

## CAMERA LENSES & MOVING IMAGE – BASICS



## LENSES – SOME TERMINOLOGY

**FOCAL LENGTH** – The lower the number the wider the angle of view. For example, a 14mm lens will be extremely wide (almost fisheye) while a 100mm lens creates a macro, detailed view.

**FIXED/PRIME** – A prime (or fixed) lens has a fixed focal length.

These lenses cannot zoom in or out (i.e. to get closer to the subject you have to physically move forward with the camera.) Prime lenses have a specific focal lengths i.e. 24mm, 50mm, 100mm.

**VARIABLE/ZOOM** – A variable (or zoom) lens can zoom in and out between two fixed focal lengths (i.e. 70-200mm) by turning the zoom ring on the lens.

**‘FAST’ & ‘SLOW’ LENSES** A lens with a larger maximum aperture (that is, a smaller minimum f-number) is called a "fast lens" i.e. a Canon EF 50mm f1.2 will open up to a maximum aperture of f1.2.

**MANUAL/ELECTRONIC** - An electronic lens communicates with the camera body, enabling the user to change the aperture and focus via the camera body. (The camera can also digitally log the metadata of each shot). A manual lens does not communicate with the camera – the exposure and focus is controlled manually via 2 rings on the lens.

**LENS MOUNT** - A mechanical and (often electronic) connection between a camera body and lens.

Different brands have different mounts i.e. Canon EF, Leica M, Nikon F.

The body and lens must match up in order to fit correctly (although adaptors are available to convert a lens to a different mount)

**CROP FACTOR** – If a camera is not ‘full frame’ the sensor will not take in the entire range of the lens – it will crop the image. For example, a 50mm lens may give an 85mm field of view.



## VARIABLE vs. PRIME LENSES

### **VARIABLE (OR ZOOM) LENSES**

PROS - Enables the user to zoom in and out, changing the framing without physically moving the camera. Good for fast moving situations (for example, documentaries) or when there is not enough space to move the camera about (for example, recording a live performance).

CONS - Tend to be much heavier than a prime lens. Image quality can be compromised slightly depending on the make and cost of the lens. More expensive than a fixed lens.

### **PRIME (OR FIXED) LENSES**

PROS - Often a better build & quality than a variable lens as there are less moving parts inside the lens itself. Much lighter and a smaller size than a variable lens.

CONS - Often means taking a few lenses out on a shoot. Swapping lenses over can take time. Often means moving the camera about more to get the correct framing.

## MANUAL vs. ELECTRONIC

### **MANUAL LENSES**

PROS - Quicker to change focus and exposure manually. Smooth transitions whilst changing exposure.

CONS - Loses some of the functionality of electronic lens (i.e. no auto focus, metadata)

### **ELECTRONIC LENSES**

PROS - Adds electronic functionality (i.e. auto focus – good for stills), records metadata.

CONS - Noticeable switching between f-stops – electronics can be noisy!



## LENS MOUNTS

A lens must have the corresponding mount to fit a camera body. The Photo Unit has both Nikon and canon cameras which offer movie capabilities

**A Canon EF-S lens** (*Electro-Focus - Short*) is identified by a white square on the lens mount. This lens will only attach to a camera body with a corresponding white square (for example a 7D or 60D – note that a 5D, Ursa Mini, Pocket Camera & M Series do not have the white square!)



**A Canon EF lens** is identified by a red dot only. This will only fit a Canon body with a red dot.

*Make sure you check any lenses you borrow or buy will fit the camera body!*

*Moving Image use mostly EF fit lenses – most of our lenses will fit most of our camera bodies.*



## Nikon Lenses

The Nikon F-mount has a significant degree of both backward and forward compatibility. Many current autofocus F-mount lenses can be used on the original Nikon F, and the earliest manual-focus F-mount lenses of the 1960s and early 1970s can, with some modification, still be used to their fullest on all professional-class Nikon cameras. Incompatibilities do exist, however, and adventurous F-mount users should consult product documentation in order to avoid problems. For example, many electronic camera bodies cannot meter without a CPU enabled lens; the aperture of G designated lenses cannot be controlled without an electronic camera body; non-AI lenses (manufactured prior to 1977) can cause mechanical damage to later model bodies unless they are modified to meet the AI specification; and AF-P lenses (introduced in 2016) will not focus, even manually, on cameras introduced before roughly 2013. Many manual focus lenses can be converted to allow metering with consumer Nikon bodies by adding a Dandelion chip to the lens.



