Design Course

Lighting Techniques for TV

An Introduction

by

Prof. Ravi Mokashi Punekar and Tonmoy Thakur
DoD, IIT Guwahati

Source:
http://www.dsource.in/course/lighting-techniques-tv

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2. Lighting Techniques
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Introduction

The module, 'lighting techniques' addresses the fundamentals of lighting and lighting technology for television. The module is structured to introduce a first time learner who is interested in executing someone else's lighting design. The module has been divided under following heads:

- Introduction
- Lighting Techniques - Artistic vs. Technical
- Lighting Variables
- Basic Lighting Triangle
- Lighting Instruments and Accessories
- Lighting Control Consoles
- Art of Lighting

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Lighting Techniques

Lighting Techniques - Artistic vs. Technical:
Available light (the natural, un-augmented light found at a location) often provides both a technically acceptable video image while also conveying the artistically correct mood. But not always can we depend on Mother Nature alone.

To light a set can be attributed basically to two reasons, viz. technical and artistic. The technical considerations factor in the minimum level of lighting required for a camera and is referred to as the Base Light. In absence of base light, the portions of the picture especially the darker areas could be filled with video noise, which appears as "grain". The artistic reason can scale to innumerous needs ranging from highlighting an important area in a shot to simulating ambient light and creating depth in a shot.

Fig.1: Broadcast Lighting (Pro TV-Romania's leading TV station)
Photo Courtesy: ARRI
Website: www.arri.de/

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In **Shot - 1**, we can see that due to inadequate base light has resulted in a grainy picture.

In **Shot - 2**, the adequate level of base light has result a finer picture.

Fig.2: Baselight and without Base Light.

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Lighting Variables

Video producers often manipulate three integral variables of lighting viz., light intensity, light character and color temperature to achieve the desired lighting results. But before, we go further into details of the above referred variables let's have a look into two basic types of illumination as shown in fig.3 (shot - 1 and shot - 2) below.

Shot - 1: Directional Light

Shot - 2: Diffused Light

Fig.3: Subject under Directional and Diffused Light.

As you can see in the above figure, the directional light cast strong shadows and further has a narrow and sharp beam (see shot - 1). It can be used to illuminate a precise area. On the contrary, as we can see in shot - 2, the diffused light cast soft and translucent shadows and has a wide and indistinct beam. It covers a wider area than directional light.

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Measuring Light Intensity - The Light Meter:
The light falling on an object is measured using a Light meter. A typical incident light meter has a half Ping-Pong ball-shaped photosphere, which collects the light (Fig.4). Place the meter with its back to the talent/subject and point the photosphere in the direction of the camera to get your reading (see shot - 2).
Note: this assumes that your set is "normally reflective".

If your set is in the snow, on water or full of bright, shiny objects, incident meter readings are often inaccurate. Use a reflected light meter reading. Also note that incident light meters are designed to properly expose a shade of middle gray that corresponds to average Caucasian skin. If you are metering very light-skinned or dark-skinned people, you'll get more accuracy with a reflected meter reading.

Shot - 1

Shot - 2

Fig.4: Demonstration on Light Meter.

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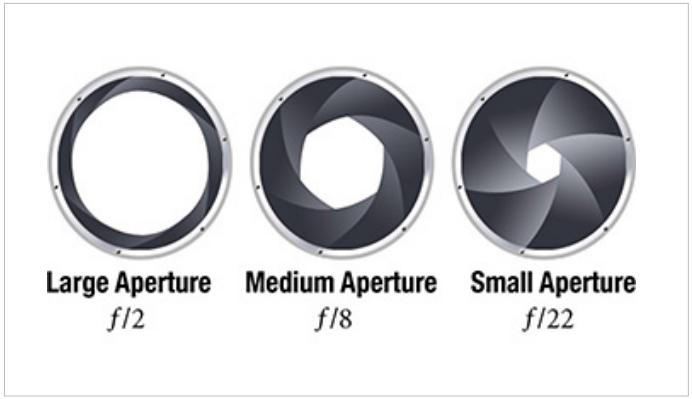
Controlling Light Intensity:
The simple techniques of controlling light intensity are often used in TV lighting. For example, if a 30 wattage table lamp is inadequate to read a book, one can seek to bring the light nearer to the book or replace the light with a high wattage lamp. But yet another way to control light intensity as shown in below Fig.5 (shot - 1 and Shot - 2) is to partially block the light as it enters the camera.



Shot - 1: Controlling Light Intensity.
Shot - 2: Neutral Density (N.D.) Filter.
Fig.5: Demonstration on Light Meter.

The aperture setting (see shot - 1) is an in-camera mechanism to control the amount of light reaching the imaging device. The second image (shot - 2) is a Neutral Density (N.D.) Filter, attached in front of a camera lens to control the intensity of light.

Many lighting technicians use filter and gel material at the light source to regulate the intensity of light.

For example:
Fastening a gel square of 'ND' material at the light source or window panes helps reducing the intensity of light falling on the set. The 'ND' material come in various grades numbered through one to four. The higher the number the less is the intensity of light.

