

Digital Photography

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First Things First

Before we can start taking photos, we of course have to have a camera. In today's day and age we have a magnitude of different types of digital cameras, finding the right one to suit your needs can be difficult. In this first section, we will cover the different types of digital cameras you could purchase, as well as different use cases for each type of camera.

Of course we all have a digital camera right in our pockets, our phones are actually very capable cameras. Most sporting 6-12+ Megapixels, these tiny cameras really do pack a punch. If daily use is your thing, finding a phone with a good camera could be what you're looking for. Although we won't be going over phone cameras in detail, most of the theory we cover later in class will be transferable to any camera.

Standard Compact/Zoom Compact

The first two types of camera we will be looking at are the Standard Compact and the Zoom Compact. Both of these cameras have the same form factor (size) the only difference being a Zoom Compact has a retractable zoom lens, usually with up to an 3x zoom, although you can find ones with higher zoom ranges. These cameras are great for on the go moments, as they are light weight and compact, ideal for travel and easy photography.

In recent years, companies have been developing what they call "Advanced Compacts" or Adventure Cameras. These compact cameras are meant for extreme conditions, providing shock resistance and water proofing. They also have better lenses offering more crisp photo opportunities. If you were thinking of doing something like scuba diving or action shots on a snowboard, this would be the ideal blend of compact and performance



Compact System Cameras (Mirrorless)

These types of cameras are the middle ground between your standard DSLR and other compact form-factor cameras. The ability to interchange the lenses on the camera offer greater flexibility for getting just the right shot, while still being lightweight enough that hiking or traveling with it would be easy enough. These cameras are perfect for enthusiast who want to take high quality pictures without breaking the bank.



DSLR

This is what most people think of when they think of digital photography as an amateur enthusiast. DSLRs offer the highest fidelity cameras on the market, and also come in a wide range of form factors. Professionals use a type of DSLR called a Medium Compact Camera which can cost as much as \$50,000!

Usually these cameras are sold as the body only, with the lenses being an additional purchase. They typically use a type of sensor called APS-C but some of the more professional models use Full-Frame sensors offering the same size a 35mm camera.

Prices start around \$400 but can get to as much as \$3-4000. Keep in mind that these cameras allow full customization from changing ISO settings, auto functions, aperture, shutter-speed and exposures allowing you to get the most out of each photo you take.



Choosing the Right Lens

If you've chosen to get a Compact System or DSLR camera you will need to get a lens. When you first buy a camera that can support interchangeable lenses you are essentially limiting yourself to that brand of equipment. For example, if you bought a Nikon DSLR you could not use a Cannon Lens on that body. This is an important thing to take into mind, so before you buy a camera you always want to check what kind of lenses are compatible with your camera body, look for the brand and the zoom capability (i.e. 18-55mm). This list can usually be found on the Specifications section of a camera's store page.

Once you know the compatibility of the camera body you can start thinking about what kind of lens you would like to use. Really it boils down to what kind of photography you plan to be doing. For example if you are planning on taking pictures of landscapes, you would want to look at a wide-angle lens or a telephoto lens. If you were taking portraits you would want a macro lens for extreme detail.

Different lenses are defined by their focal length. A smaller focal length will capture more of the scene, while a larger focal length will bring the subject in close. In the following section we will go into more detail of what these types of lenses do and what the pros and cons for each are.

Fish Eye Lens

This type of lens offers a wide, almost distorted view akin to looking through a fish bowl. This allows you to be close to an object and still see everything in the peripherals. It is commonly used in action sports such as snowboarding and skateboarding to allow the camera operator to be close to the subject while still having it in full view.

Any lens that has a less than 14mm focal length can be considered a Fish Eye.



Wide Angle Lens

This type of lens is typically used for capturing landscape photos. Ranging from 14-35mm focal length, wide angle lenses offer the ability to take in everything at detail within a shot. These lenses usually don't offer much by the way of zoom, but will at least allow you to take beautiful shots of all your vacation's lookout points.

Standard Lens

50mm give or take is the standard focal length for lenses. These lenses offer great overall use and can take fantastic photos in most situations. Although DSLRs are technically just the body form factor, most come in kits with at least a standard lens. These lenses are good for just about anything!

Telephoto Lens

The range on these lenses varies from about 70-200mm, but can go to as much as 300mm or more!

