Basics of Video Camera, Light and Sound
BA(JMC) 205
Unit III

Syllabus- Unit 3

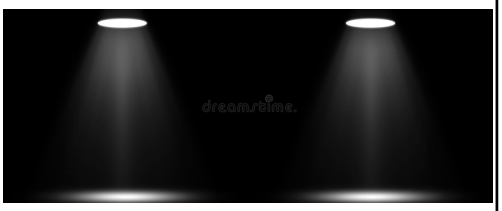
Unit III: [Lighting]

- ✓ Light and its Properties
- ✓ Different types of Lights
- ✓3. Other tools used in Lighting: Diffusers, Reflectors, Cutters and Gels
- ✓4. Basic Lighting Techniques

Light and its Properties

What is light?

- Like Sound, **light is a wave**. When energy moves, a **disruption** known as a wave occurs.
- The term "**light**" refers to **electromagnetic radiation** that falls within the visible spectrum and allows for the perception of colour, shape, and texture.



Properties of Light

- Wave-Particle Duality: Light behaves as **both waves and particles (photons)**.
- **Speed of Light**: **Approximately 299,792,458** meters per second (in a vacuum).
- **Electromagnetic Spectrum:** Range of all possible frequencies of **electromagnetic radiation,** including **radio waves, microwaves**, **infrared**, **visible light**, **ultraviolet**, **X-rays**, and **gamma rays**.

Reflection

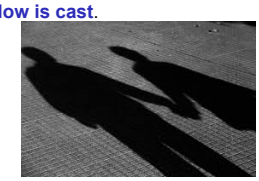
- **Bouncing back of light** when it strikes a surface, allowing us to see objects.
- Reflection is the basis for **vision, mirrors**, and various optical applications.
- **Regular (Specular) Reflection**: Parallel light rays reflect uniformly, creating a clear, sharp image (e.g., mirrors).
- **Diffuse Reflection:** Light rays scatter in various directions, producing a non-distinct image (e.g., rough surfaces).

Refraction

- **Refraction Defined:** The bending of light as it passes from one medium to another of different optical density.
- Significance: Refraction is responsible for phenomena like **lenses, prisms, and the apparent bending of objects in water**.
- Types of Refraction
  - **Converging Refraction:** Light bends towards the normal when moving from a rarer to a denser medium (e.g., air to glass).
  - **Diverging Refraction:** Light bends from the normal when moving from a denser to a rarer medium (e.g., glass to air).

Shadow

- Shadows Defined: An area where light is blocked by an object, resulting in reduced or no light intensity.
- Importance: Shadows provide insight into **the behaviour of light** and play a role in various scientific and artistic contexts.
  - **Light Source:** The origin of light rays that illuminate objects.
  - **Object:** The obstruction that blocks light rays from reaching a surface.
  - **Screen:** The surface on which the **shadow is cast**.

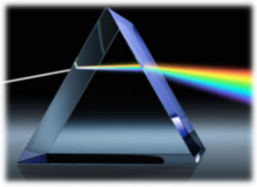


Visible Light

- So now we know that light is a wave. Specifically, it is an electromagnetic **wave within the visible spectrum – the only wave we can see**. We usually perceive light as white - like sunlight or a light bulb. However, reflecting off of things allows us to see colours like red, orange, yellow, green, blue, indigo,

Prisms

- When you made your own rainbow using a glass of water, you made a prism. **Prisms create a boundary** where white light is not only bent or refracted but is separated into **all the colours of the rainbow**. This is the same thing in the sky after it rains – the raindrops act as the prism.



Different types of Lights

Hard Light

- Direct light transmission from a tiny point source creates reasonably coherent parallel beams. As a result, the **light seems hard, crisp, and clearly defined**. Hard light sources include the sun at the **light in a clear sky, a concentrated spotlight, and a clear, unfrosted light bulb**. A crisp, distinct shadow is created by hard light.
- **Skin flaws are visible** when a face is **illuminated** with **hard light**. The end outcome is not favourable. TV uses various lighting equipment, such as the **ellipsoidal spotlight and beam-spot projector**, to provide hard light.