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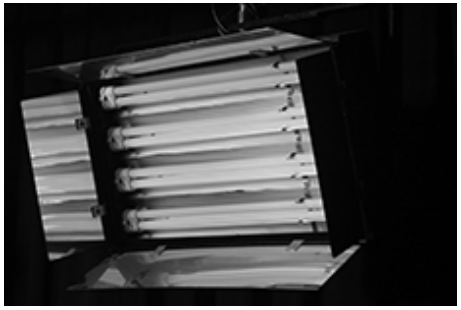
Light Character:
The second characteristic is light character. It is the relative harshness or softness of light beam-also called the degree of diffusion of the light beam.

Sun - Light Source

Fresnel - Light Source



Broad Light Edited

Fig.6: Color Temperature - Light Sources.

The third important lighting variable is color temperature. Different light sources (studio lights, fluorescents, the sun, etc) provide different colored version of the nominally "white light". Within the spectrum of visible light (the wave-lengths falling between infrared and ultraviolet), there are many gradations of color. Sources emitting light closer to the infrared have, as you would imagine more of a reddish/orange tinge, and likewise, those further up toward the ultraviolet end of the spectrum look more bluish. The imperceptible difference between different light versions is often compensated electronically by the camera following a process called white balance as shown in the figure below.

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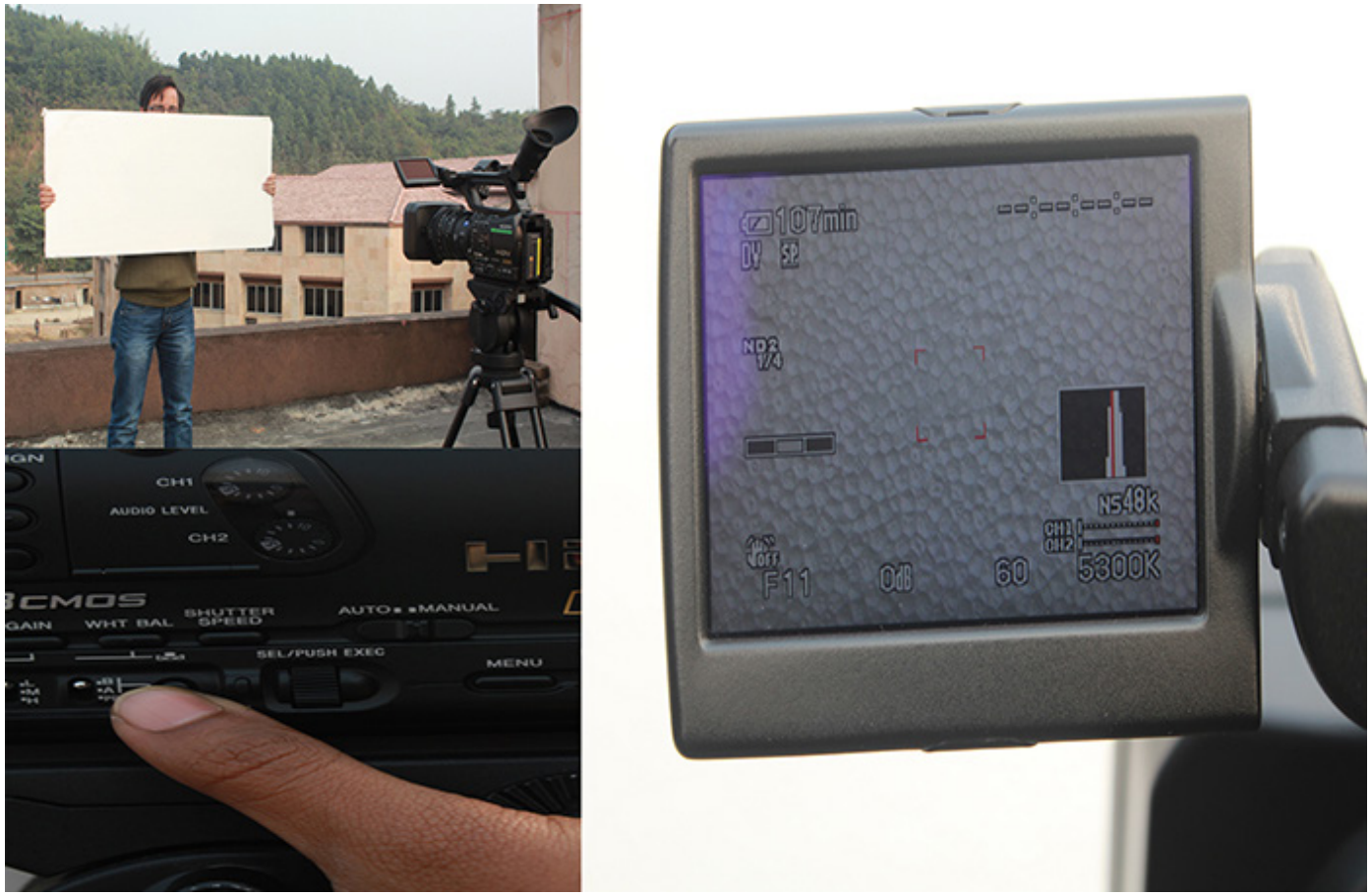

Demonstration of White balance.

Fig.7: Color Temperature - Auto White Balance adjustment in an EFP camera.