These lenses allow you to take super close detailed pictures while being very far away. Want to take a picture of a snowy mountain top from the base, grab a telephoto. Want to snap a photo of a pride of lions without being mauled, grab a telephoto. Take a long exposure of the Milky Way, grab a telephoto. These lenses are more for the niche enthusiast but can still provide fantastic pictures. Some will even zoom on an object more than a mile away!



Portraits are generally taken with shorter telephoto lenses typically ranging from 50-105mm, these are ideal for things like weddings and relator photos.

Crop Factor

You might want to get out a calculator for this next section. Although a lens's focal length may say that it is, for example, 18-55mm, these numbers cannot be directly compared across different formats as the actual angle of view you capture is determined by the imaging sensor. The most common of these imaging sensors are Full-Frame, APS-C, and Micro Four Thirds (MFT). In order to know what one format compared to the other we have to convert these focal lengths into a standard. The Industry Standard is called the Full Frame Equivalent, which we calculate using a format's crop factor (the ratio of a camera's sensor size to 35mm film frame).

Taken from digitaltrends.com this excerpt explains the way we calculate this Full Frame Equivalent rather well.

“Most APS-C sensors have a crop factor of 1.5x, which means if you multiply a lens' focal length by 1.5, you will get the full frame equivalent focal length of that lens. (Canon is an oddball here, with a crop factor of 1.6x on its APS-C cameras.) For example, an 18-55mm kit lens on a Nikon D5600 will have a full-frame equivalent focal length of 27-82.5mm. The Micro Four Thirds format is a bit smaller than APS-C and has a 2x crop factor, so a 14-42mm MFT lens will have an equivalent focal length of 28-84mm. Notice anything about those numbers? Exactly: An 18-55mm APS-C lens provides just about the same field of view as a 14-42mm MFT lens. Across manufacturers and formats, basic kit lenses cover roughly equal zoom ranges and fields of view.”

This is an important factor in taking the correct photo with a DSLR or Compact System Camera.

Filters

Filters are used for many different things, from correcting or enhancing colors, ensuring accurate exposures, and simply protecting the lens from scratches and other harms.

As far as camera equipment goes, filters are generally rather cheap, and can be a great tool to ensure the highest quality photos. In this next section we will cover a few of the more common filter types, excerpts are taken from adorama.com on an article on filters.

UV & Skylight Filters

“Protective UV and skylight filters are often used to protect the front element of a lens against moisture, dirt, and scratches, which makes them ideal for shooting in wet, dusty, or muddy environments. In the past, UV filters were also used to prevent the UV light from causing haze and fogginess in older photographic films, which were typically more sensitive to UV rays.

On the other hand, skylight filters are every photographer's best friend when shooting under a clear blue sky. They can reduce the excessive blue cast that often appears in photographs taken outdoors. They can also keep skin tones free of color reflections from objects that are around the subject.

Keep in mind, however, that with a skylight filter as your lens' protection, the image quality of your photos may be compromised as it can intensify lens flares that tend to add a color tint and reduce image contrast.” (adorama.com, 2019)

Polarizing Filters

“Polarizing filters, pretty much like sunglasses, add depth to an image by saturating its color and reducing reflections. These filters have a rotating mount that’s easy to attach to a lens. Once a polarizing filter is mounted on your lens and the subject is already framed, you can slowly rotate the filter while watching how the image changes on your camera’s viewfinder or live view.

Polarizers are best for shooting landscapes. They darken skies and make colors pop, as well as eliminate glare and reduce reflections on glassy or water surfaces.” (adorama.com, 2019)



Neutral Density Filters

“Neutral density (ND) filters are sheets of dark-colored glasses that reduce the amount of light that enters your lens and hits to the sensor, but without affecting the color of the resulting image. This includes excess sunlight and powerful light from studio flashes.

An ND filter doesn’t need any adjustment at all, and you can still use the metering and focusing system of your camera and lens even with this filter attached to your lens.

