little squares to record more light and more details that you get better images.
- [Here](#) is a useful resource on sensor size
- Full-Frame sensors are the standard for professional videography and photography.
- Anything smaller than a full-frame sensor is called a crop frame sensor.
- The main difference between DSLR and mirrorless cameras is the **size of the camera body**.



How to Buy a Camera

You don't need a super expensive camera to get started.

What to look for

- Removable lens (or one with a good zoom)
- Manual mode

Cameras based on price range

- \$200-\$400**
 - We recommend a couple of point and shoots.
 - The Canon PowerShot series include small but powerful little cameras. We used a camera really similar to these for years.
 - Canon PowerShot SX730 Digital Camera



- **\$600-1200**

- This is a higher-end point and shoot camera called the **Sony RX100**. It doesn't change lenses, but it has a giant sensor and the lens zooms really far, so it gets the job done.
- **Less Expensive Option:** Sony RX100 III
- **Higher-end option:** Sony RX100 VII
- The **Canon 80D** is another option and is a really amazing camera. It has a cropped sensor, but it can change lenses and can use the same lenses as any professional Canon camera.



- **\$400-600**

- We like the Sony Alpha a6000 which has the capability of changing lenses and capturing high-quality images but is still relatively inexpensive.



- **1500-2500**

- Ok, now we're at the camera we use, the Sony A7iii. It's a full-frame sensor. It's small. You can change lenses. It's amazing in low-light and is just a really wonderful camera.

remember:

Your phone is all you need
to document your trip.

Chapter 2

Exposure



The Concept of Exposure

- Exposure is a measure of how much light makes it into your camera.
- Photography and videography are the craft of capturing light in a controlled way.
- Automatic exposure: Your camera automatically adjusts its settings to what it thinks is the right amount of light.
- Learning these settings and adjusting the exposure manually will allow you to take much better photos and videos.



Three Things Affect Exposure

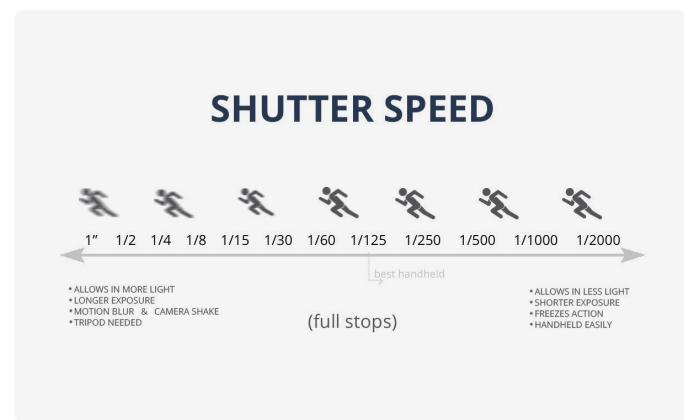
- Three pillars of exposure**
 - Shutter speed
 - Aperture
 - ISO
- The process of exposure is adjusting these settings to get the balance just right to get a good looking image.
- Your camera has this little light meter which tells you how you are doing. The best place to be is zero.

-3..2..1..0..1..2..3



Shutter Speed for Exposure

- Change your camera to manual
- Most cameras have a light meter. Locate it and try to get your number as close to 0 as possible.
- The safe zone: Try and keep your light meter number between negative 1 and positive 1



Chapter 3

Shutter Speed

Shutter Speed, Explained

- There's a little window inside of your camera. It opens up and lets light into your sensor. Whatever light gets recorded while that window is open, is what is recorded onto your image.
- The amount of time that the window is open is measured in fractions of a second.
- We like to think of the shutter speed as blinking. What happens when you blink is exactly what happens when the shutter speed is open and closed on your camera.
- The L RULE: The lower the number, the lighter the image

challenge:

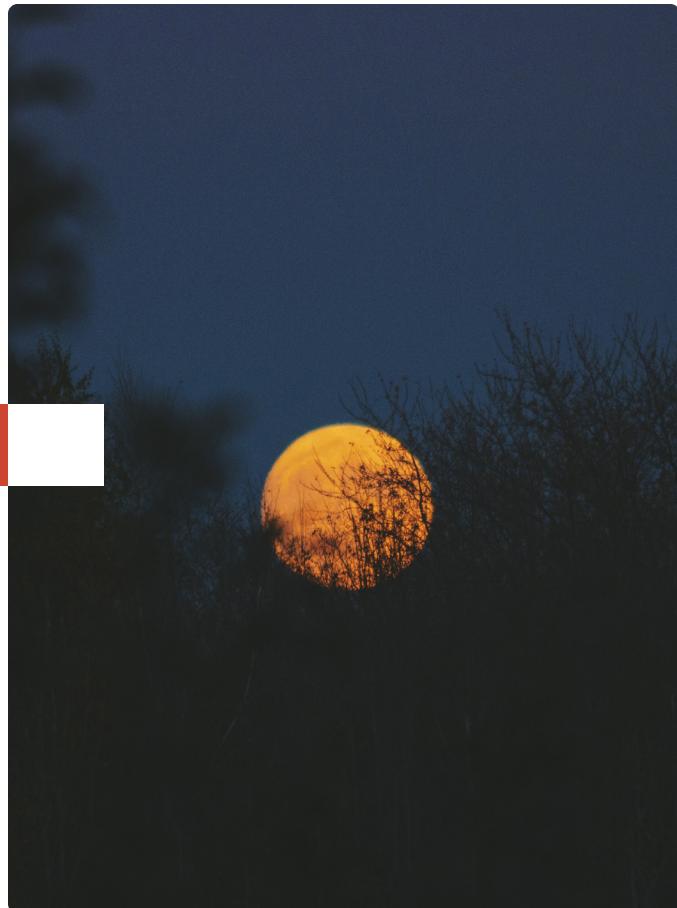
Find your shutter speed. Learn how to adjust it and watch how it affects your light meter.

Shutter and Blur

- Shutter speed not only affects exposure, but it also affects something called motion blur.
- Play with a slower shutter speed like 1/80 or 1/100 to get a lot of motion blur of moving subjects.
- If you want to avoid motion blur, use a fast shutter speed like 1/500 or even 1/8000.

What You Can Forget, and What You Can't

- **What to Remember**
 - The lower the number the lighter the image
 - The higher the number, the darker the image
 - Don't let your shutter go below 1/60



Chapter 4

Aperture

Aperture, Explained

- Shutter speed happens in the camera body. Aperture happens in the lens.
- There is a hole in the lens called the iris, and it opens and closes.
- The wider the iris the more light is let in. The smaller the iris, the less light is let in.
- Your eye's iris does the same thing for you.
- **Aperture also referred to as F-stop, is measured with a number.**
 - Example: f/2.8 and this indicates a certain amount of width
- **The lower the number the wider the iris becomes**
 - f/1.4 is a wide-open lens.
 - f/22 is very small and barely any light gets through.
- Lenses with lower f-stops are more desirable because they let more light into the camera

challenge:

Find out where your camera's f-stop is and start to play with it.

Aperture for Exposure

Again, the light meter will help you choose the right f-stop.

What You Can Forget, and What You Can't

- **What You Can Forget**
 - The mechanical process of aperture
 - The example of the human eye
- **What You Can't Forget**
 - Aperture is a number that allows a certain amount of light into the camera sensor
 - The lower the f-stop number the wider the iris. The wider the iris the lighter the image.
 - **Wide-Open:** Lower range f-stops like f/1.4, f/1.8 or f/2.0
 - **Closed:** Higher range f-stops like f/8, f/16 or f/22
 - Lenses with wide-open apertures are more expensive



Chapter 5

ISO

ISO, Explained

- 3rd Pillar of Exposure: ISO
- ISO determines how sensitive your image sensor is
- You can determine how sensitive your image sensor is to light by adjusting ISO.
- ISO allows the same amount of light to be a much brighter image.
- The higher the number the lighter the image.

ISO and Exposure

- You begin to use your ISO when your aperture is as wide as it can go and your shutter speed is the slowest it can go without getting any motion blur.
- Remember: Look at your light meter to help you decide if the image will be properly exposed.
- ISO also applies to video.

ISO's Dark Side

- ISO comes at a cost.
- ISO is also the culprit when it comes to digital noise.
- Every camera is different when it comes to ISO threshold to creating digital noise because it all comes down to the sensor.
- If you bump your ISO, lower your shutter speed and aperture the lowest it can possibly go and the image is STILL too dark, don't take the picture!
- DON't let your camera pop up the flash if you're trying to take a pretty picture.

What You Can Forget and What You Can't

- **What You Can Forget**
 - The technical aspects of ISO like signal boosting and sensor sensitivity.
- **What Not to Forget**
 - ISO affects exposure
 - Opposite of the "L Rule" as you higher ISO, your image will be brighter
 - ISO causes digital noise
 - ISO should be a last resort

challenge:

Find your ISO and adjust it to see what your camera's limit is until it starts showing digital noise.