In the above figure, the Auto White Balance adjustment is carried out to suit the outdoor lighting condition .The adjustment values are stored in one of the memories. Once, the memory (A or B) is assigned and ascertaining the required ND and iris adjustments, the camera operator zooms in on a white piece of thermocol obtaining a white area on the screen. The final step is to press the white balance button. During adjustment, an in-progress message is displayed on the screen and when the adjustment is completed successfully, the messages changes to a completion message and the obtained color temperature is displayed.

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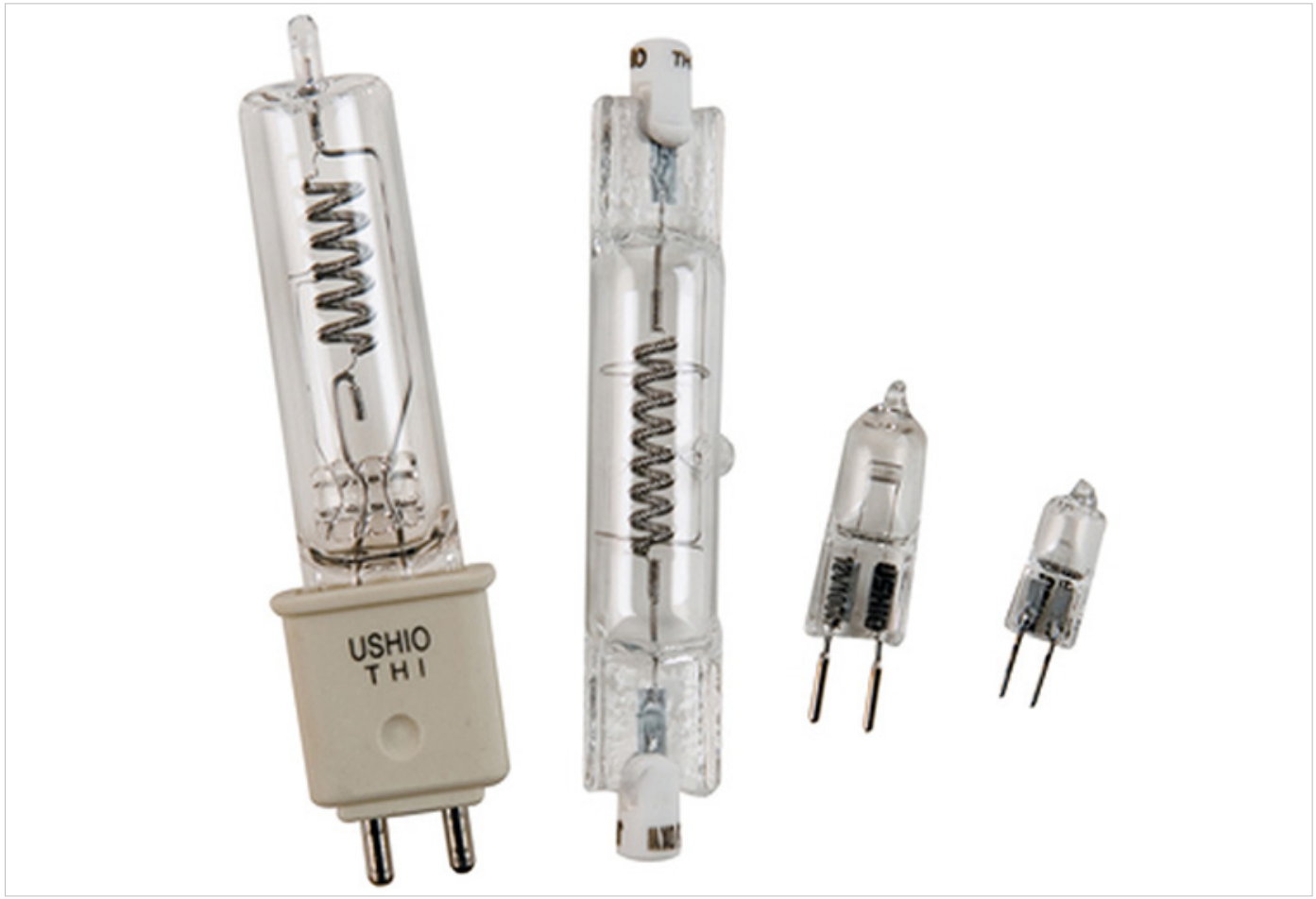
A common color temperature in professional productions is3, 200 degrees on the Kelvin scale (abbreviated 3,200 deg, K).



A Typical Quartz Lamp.
Fig.8: Color Temperature - Studio Quartz Lamp.

With quartz lamps (see fig. 8) serving as our reference for pure white light, sources with a higher Kelvin rating emit white light with a bluish tint, and those with a lower color temperature radiate white light with a reddish tint.

HMIs have one important difference: they produce a 5,600 deg.K light that mixes, unfiltered, with day light".