By reducing the intensity of incoming light, this filter allows you to shoot with slower shutter speeds without overexposing your image. In that case, if you’re going to take a photo of a moving subject like flowing water, make sure to use a tripod for more dramatic motion blur and to ensure that everything else is tack sharp.” (adorama.com, 2019)



Color Correcting Filters

“Color correcting filters, also known as cooling and warming, color conversion, or color compensating filters, are used to correct and/or enhance the color of your scene. Warming and cooling filters are great for correcting indoor lighting and making your scene look gloomier or sunnier while other colored filters are great for bringing out certain hues in a scene.” (adorama.com, 2019)



Framing the Perfect Picture

Now that we have a background in getting ourselves set up with the right equipment, we can start thinking about framing that perfect picture, whether it is a portrait of a loved one or a landscape of the Colorado Rockies, we can use the theory that a good photograph creates depth, and there are many ways to achieve that including: light and contrast, colors, movement, a solid composition, and depth of field. You should try to have at least one of these elements present in your photo.

One of the most important things you can do to take a great photo is to avoid flat lighting. Some areas should be lighter and some should be darker, much like a painting has negative space to bring out the portions that have positive aspects to them. Knowing the right lighting conditions to take your picture in can make or break a picture right off the bat, for example, if you like taking landscape pictures then you look for what is called the magic hour, at dusk at dawn.

The most important thing is composition, using a foreground, middle ground and background in an image. Try adhering to the Rule of Thirds to get that perfect picture in frame.

“The rule of thirds breaks the image up into nine equal squares. Where the lines intersect we call these Points of Interest. The rule works by placing your subject, and other elements, along the lines and at the points of interest. Most cameras will have the option to overlay this grid on the viewing screen, so turn it on if that helps. The human eye is naturally drawn to these points of interest. It won’t generally look in the center of an image first, unless there is a particularly arresting subject drawing the eye there.” (digitaltrends.com, 2019)

The Three Kings (Exposure Triangle)

ISO, Shutter Speed, and Aperture, the Three Kings of Photography are the keys to taking your photographing skills to the next level. Although most new DSLRs will come with an auto mode that will calculate all this for you, if you want to take professional quality photos these are things that you will learn to change and manipulate on the fly. First let's get an overview of what each of these things do, as explained by photographylife.com.

Shutter Speed

"The length of time a camera shutter is open to expose light into the camera sensor. Shutter speeds are typically measured in fractions of a second, when they are under a second. Slow shutter speeds allow more light into the camera sensor and are used for low-light and night photography, while fast shutter speeds help to freeze motion. Examples of shutter speeds: 1/15 (1/15th of a second), 1/30, 1/60, 1/125." (photographylife.com, 2019)

Aperture

"A hole within a lens, through which light travels into the camera body. The larger the hole, the more light passes to the camera sensor. Aperture also controls the depth of field, which is the portion of a scene that appears to be sharp. If the aperture is very small, the depth of field is large, while if the aperture is large, the depth of field is small. In photography, aperture is typically expressed in "f" numbers (also known as "focal ratio", since the f-number is the ratio of the diameter of the lens aperture to the length of the lens). Examples of f-numbers are: f/1.4, f/2.0, f/2.8, f/4.0, f/5.6, f/8.0." (photographylife.com, 2019)

ISO

"A way to brighten your photos if you can't use a longer shutter speed or a wider aperture. It is typically measured in numbers, a lower number representing a darker image, while higher numbers mean a brighter image. However, raising your ISO comes at a cost. As the ISO rises, so does the visibility of graininess/noise in your images. Examples of ISO: 100, 200, 400, 800, 1600." (photographylife.com, 2019)

Working Together To Create an Exposure

When we point our camera at a subject and hit the shutter button, the subject gets into the lens as a form of light. If the subject is well lit plenty of light then travels into the lens, and vice versa. When the light enters the lens, it passes through glass elements and then passes through the Aperture. Next it hits the shutter curtain, which is like a window that opens when needed and can open within a matter of milliseconds. This time is called the Shutter Speed. The sensor then gathers light and your ISO brightens the image if necessary, the shutter is then closed and light is blocked from reaching the camera sensor.

To get the image properly exposed, so that it is not too bright or too dark, Shutter Speed, Aperture and ISO need to play together.

Specific Case Scenarios for Getting Your Exposure Correct.

