It is not possible to create a photograph without light. People having basic scientific knowledge are well aware of the physical parameters of light named as intensity, wavelength and frequency. However when in photographic domain the terms get changed to cool, warm and colour temperature. What one might see as white light from different sources can actually have different colors depending on what all wavelengths of the electromagnetic radiation are present in that source. In photography this intimation is conveyed through the term *color temperatures*. Direct sunlight at noon is considered to be at "normal" color temperature. So all light sources are compared to this as a standard. For example, light from an incandescent light bulb appears to be more orange than sunlight. On the opposite side of the spectrum, shady areas appear to be blue than sunlight. In photography, we refer to these differences as being "warmer" (or more orange) and "cooler" (or more blue) than our neutral sunlight reference point.Normally when we look at a subject we sense the right colour irrespective of the light illumation and its characteristics. That's because our brains compensate for different color temperatures so that we just see normal colors. Cameras, on the other hand, don't automatically compensate for different color temperatures. Instead, unless one uses a setting that compensates for different color temperatures, cameras capture the light and color temperatures that are actually in a scene, not what our eyes see. If an incorrect white balance setting is used in a camera, images turn out unnatural, with bad skin tones in portraits and color shifts at back grounds and cloths.

Slde 1

Colour Temperature

Color temperature is measured in units of Kelvin (K) and is a physical property of light. There is a large scope for variance between different light sources, even if they appear to be exactly the same. For example fluorescent lights and incandescent bulbs emit light at different color temperatures. Similarly, sunlight at noon can have a different color temperature than it does at sunset. A neutral color temperature (sunlight at noon) measures between 5200-6000 K. An incandescent light bulb (warm/orange) has a color temperature of around 3000 K, while shade (cool/blue) has a color temperature of around 8000 K. Here's a chart that gives you a few different light sources and their typical range of Kelvin measurements:

slide 2

Light Type	Color Temperature in Kelvin (K)
Candle Flame	1,000 to 2,000
Household Lighting	2,500 to 3,500
Sunrise and Sunset	3,000 to 4,000
Sunlight and Flash	5,200 to 6,000
Clear Sky	6,000 to 6,500
Cloudy Sky and Shade	6,500 to 8,000
Heavily Overcast Sky	9,000 to 10,000

Photographically speaking, things get tricky when the scene one tries to photograph has multiple light sources with different color temperatures. This situation is known as *mixed lighting*. Different lighting *conditions* can also have different color temperatures.

Slide 3

White Balance?

As the name suggests, white balance, *balances* the colour temperature in a digital image and tries to make the photograph appear in natural colour irrespective of the lighting source. This is achived by adding the opposite colour to the image in an attempt to bring the color temperature back to neutral. As a thumb rule whites appearing blue or orange, should appear white after correctly white balancing an image.

In a simpler definition, white balance in digital photography means adjusting colors so that the image looks more natural. This can be done it in camera or during , post-processing using an appropriate software.

In-Camera White Balance

Most cameras come with the option to manually set or adjust white balance. Typical settings include "sun", "shade", "tungsten" and "fluorescent". Some cameras come with the option to manually set a color temperature by choosing a specific Kelvin value.

Changing WB in Camera vs In Post-Processing Software

All digital images obtained in RAW format, can be easily adjusted for white balance in post-processing software at a later stage. But while capturing images in JPEGs instead of RAW adjusting white balance later can be quite damaging to the image. In that scenario one need to learn how to adjust white balance on a camera. In most circumstances in auto white balance mode the camera gives a decent picture. But there can be cases wherein the camera is fooled by lighting conditions and give bad colours. That's when one needs to manually set white balance.

How to Change White Balance in a Camera

Slide 4

White balance can be changed very easily on most DSLR and mirrorless cameras. There are some dedicated buttons that allows one to quickly change between different white balance presets. One will often find a "WB" button – Holding that button and moving the rear dial will allow it switch between different white balance settings, such as "Incandescent", "Fluorescent", "Direct Sunlight", etc. If there is no dedicated white balance button, select white

balance through the camera menu. For example, if you have an entry-level canon camera, simply navigate to the "Shooting Menu" and scroll down until you get to "White Balance". Once there, you will be presented with a number of different presets.

Camera White Balance Presets

Most DSLR cameras have white balance presets that are set to a certain Kelvin number by the manufacturer. These presets also vary depending on the manufacturer and camera model. Here is the list of common presets for most DSLR and mirrorless cameras:

- **Auto (A)** – Default WB setting. The camera automatically guesses the WB depending on ambient light and use of flash. Some cameras have more than one auto setting for different environments / lighting situations.
- **Incandenscent (Light Bulb)** – Use it strictly under tungsten light bulbs or the image will look very blue.
- **Fluorescent (Glowing Tube)** – Use if photos look too green or when under fluorescent lights. Since there are many different types of fluorescent bulbs, some cameras provide several different selections for this setting.
- **Direct Sunlight (Sun)** – Used when shooting outdoors with the sun shining on the subject.
- **Flash (Lightning Bolt)** – Used when utilizing on-camera flash.
- **Cloudy (Cloud)** – Used in cloudy days or in shades. Will yield warmer images than sunlight.
- **Shade (House with a Shadow)** – Warmer than cloudy, adding orange colors to the photograph. Good for sunsets and shades.
- **Choose Color Temperature (K)** – Lets you manually change the Kelvin value (typically from 2,500 to 10,000).
- **Preset (PRE)** – Used for colour matching with a white balance card.

The above list may have a different nomenclature depending on the manufacturer of the camera. The best way to obtain the correct white balance is through the "Preset (PRE)" setting. An additional requirement is a a white balance card (also known as "grey card", or "18% gray card. The process involves holding the white balance card in front of the camera lens in order to have the camera read the correct colour temperature of the light that gets reflected from the card. Some cameras might require you to take a picture of the white balance card first, and then read the colours off of it to determine the correct white balance.

Please note that it is not a permanent camera setting – each time the light conditions change, the whole process is to be repeated.

How to Change White Balance in Post-Processing Software

If one don't want to worry about changing the white balance in camera for different situations and the preferred image format is RAW, one can always adjust the white balance using post-processing software such as Adobe Photoshop or Lightroom. This is also referred to as "colour correction". In your software you'll probably see a panel that looks something like this:

Slide 5
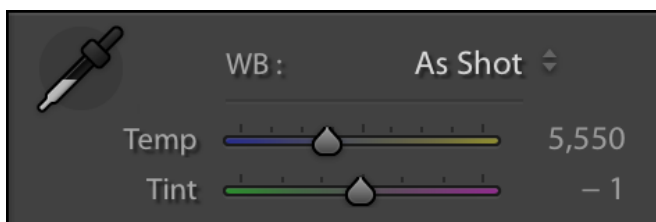
Just like setting the white balance in your camera, you can manually set the white balance either by adjusting the temperature value or by using the eyedropper tool on the left side and clicking on a neutral or white part of the image. Similar to your camera, you can also choose a preset white balance:
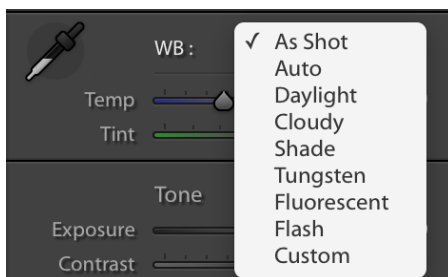
Remember, this is effective only if the images are in RAW format. For a JPEG image, one will be able to make only slight white balance adjustments

Let us conclude this module with a hope to make use of white balance concepts to create better photographs.