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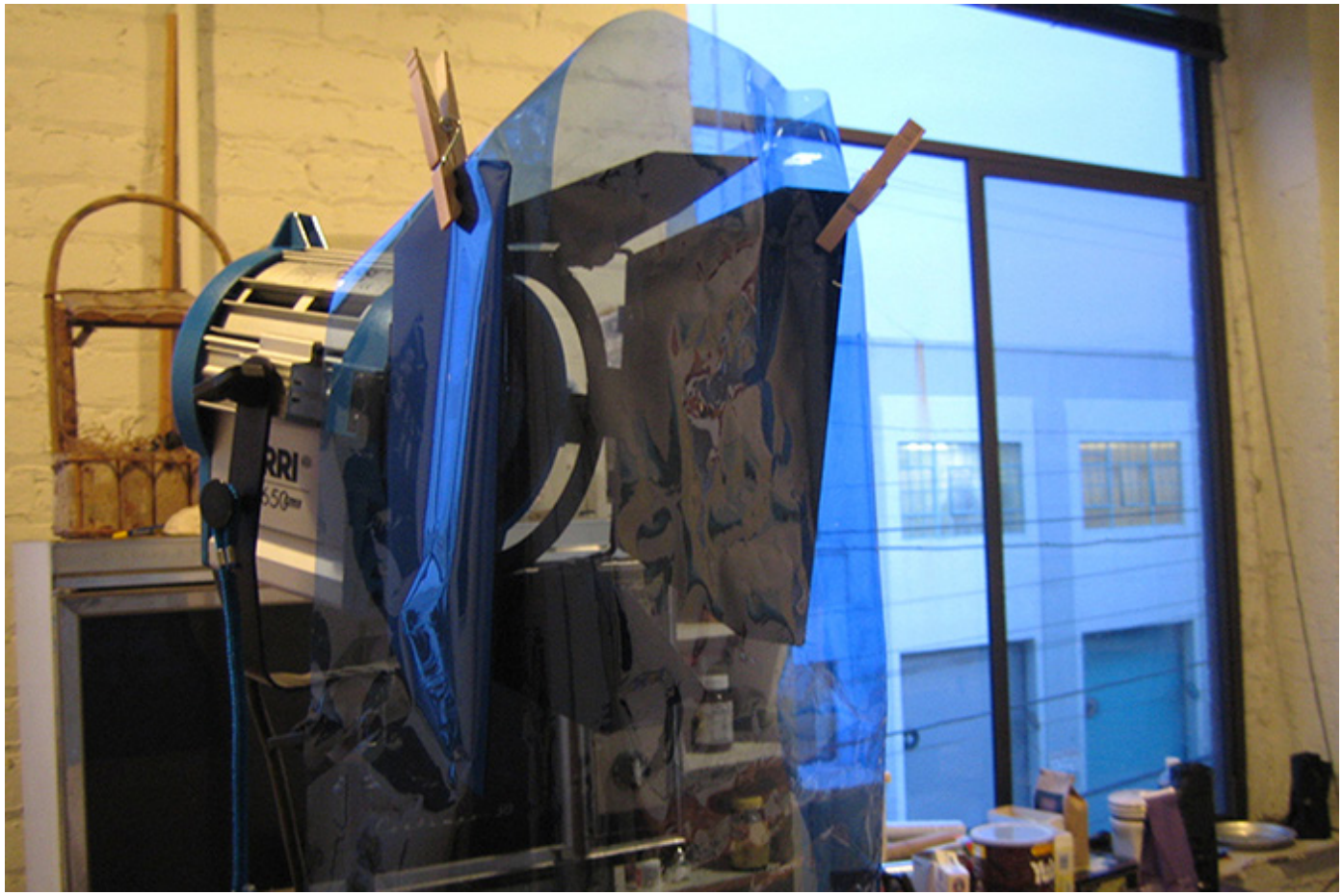

Fig.9: Color Temperature - Color Correction gel.

The color correction gels are often used to change the color temperature at light source. In the above figure, we can see the use of Color Temperature Blue (CTB), a color correction gel at the light source and the window panes, converting the color temperature to match with 'daylight' color. A CTB gel converts tungsten light of 3200 deg K to 'daylight' color.

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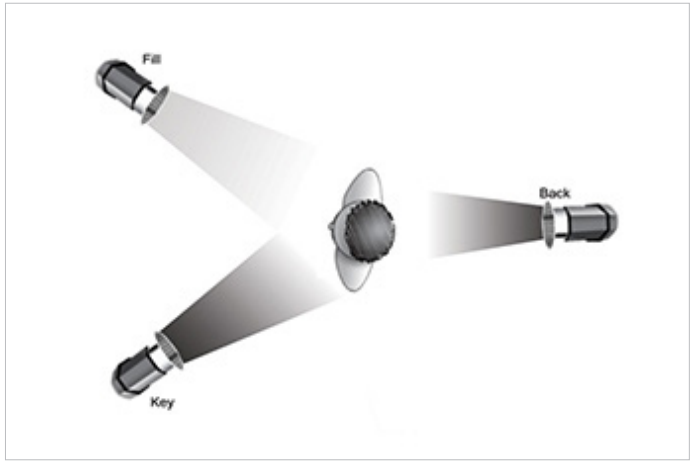
Basic Lighting Triangle

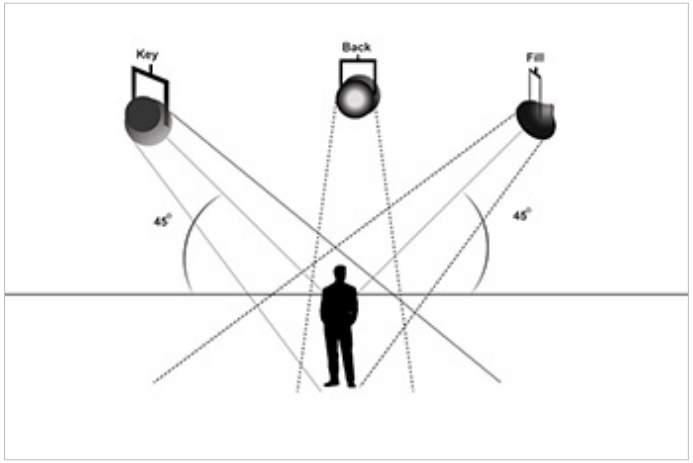
The purpose behind lighting a subject can be attributed to three main reasons:

- To properly illuminate a subject, with a motivated source.
- To fill in shadows created by such motivated source.
- To separate the subject from the back ground.