Here is a list of specific scenarios that you could expect to see, as laid out on photographylife.com

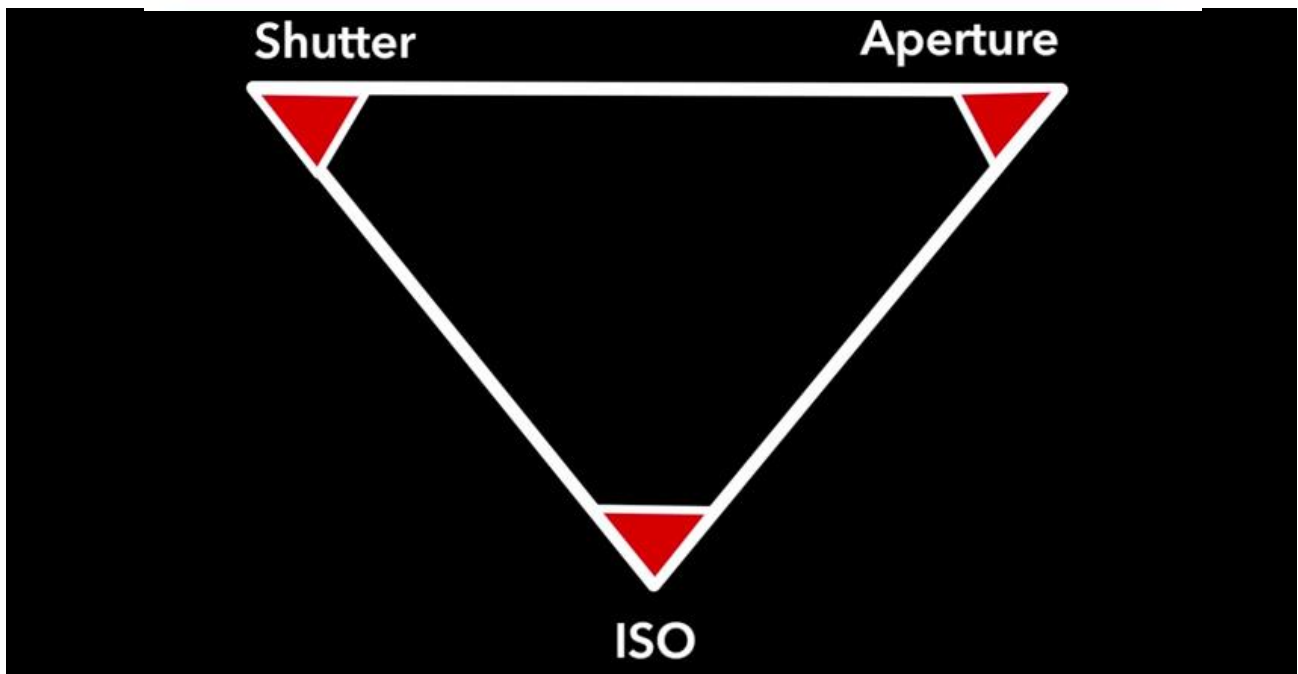
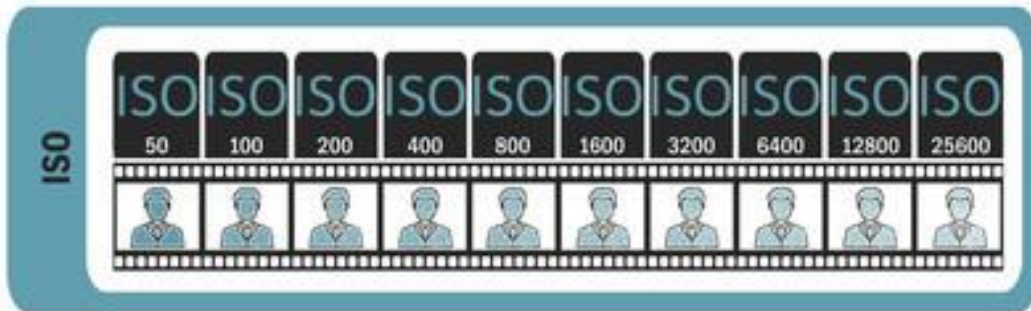
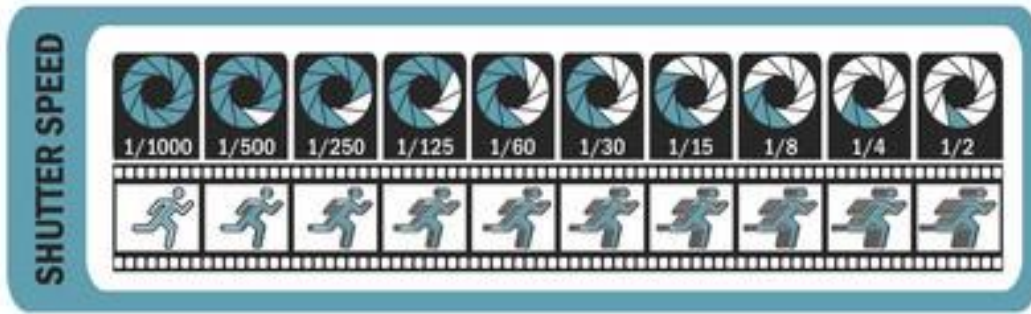
What should I do in low-light situations? Use Aperture-Priority mode, set your aperture to the lowest possible number. Be careful if you have a fast lens such as Nikon 50mm f/1.4, because setting aperture to the lowest number (f/1.4) will make the depth of field very shallow. Set your “Auto ISO” to “On” (if you have it) and make sure that the maximum ISO and minimum shutter speed are both defined, as shown in section 3. If after increasing your ISO you are still getting small shutter speeds (which means that you are in a very dim environment), your only other options are to either use a tripod or a flash. If you have moving subjects that need to be “frozen”, you will have to use flash.