Soft Light

- Introduction
  - ✓Soft, diffused light has a distinct impact on various industries and creative fields.
  - ✓Manufacturing industry: Achieving uniform field of light.
- Soft Lighting in Videography
  - ✓**Umbrella reflectors** are used for **soft lighting** in videography.
  - ✓Reflection off the inner surface of umbrella-shaped reflectors.
  - ✓**Silver or white umbrellas** are used to create a **soft lighting effect**. Lighting effect using umbrella reflectors.
- Soft light's benefits in glamour work.
  - ✓Diminishing the appearance of **creases, wrinkles, and blemishes**.
  - ✓Enhancing overall appearance and quality of the subject.

Soft Light

- **Flat Illumination in Soft Light**
  - ✓Soft light near the camera leads to diminished surface detail.
  - ✓Resulting effect is known as **flat illumination**.
  - ✓Trade-off between reducing **imperfections and losing detail**.
- **Macro Videography and Depth**
  - ✓Macro Videography capturing **complicated details**.
  - ✓Shadows **may conceal details** in macro shots.
  - ✓Flat lighting in macro Videography **reduces depth perception**.
- **Limitations of Flat Lighting**
  - ✓Potential **lack of depth** in subjects.
  - ✓**Two-dimensional** appearance due to **lack of shadows**.
  - ✓Subject appearing **dull and lacking vitality**.

Type of Lights


Tungsten Lighting


HMI


Fluorescent Video Lights


LED lamps

Kind of Light

- Tungsten lighting's legacy in film and video production.
- Resemblance to traditional **incandescent bulbs**.
- Ideal for indoor lighting setups.
- **Tungsten Lighting Basics**
  - ✓Tungsten lamps as **incandescent filament bulbs**.
  - ✓Warm, **natural colour temperature** resembling daylight.
  - ✓Range of wattages for different lighting needs.
- **Industry Standard for Decades**
  - ✓Established **history in film and video product**
  - ✓Trusted by professionals for consistent results.
  - ✓**Reliability and familiarity** in various settings.

Pros

- **Natural Warmth and Colour**
  - Tungsten lamps emit a warm and natural colour temperature.
  - Resembles daylight, creating a visually pleasing and authentic look.
  - Ideal for enhancing skin tones and providing a comfortable ambience.
- **Interior Lighting Integration**
  - Tungsten lights resemble conventional incandescent bulbs.
- **Easily Adjustable Intensity**
  - **Compatible with dimmers for precise** control of brightness.
  - Effortlessly adapt lighting to suit specific shot requirements.
- **Cost-Effective Solution**
  - Tungsten lights are generally more affordable than some alternatives. Well-suited for productions with budget constraints.

Cons

- While tungsten lighting has many benefits, there are also some drawbacks to consider.
- **Heat Generation**
  - Tungsten lights produce significant heat during operation.
  - Requires proper ventilation and management to avoid discomfort or safety hazards.
- **Energy Consumption**
  - Tungsten lighting is less energy-efficient compared to newer technologies like LEDs. Higher power consumption may result in increased electricity costs over time.
- **Fragility and Bulb Lifespan**
  - Tungsten bulbs are relatively fragile and can be easily damaged.
  - Frequent replacement might be necessary due to shorter bulb lifespan.

HMI Lighting

- **Brightness and Color Accuracy**
  - ✓HMI lights offer high brightness levels, suitable for various environments.
  - ✓Emit daylight-balanced colour temperatures, approximating natural sunlight.
  - ✓Ensures accurate colour reproduction, which is critical for visual fidelity.
- **Flexibility in Intensity Control**
  - ✓HMI lights are compatible with dimmers and ballasts.
  - ✓Easily adjust brightness levels to achieve desired lighting effects.
  - ✓Provides dynamic control during shoots for creative lighting setups.

PRO

- **Daylight-Balanced Illumination**
  - HMI lights emit colour temperatures similar to natural daylight.
  - Ideal for achieving realistic outdoor scenes and minimizing colour correction.
  - Ensures accurate colour representation and visual authenticity.
- **Efficient Energy Consumption**
  - HMI lights provide brighter output with less energy consumption.
  - Energy-efficient choice compared to traditional tungsten lighting.
  - Aligns with environmentally conscious production practices.
- **Flicker-Free Performance**
  - HMI lights operate without noticeable flickering.
  - Suitable for shooting at various frame rates, including slow-motion.
  - Provides consistent lighting even in challenging shooting conditions.