The motivated source or the key light is the most obvious source of light in a lighting triangle. It often creates harsh shadows. The fill light compensate the harsh shadows by filling the darker areas. The third main source of illumination is called the back light, also sometimes referred to as a 'rim' light. The back light's chief function is to separate the subject from the background. This helps create the illusion of depth and three- dimensionality on our two- dimensional television screen. In a normal lighting design, back lights, like key and fill lights, are placed above and directly behind the subject. Sometimes back lights are placed opposite the key light.



Shot - 1:



Shot - 2:

Fig.10: Three Point Lighting.

As we can see in the overhead diagram (shot - 1) the key light is at right angles to the fill light and the back light is positioned behind and above the subject.

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The cross fire between the key and fill light and the backlight positioned exactly above and behind the subject, explains the basic lighting triangle followed initially by all professionals. The ratio of lighting between key, back and fill light is (1:1:1/2).Supposedly, if the key light is measured at light intensity of 500 f.c. (foot candles), the back light too should be calculated at an intensity of 500 f.c. (foot candles) and the fill light at a lower intensity of 250 f.c. (foot candles). Now, under many circumstances one may choose to differ with the above mentioned lighting ratio to suite creative needs. Now, for instance if we have a poorly lit back ground one may choose to increase the intensity of backlight to the ratio of (1:1 ½:1/2), which results to an increase of 250f.c of back light than the key light.

The three-point lighting on many occasions proves to be restrictive if more than one camera angle is desired. In many such cases the four-point lighting is used. Apart from providing wider camera angle, the easier nature of set up is an added advantage to four-point lighting. However, nature of light is very flat. It uses four spot lights. The lighting ratio in four point lighting is 1:1 for all the lights i.e. all four lights illuminate in the same intensity.

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Lighting Instruments-Accessories

The appropriate selection of lighting equipments and accessories is very crucial to any TV production. There are two generic categories of instruments: spot lights, simply called spots and fill lights, called fills, or sometimes floods.

Spot lights/spots: Spots are found in three main varieties, the most common and flexible is Fresnel. The lighting equipment is named after Augustine Fresnel, the inventor of the instrument's concentric circled lens, which is responsible for conversion of the light into a soft edged beam. Within the Fresnel, the lamp and the reflector position are adjusted by a crank and screw system. This allows the light beam to be made broad or narrow as desired. Most Fresnels use the 3200 deg.K quartz lamps. However, HMI lights also come in the operationally flexible Fresnel configuration.

The second type of lensed spot light is the ellipsoidal (see fig.11), sometimes called aleko light. The ellipsoidal spot light creates a narrower, more precisely shaped beam than the pinned Fresnel. The ellipsoidal primary advantage is its ability to throw a sharply defined, intense light beam across a relatively long distance. The ellipsoidal features beam shaping "leaves" within its inner mechanism, which can project a great number of shaped beams of light, including sharp or softy edged circles, squares and other geometrics. Ellipsoidal spotlights permit the insertion of cookies into the instrument to project a wide variety of patterns on curtains, floors and walls.

Shot - 1: Fresnel

Shot - 2: Ellipsoidal

Fig.11: Images of Different Types of Spot Lights.

Ellipsoidal are employed frequently in theater and stage productions but see more limited application in TV production.

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Unlike the relatively bulky Fresnel's and ellipsoidal, open front spots have no lenses. This reduces their weight and makes them ideal for field productions with small crews. Sometimes called bashers, open front spots, like Fresnel's, can serve both as spots and fills, but they don't focus quite as efficiently as Fresnel's. Open front spots are relatively inexpensive. A portable kit containing three open fronts cost less than two Fresnel's or one HMI light. Lighting manufacturers market many excellent lighting kits, designed around open front spot and fill instruments, with lightweight, collapsible stands and other ingeniously designed accessories.

Fig.12: Visuals on Different Types of Accessories for Spot Lights.

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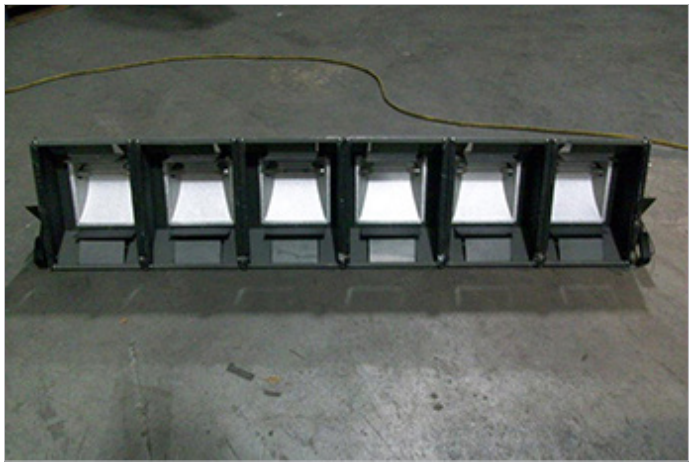
Fill Lights:
Fill lights or fills gives diffused lighting. Tasked with providing fill and base light, plus some background and side lighting, fills come in five main varieties as show in the figure below.