Most Nikon F-mount lenses cover a minimum of the standard 36×24 mm area of 35mm format and the Nikon FX format, while DX designated lenses cover the 24×16 mm area of the Nikon DX format, and industrial F-mount lenses have varying coverage. DX lenses may produce vignetting when used on film and FX cameras. However, Nikon lenses designed for film cameras will work on Nikon digital system cameras with the limitations noted above.

## CROP FACTOR

Crop factor relates to the size of a camera body sensor and how this changes the image via a lens. 'Full frame' sensors (5D, 6D, Nikon D5, Sony A7) display a lens's entire field of view.

Sensors which are not full frame (commonly known as APS-C sensors used in the 60D, 7D, 600D etc.) will crop the image to varying degrees. For example, a 60D has a smaller sensor than a full frame one, therefore cropping the image by a factor of x1.6 (see below).

This doesn't create a lower quality image, it just means that you may have to move the camera back to get a wider shot!

*When borrowing lenses it's a good idea to check a lens on a camera first to make sure it's the type of shot you want before shooting.*



**5D 11-16 (@16)**



**60D 11-16 (@16)**



**5D 24-70 (@24)**



**60D 24-70 (@24)**

## WHICH LENS SHOULD I USE?

This is dependent on the sort of look or feeling you want to convey. However, some examples below:

### **Ultrawide (or Fisheye)**

Focal length: Full-frame less than 24mm; APS-C less than 16mm;

PROS - Easy to handheld and to move around with smoothly, with a good depth of field.  
Good for cramped conditions or small rooms.

CONS – Can distort the image.

Edge of the lens may be visible in shot. Can ‘fish-eye’ – especially on a full frame sensor.



## Wide angle

*Focal length: Full-frame around 24-40mm; APS-C 15-24mm*

PROS - Very useful for filming master shots of the whole scene, or getting in close and working in cramped spaces.

Easy to handhold, with strong perspective and good depth of field.

CONS - Close ups will be distorted. If you want to shoot with just one prime lens, this may be the one.





## **Standard**

*Focal length: Full-frame around 50mm; APS-C around 35mm.*

These lenses (a 50mm is often referred to as 'a standard') offer natural-looking perspective. 50mm prime lenses are usually small and 'fast' (they often have a wide maximum aperture which lets in a lot of light).

PROS - They are good for two-shots and mid shots (hips to head)

CONS - Slight distortion if used for close ups.



## **'Portrait' lens**

*Focal length: Full-frame around 85-100mm; APS-C around 50-60mm.*

These are the shortest lenses that will give undistorted close ups.

These lenses seem to flatten perspective (which is good for strong, graphic compositions) and can produce a shallow depth of field.

PROS - They are usually quite 'fast' which makes them good in low light.

CONS - They are difficult to handhold and are best used on a tripod.



## **Telephoto lenses**

Focal length: Full-frame, 135mm and above. APS-C 85mm and above.

PROS - Good for flattening perspective, isolating the subject from the background and bringing distant objects closer.

CONS - Usually big and heavy. Need to be used on a tripod to avoid shake.



## CAMERA LENSES & MOVING IMAGE – SOME RESOURCES

Adapting old lenses for modern cameras <http://mathieustern.com/the-weird-lens-challenge/>

Behind The Glass – video tutorials focusing on lenses - <https://vimeo.com/27582408>

Article on lens basics <http://nofilmschool.com/tags/lenses>

Shot Reverse Shot – [Video exploring different lenses effect on mood etc https://youtu.be/5UE3jz\\_O\\_EM?t=107](https://youtu.be/5UE3jz_O_EM?t=107)

Extensive forums/resources for professional cinematographers <http://www.cinematography.com/>