Cons

- HMI (Hydrargyrum Medium-Arc Iodide) lighting has several drawbacks to consider.
- Heat Generation
  - ✓HMI lights produce substantial heat during operation.
  - ✓Requires proper ventilation and cooling systems.
- Power Consumption
  - ✓HMI lights consume more power compared to some alternatives.
  - ✓Increased electricity costs and demand for power sources.
- Initial Investment
  - ✓HMI lighting systems come with a higher upfront cost.
  - ✓Budget constraints might limit access to these lights.
- Color Consistency
  - ✓Maintaining consistent colour temperature can be challenging.

Fluorescent Video Lights

- If you have seen a lighting fixture on set with a row of light tubes, you have witnessed fluorescent film or video lighting kits in operation. These lamps produce UV light from mercury vapour and are suitable for use both inside and outdoors.

Pros

- Fluorescent lighting provides spaces with a naturally mellow light that is commonplace. In addition, they are inexpensive, portable, and adaptable to various shooting settings.
- Like LEDs, fluorescent film lighting kits have low power needs and do not generate excessive heat.

Cons

- External ballasts are not necessary for fluorescent lighting; however, they may assist prevent flickering difficulties. Like HMIs, this requires additional assembly and disassembly.
- Dimming fluorescent lamps are also more difficult than with other types. You can always remove bulbs to lessen the illumination intensity, but you will have less control.

LED Lamps

- LED (Light Emitting Diode) lamps have revolutionized film production lighting.
- An essential tool that offers a myriad of benefits for filmmakers.
- **Energy Efficiency and Cost Savings**
  - ✓LED lamps are highly energy-efficient, consuming less power.
  - ✓Significantly lower electricity costs compared to traditional lighting.
  - ✓Aligns with budget-conscious filmmaking and sustainability efforts.
- **Minimal Heat Generation**
- **Long Lifespan and Reliability**
  - ✓LED lamps have a prolonged operational lifespan. Reduced need for frequent replacements and maintenance.

Pros

- **Energy Efficiency and Cost Savings**
  - ✓LED lamps are highly energy-efficient, consuming less power.
  - ✓Significant reduction in electricity costs compared to traditional lighting.
- **Energy Efficiency and Cost Savings**
  - ✓LED lamps are highly energy-efficient, consuming less power.
  - ✓Significant reduction in electricity costs compared to traditional lighting.
- **Versatility of Lighting Options**
  - ✓LED lamps come in various forms: panels, tubes, and more.
  - ✓Adaptable to different scenes and shot configurations.
- Minimal Heat Generation
  - ✓LED lamps produce very little heat during operation.
  - ✓Creates a comfortable environment for both talent and crew.
  - ✓Reduces the need for cooling equipment and potential overheating issues.

Cons

- **Color Inconsistencies**
  - ✓Some LED lamps may exhibit colour inconsistencies.
  - ✓Variations in colour temperature and colour accuracy can impact visual continuity.
- **Initial Investment**
  - ✓High-quality LED lamps can come with a significant upfront cost.
  - ✓Balancing the initial investment against long-term benefits is necessary.
  - ✓Consider budget constraints and ROI when choosing LED lighting solutions.
- **Light Output Limitations**
  - ✓Some LED lamps may have limitations in achieving high light output.
  - ✓Ensuring sufficient brightness for specific scenes might require additional fixtures.
  - ✓Evaluate if the chosen LED lamps can meet the required intensity.

Other tools used in Lighting: Diffusers, Reflectors, Cutters and Gels

Accessories

- **Accessory Mounts.** If you find yourself in situations where you need to get your lights into places where you can't use a normal light stand, you'll need a variety of accessory mounts. Look for mounts such as c-clamps, scissors clamps (especially for drop ceilings) and flexible arms for manoeuvring your reflectors and flags and door hangers.
- **Barndoors.** Barndoors are the adjustable flaps in front of a light that gives you the ability to block or shape the light beam and spill.