Shot - 1: Scoop

Shot - 2: Broad

Shot - 3: Soft Light



Shot - 4: Cyc Light

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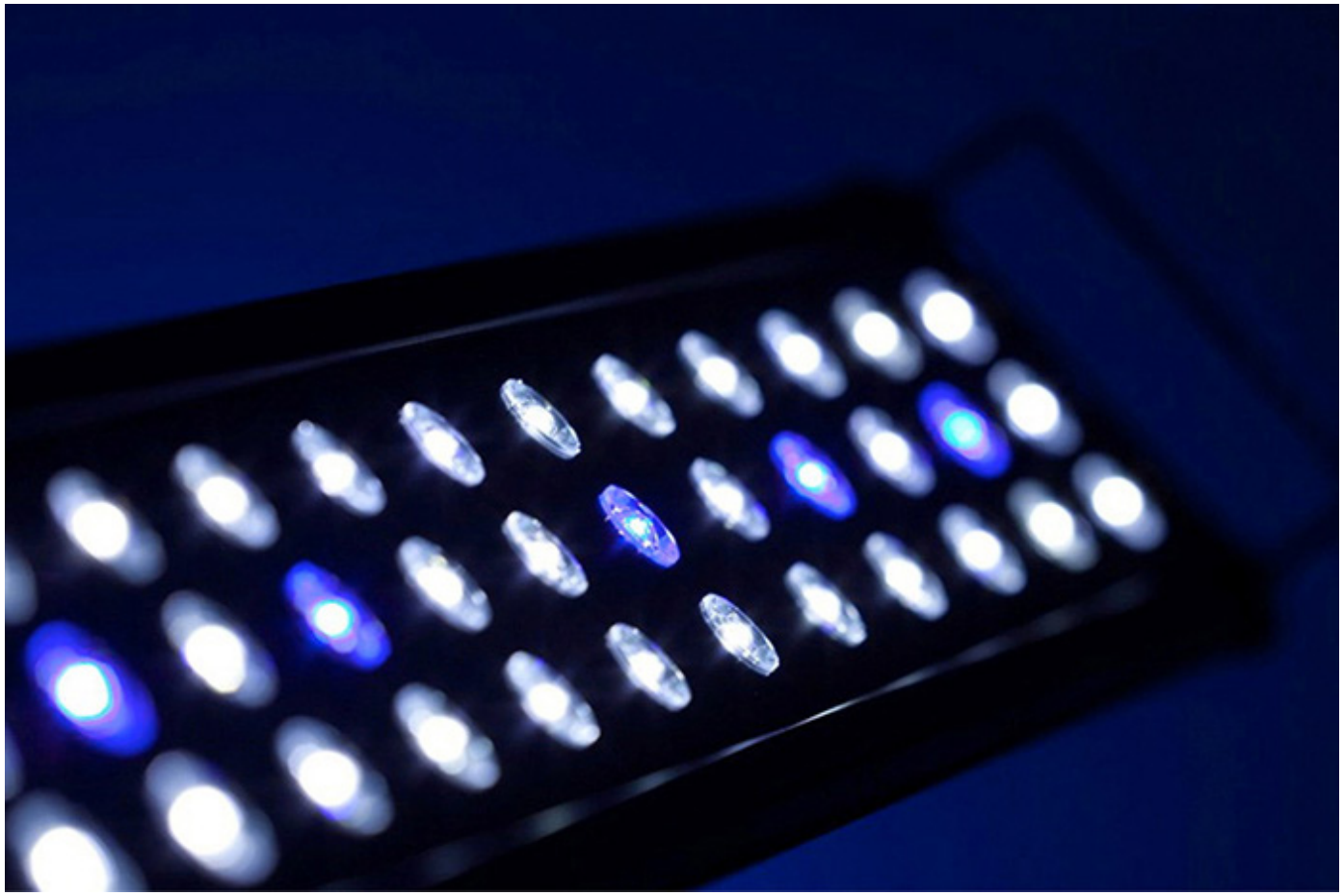

Fig.5: Strip Light
Fig.13: Different Varieties of Fill Lights.

Both Fresnel and open front spots sometimes can serve as fill light in a pinch. However, the Fresnel is designed primarily for spot lighting, so the broad, scoop, or softlight is the usual choice for fill lighting.

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Fig.14: Visual on how reflectors are used to redirect light and serve as fill light.

Fig.15: A TV Studio.

In the television studio, various types of spot lights and fill lights are suspended from the ceiling (see fig.15). The lights are too heavy and bulky to be used outside.

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Most EFP's (Electronic Field Production) use portable lighting packages that consist of several small, efficient lighting instruments that can be plugged into ordinary electrical outlets. Most portable instrument can either be mounted on collapsible floor stand or clipped on to doors, windowsills or furniture. These instruments generally operate as flood lights but can be adjusted to function as spot light as well. To obtain more directional control, EFP lighting packages include a number of small spot lights, which can be diffused with a collapsible diffusion tent often called soft box. In general, television lighting has less contrast between light and shadow areas than do film and theatre lighting. Diffused light is therefore used extensively in television lighting, especially on news and interview sets, for game shows and situation comedies and in many field productions.