What do I need to do to freeze action? First, you will need plenty of light. Freezing action during the broad daylight is easy, whereas it is extremely tough to do it in low-light situations. Assuming you have plenty of light, make sure that your aperture is set to the lowest number (again, be careful about depth of field), then set your “Auto ISO” to “On” (if you have it) and set your minimum shutter speed to a really high number such as 1/500th or 1/1000th of a second. For my bird photography, I try to keep shutter speeds at 1/1000th of a second and faster:

What settings do I need to change to create a motion blur effect? Turn off Auto ISO and set your ISO to the lowest number. If the shutter speed is too fast and you still cannot create motion blur, increase aperture to a higher number until the shutter speed drops to a low number below 1/100-1/50 of a second.

What do I do if I cannot get proper exposure? The image is either too dark or too bright. Make sure that you are not shooting in Manual Mode. Set your camera meter to “Evaluative” (Canon) or “Matrix” (Nikon). If it is already set and you are still getting improper exposure, it means that you are probably taking a picture where there is a big contrast between multiple objects (for example bright sky and dark mountains, or sun in the frame) – whatever you are trying to take a picture of is confusing the meter within your camera. If you still need to take a picture, set your camera meter to “Spot” and try to point your focus point to an area that is not too bright or too dark. That way you get the “sweet middle”.

How can I decrease the amount of noise/grain in my images? Turn off “Auto ISO” and set your ISO to the base ISO of the camera (ISO 100 on Canon and ISO 200 on Nikon).



Getting Your Photos off Your Camera

Most cameras use SD cards to store all of the photos on. Some computers come with a reader preinstalled, but you can pick them up at your local stores for \$20 or so. If your camera doesn't use a Micro SD then it uses internal storage which can be accessed with the micro-USB that came with the camera for charging. Simply plug the regular USB end into a computer to easily access your photos.

Photos are stored as either .PNG or .JPEG. JPEG files have different compression types so it can be lower quality than a PNG, but both can work for your photo needs. JPEG is usually the default file type. Sometimes you can change your file type to a .TIF file but this requires a high end camera and a large storage space as these are raw uncompressed files offering the highest fidelity.

When you plug in your SD card or camera the file explorer (windows) or finder (mac) will open and you will be presented with the file tree of your storage space. All your photos live in the DCIM (Digital Camera Images) folder, which is the standardized directory name for a camera's file system.

From here it is a simple drag and drop process to get the images off your camera and onto your computer. After you are done feel free to delete the photos from your camera's storage as you will need it to take more pictures.

Post-Processing

Post-Processing includes anything you do to the photo after you take it. Usually this is done on a computer program such as Adobe Light Room or a free alternative GIMP. These will allow you to crop, change dimension sizes, change color washout, and remove red-eye as well as many other things.

This is something I encourage you to look into and research on your own, as a good post processing can make a bad image good, and a good image great.