Accessories

- **Carrying case.** It's no fun having all the toys if you can't bring them, so a good case is necessary. Keep in mind that you will be carrying these kits, so make sure they aren't so heavy that you have to rent some elephants to move them.
- **Gels.** Most light kits have a supply of gels. These gels help control the intensity of light (**ND Filters**), change indoor light to outdoor (**colour-temperature blue (CTB) gels**) and change outdoor window light to indoor light (**colour temperature orange (CTO) gels**). The kits may also include gel frames to mount the gels on the lights.
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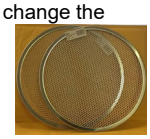
Accessories

- **Scrims.** A scrim is a metal mesh screen that you place over the light to decrease intensity. Scrims come in whole, half and a variety of densities. You might use a half scrim to change the intensity of only half of the light, for example.



- **Soft boxes.** These large diffusion boxes fit on the front of **reflector spots and Fresnel** to turn them into soft lights.

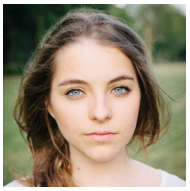
Accessories

- **Adjustable.** Most **reflector spots and Fresnels** have an adjustable bulb so that you can move it from the flood to the spot position. This gives you greater flexibility in the type and intensity of your key light.
- **Stands and stand height.** It is essential to know what type of video you usually shoot. If you do a lot of work where your talent is standing, you will need a light stand that has a greater height than seated interviews. Professionals often choose to position the key light at an angle of about **45- degrees above the talent**. That's pretty high and requires a stand that rises to at least eight feet.
- **Umbrellas.** An umbrella is an excellent tool for changing a bright key light into a large soft fill light.

Basic Lighting Techniques

Flat light

- This is **flat lighting** when your light source faces directly **the front** of your subject. Flat lighting on a face will mean that your subject is **well-lit**, and you **cannot see any shadows** along their face.
  - ✓This is not the desired look in portraits
  - ✓you need shadows to draw your subject to life.
  - ✓However, there are circumstances where it's beneficial.



Broad light

- With **broad light (a type of side lighting),** your subject's face is at an angle, the **most well-lit side** of the face is closest to the camera, and the **shadow falls on the back side** of the face. This type of light can make a face look fuller, so it's ideal for those with **narrow faces**.

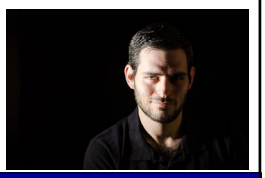
Short light

- Another type of **side lighting**, **short light**, is the opposite of broad light in that the face is at an angle, and **the shadow falls on the side of the face closest to the camera**. This light works **well to thin a face** and is flattering on most people.

One thing to remember is that shadows draw out textures and imperfections. While broad light is a wonderful way to emphasise freckles, it will also draw out imperfections like acne and scars.

Split light

- **Split lighting** is another type of side lighting, but it is defined as light that hits your subject from the side at a **90-degree angle**.
- You can easily recognise **split lighting in an image by half** of the subject being lit and the other half in the shadows. With a face specifically, you'll see the shadow line straight down the middle of the forehead, nose, and chin.



Backlight

- **Backlight** is just that, light that comes from behind your subject. This is commonly seen in photos from the beloved **golden hour** when the **sun is low on the horizon** and starting to set, but it can be done at all hours of the day.

- Sources of the backlight can include a **window behind your subject** in the middle of the day to **a flash placed behind** with a colourful gel for something fun.

- As **beautiful as the backlight** is, it comes with its own challenges, which can include a look of haziness and lack of clarity in your subject. Because of this, I like to do a few things.

Semi-silhouette:

- One effective technique for utilising **backlight** is to allow the light to subtly enter the frame, creating a captivating visual effect. When engaging in this activity, there is a visually pleasing radiance that produces a pleasing contrast against a dimly lit backdrop. In this particular scenario, it is common practise intentionally increase the exposure of my subject, resulting in a darker appearance compared to the usual. This deliberate adjustment is made in order to enhance the contrast within the image and ultimately establish a cosy and tranquil atmosphere.