Fig.16: Bounce - Lighting and Lighting Umbrellas

Fig.16: A Typical ENG Portable Light Kit.

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Lighting Control Consoles

Lighting control consoles allow you to adjust the intensity of many lighting instruments at the same time and to program sophisticated changes in your lighting effects to occur on cue. Consoles allow grouping of instruments to be preset, faded up, faded out and/or replaced by an entirely different array of light for the next scene. The more sophisticated control consoles electronically store hundreds of these lighting configurations.

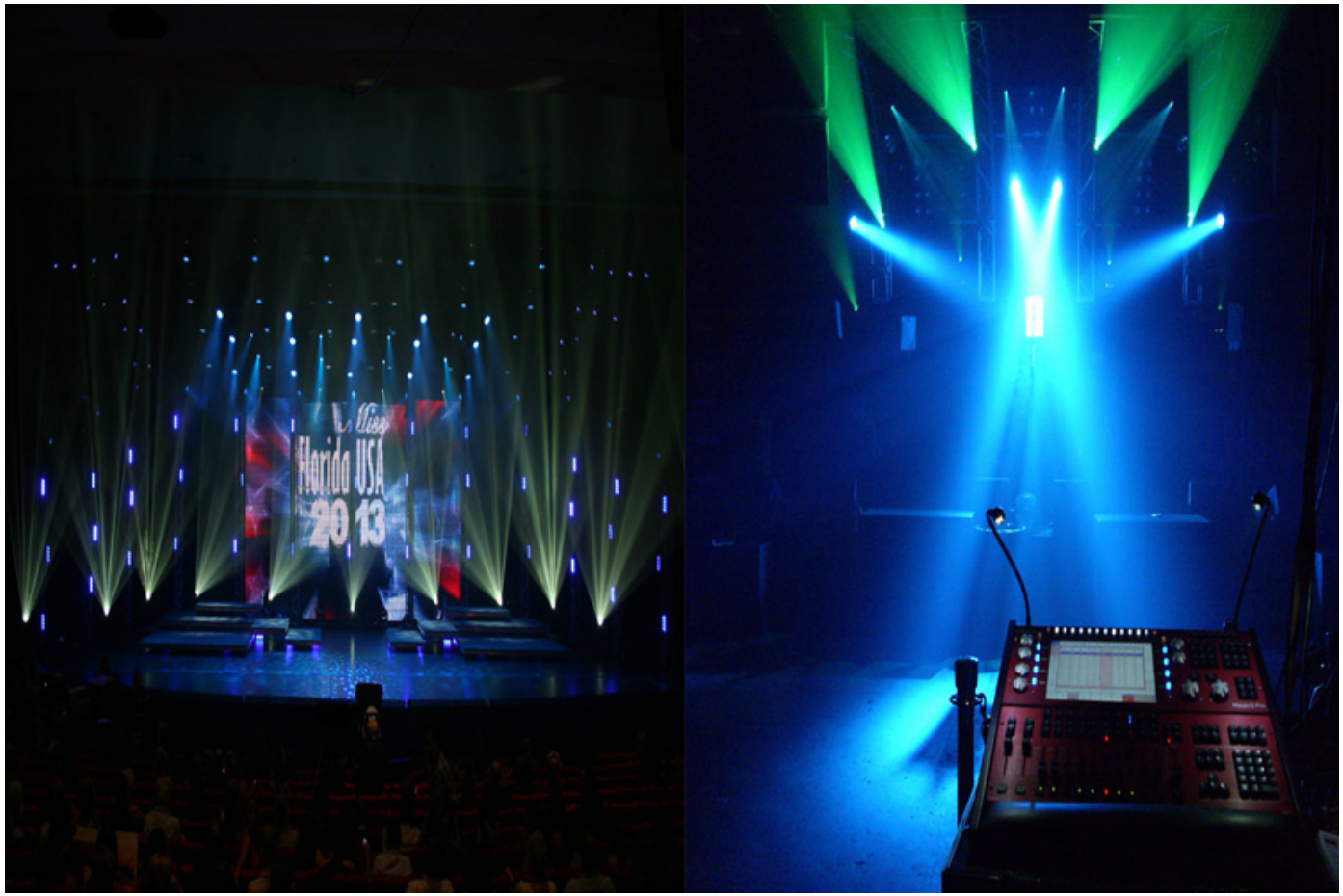

Fig.18: Modern - Day Lighting Consoles.

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Art of Lighting

The art of lighting differs on highlights and shadows as well as the way light effect is given. In shot - 1, below (see fig.19) the contrast between highlights and shadows, a key feature to low key lighting. On the contrary, In shot - 2, under high key lighting, the subject is under no influence of high contrast range between highlights and shadows.

Shot - 1: Low key Lighting

Shot - 2: High Key Lighting

Fig.19: Highlights and Shadows - Low and High Key Lighting.

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The background light is effectively used to highlight clothes and clothing accessories in the background of the stage scene as we can see in shot - 1 (see fig.20) below.