Chapter 6

How Exposure Works in Real Life

The Importance of Application

- Exposing is a puzzle and the pieces are determining your shutter speed, aperture, and ISO.
- You will learn by doing!



Chapter 7

Understanding Lenses

- The lens is just as, if not more important than the camera body itself when it comes to capturing a good image.

- What makes a good lens**

- Zoom**

- Is also known as a "focal length", which means how far the lens is zoomed, either wide, close, or somewhere in the middle.

- Aperture**

- Means how open the iris in the lens can get with some of the lowest apertures going down to 1.2 which lets a ton of light in and gives a beautiful depth to your image.

Focal Length

- Technically, the focal length is the distance between the lens and your image sensor
- This is just a fancy way of saying how zoomed the image is and every level of zoom is given a number.
- Different focal lengths**
 - 50mm** around the angle that a human sees the world
 - Telephoto:** Lenses above 50mm, meaning they are zoomed in further than the human eye can see
 - Wide-angle:** Less than 50mm, meaning they capture angles wider than the human eye can see.
 - The focal range** can go from really wide angles like 12mm to super-telephoto like 300mm
- All of our lenses are between 16mm and 85mm

Prime vs Zoom

- There are two kinds of lenses**
 - Prime lenses:** These lenses remain at a fixed focal length, meaning they don't zoom at all
 - Zoom lenses:** These are any lens that has a range of focal lengths, meaning the lens can zoom in and out.

Zoom Lenses

Some common zoom lens focal ranges are 16-35, 24-70 24-105, and 70-200.

Prime Lenses

- Prime lenses usually smaller, simpler, and cheaper than zoom lenses.
- Common focal lengths include 35mm, 50mm, and 85mm.
- They generally have a lower f-stop or aperture, so they can open up really wide and let in a lot of light.

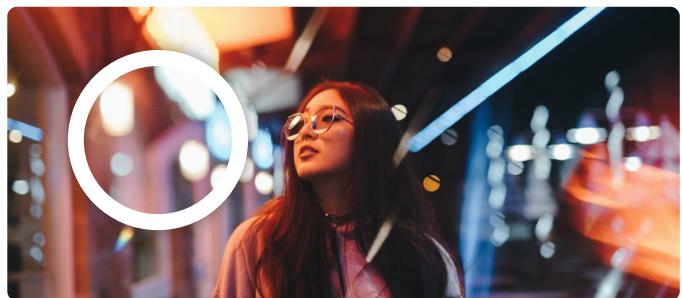


Blue and Bokeh

- Bokeh is the creamy, blurry part of a photo.



- Bokeh is a Japanese word that means "blur" or "haze"
- Bokeh tends to be more pronounced when there are lights in the background.



- Bokeh is connected to aperture. The wider your aperture, the blurrier your bokeh.
- The more open your aperture, the more blurry bokeh you're going to get.
- Zoom also affects Bokeh. If you are super wide, like 16mm, you're not going to see much Bokeh. A focal length like 85mm will make for some really great bokeh.
- Human portraits are great for using bokeh.

challenge:

Open your lens wide open and go play with Bokeh and see what results you get. See when you like it and when you don't



Chapter 8

Video Only Concepts

Frame Rate

- Video works this same way as photo, but instead of recording just one image, it records a bunch of images over time.
- It then strings together those individual pictures fast enough so that our brains think it's moving in real time
- The people who pioneered this technology determined that you needed about 24 of these pictures to play every second in order to adequately trick the eye into seeing motion.
- When TV came around they started shooting more frames per second, like 30 or 60.
- Most cameras have the ability to change this setting. It's called the frame rate.
- We tend to stick to 24fps (frames per second).
- We shoot in 60fps when we want to slow the video down later. It has double the number of frames every second. This allows you to slow the video down and still have enough images per second to make it look smooth.

Shutter Speed for Video

- Your shutter speed number should be around double the number of the frame rate.
- We like to shoot in 24 fps. So double 24 is 48. So according to this rule, my shutter speed should be 1/48.
- Video LIKES motion blur!
- However, we break this rule a LOT! Sometimes our shutter speed is at 1/500, it doesn't make much of a difference to most people.

Focal Length for Video

- The more zoomed in you are, the more shaky camera footage will be.
- The rule of thumb here is that if you are going handheld, meaning without a tripod, don't bring a really zoomed in a lens like a 50mm or 85mm.
- Once you get above 35mm it becomes difficult to avoid shaky footage.

Focus for Video

- For photography you can often rely on autofocus, however, this is not the case with video.
- There are lots of times where you need to put your lens in autofocus and manually adjust it.