Reflector

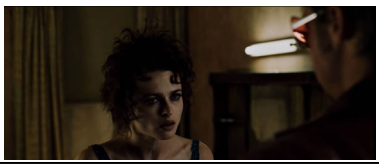
- Sometimes I want the strong haze that comes with the sun warmly filling the frame but losing clarity in my subject's face is no good. To combat the loss of clarity I use a reflector to pop some of that sunlight back onto my subject.
- When using a reflector, place it opposite the light source and then adjust the angle to direct the light exactly where you want it. You'll also want to move the reflector closer to your subject for stronger light and further away from for softer light. Without a reflector

Butterfly light

- With butterfly light, the light is placed above and in front of your subject to create a small shadow under the nose resembling a butterfly (hence the name). This light highlights prominent cheekbones, which is why you often see it used on women.
- However, it emphasises the shadows from deep-set eyes.

Rembrandt Lighting

- Rembrandt lighting (also called 45-degree lighting) is characterised by a small, triangular highlight on the shadowed cheek of the subject. The lighting takes its name from the famous Dutch painter who used skylights to illuminate his subjects. This type of lighting is dramatic. It is most often used with male subjects, and is commonly paired with a weak fill light to accentuate the shadow-side highlight.



FILM LIGHTING TECHNIQUES

TYPE OF LIGHTING	EFFECT	WAYS TO ACHIEVE
Natural Lighting	• Replicates real life • Free	• Use light already available at the location • Use bounce boards or flags to reflect or block light • Use diffusion • Consider time of day • Make sure to location scout
Key Lighting	• Illuminates the subject or actor • Brightest light in the frame	• Primary light in a 3 point setup • Avoid placing the key light too close to camera so the subject doesn't appear flat & featureless - part of 3-point lighting
High Key Lighting	• Reduces the lighting ratio (light to dark) in the scene • Can be used to create an optimistic or hopeful tone	• Heighten the key light • Use lots of fill light • Use diffusion
Low Key Lighting	• Emphasizes dark tones & shadows • Creates ominous & suspenseful mood	• Use smaller light sources • Use one light source & bounce for fill
Fill Lighting	• Cancels out shadows created by the key light • Can highlight things behind an object or for a rack focus	• Place opposite the key light • Use a less powerful light than the key light - part of 3-point lighting

Film Lighting Technique

Back Lighting	• Used to separate an actor or object from the background • Helps the frame feel more three dimensional	• Place behind the actor or object • Place higher than the actor or object • When placed at an angle behind the actor or object it is called a "kicker" • Part of 3-point lighting
Practical Lighting	• Good for wide shots & long takes • Helps give depth of field to a scene	• Makes use of set dressing/props such as lamps, candles, torches, tv, etc • Use a dimmer to reduce the light's intensity • Use a hidden motivated light to increase the light's intensity • Swap out bulbs to color correct, brighten or soften the light
Hard Lighting	• Dramatic effect • Creates shadows, silhouettes & highlights • Draws attention to certain parts of the frame	• Use bright sunlight • Use kicker light with soft fill • Minimize or eliminate fill light • Cut the light with diffusers & flags
Soft Lighting	• Tender, emotional scenes • Portraying characters favorably • Can give characters a youthful look • Reduces shadows	• Use large light sources • Heighten key light & use fill lights generously • Use diffusion

Film Lighting Technique

Bounce Lighting	• Creates a larger area of evenly spread light • Can bolster any kind of film lighting • Highlights a subject without shining directly on them	• Use white boards, white cards or reflectors • Point direct light at the board/ card/reflector & shine toward the subject
Chiarascuro/Side Lighting	• Provides drama & mood • Highlights a person or object • Can help contrast	• Place to the side of the actor or object • Can provide harsh shadows if not diffused • Use bounce cards to control
Motivated Lighting	• Imitate natural light source i.e. sunlight, moonlight or lamps • Enhance practical lights	• Use filters, flags, colored gels or bounces to help it appear more natural
Ambient Lighting	• Helps provide overall light but can also alter controlled light if not handled correctly	• Light that's already present at the location • Consider the time of day and entrances of light for each frame • Make sure to location scout