In shot - 2, the kicker light, placed behind and below the subject unlike rim light, placed behind but above the subject, creates an "hallow effect". Such techniques are often employed in shampoo commercials.

Shot - 1: Background Light

Shot - 2: Kicker Light

Fig.20: Use of background light and Kicker Light.

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Lighting Techniques for TV

An Introduction

by
Prof. Ravi Mokashi Punekar and Tonmoy Thakur
DoD, IIT Guwahati

Source:
http://www.dsource.in/course/lighting-techniques-tv/art-lighting

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Similar to background light, set lights are used to provide sufficient baselight in the scene to avoid video noise and to flatly illuminate all relevant portions of the set.

Fig.21: Typical use of Set Light.

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Important Vocabulary

Important Vocabulary – Terms used for the Module:

1. Available Light:
Naturally existing light found on location.

2. Background Lights:
The background lights also called 'specials' in theatre primarily serves the function of highlighting an important object(s) in the background. Properly designed background light greatly aids to suggest three- dimensionality in a frame.

3. Back Light:
The back light is the third source of illumination in the basic lighting triangle and serves the purpose of separating the subject from the background.

4. Baselight:
The camera's need a minimum level of light intensity to deliver acceptable video footage i.e. without objectionable video noise.

5. Basic Lighting Triangle:
Basic lighting triangle or "triangular" lighting engages all three source of illumination i.e. key, back and fill light in the ratio of 1:1:1/2 to properly and artistically illuminate a subject.

6. Bounce- Lighting:
A lighting technique in which the instruments are aimed at a white ceiling or walls rather than directly at the subject. The light reflected of these surfaces provides a soft, highly diffused effect.

7. Broad:
A rectangular, open front fills.

8. CTB (Color Temperature Blue):
A color correction gel responsible for converting tungsten light of 3200K to 'daylight' color.

9. Color Temperature:
A light source's relative position along the spectrum of visible light, measured in degrees on the Kelvin scale.

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10. Cucalorus (cookie):
A patterned piece of metal, wood or cardboard placed in front of a Fresnel to project the pattern on a wall or other surface: also a patterned metal insert placed inside and behind the lens of an ellipsoidal light used for the same purpose.

11. Cyc Lights:
Broads used to illuminate, and often to colorize, a cyclorama.

12. ENG:
Electronic news gathering.

13. EFP:
Electronic field production.

14. Ellipsoidal Light:
A spotlight creating the narrowest, most clearly shaped and intense beam of light of any instrument used in TV production.

15. Fill Light:
In the lighting triangle, the light responsible for softening shadows made by the key light.

16. Fill Lights(fills):
Sometimes also known as a 'flood' are lighting instruments that provides diffused light than spots and are tasked with providing fill and base light plus some background and side lighting.

17. Flood:
Adjusting a lighting instrument such as a Fresnel spotlight to project a broader, more diffused beam of light. Also known as "spread".

18. Focusing:
Either narrowing or widening the beam of light an instrument emits.

19. Foot Candle (f. c):
The intensity of light falling on a surface placed 1 foot away from a point light source of 1 candle power.

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20. Foot Lambert:
The measuring unit for reflected light. Reflected light is the product of incident light falling on an object and the object's reflectance. The Caucasian face with a typical reflectance of .36 reflects 36 foot lamberts when illuminated with 100 foot candles of incident light(100 f.c. times .36=36 foot lamberts).

21. Fresnel:
An adjustable focus spotlight with a unique glass lens, consisting of a series of concentric circles.

22. Halogen-Metal-Iodide(HMI) Light:
Similar in design and intent to a Fresnel ,HMI lights operate at a color temperature of 5,600 deg.K, compared to a Quartz lamps 3,200 deg.K.

23. Key Light:
The main source of illumination in the lighting triangle.

24. Kicker Light:
A type of back light striking the subject from a low angle. Kickers provide subject with a halo effect.

25. Light Intensity:
The level of brightness provided by a light source.

26. Light Meter:
A photosensitive device that measures light intensity.

27. Lighting console:
A device used to switch lights on and off and/or control the intensities of one or more lighting instruments in a studio. Also called a "board".

28. Lighting Ratios:
The relative intensities of the key, back and fill lights in the lighting triangle.

29. Lighting Umbrella:
A lighting accessory used to diffuse the harsh quality of spotlights, allowing them to simulate the effect of softlights.

30. Motivated Light Source:
The logical direction in the shot from which the key light should come.

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31. Neutral Density (ND) Filter:
A frequently used filter that reduces the intensity of light reaching the camera's image sensing device(s) without effecting color values.

32. Quartz Lamp:
The artificial incandescent light source used most often in television production. The light features a tungsten filament that glows in an iodide (also known as halogen) gas. The "glass" envelope is made of quartz, from which the lamp gets its name. Also called "tungsten-halogen" or "quartz-iodide" lamps.

33. Reflected Light:
Light that bounces off the subject rather than light striking the subject directly.

34. Set Light:
Fill lights used to provide sufficient baselight in a scene to avoid video noise and flatly illuminate all relevant portions of the set.

35. Spotlights (Spots):
Lighting instruments with beams narrowly focused; used specially for key, back and background lighting.

36. Video Noise:
"Grain or "snow visible in the picture, especially the darker areas. Video noise results due to inadequate base light levels.

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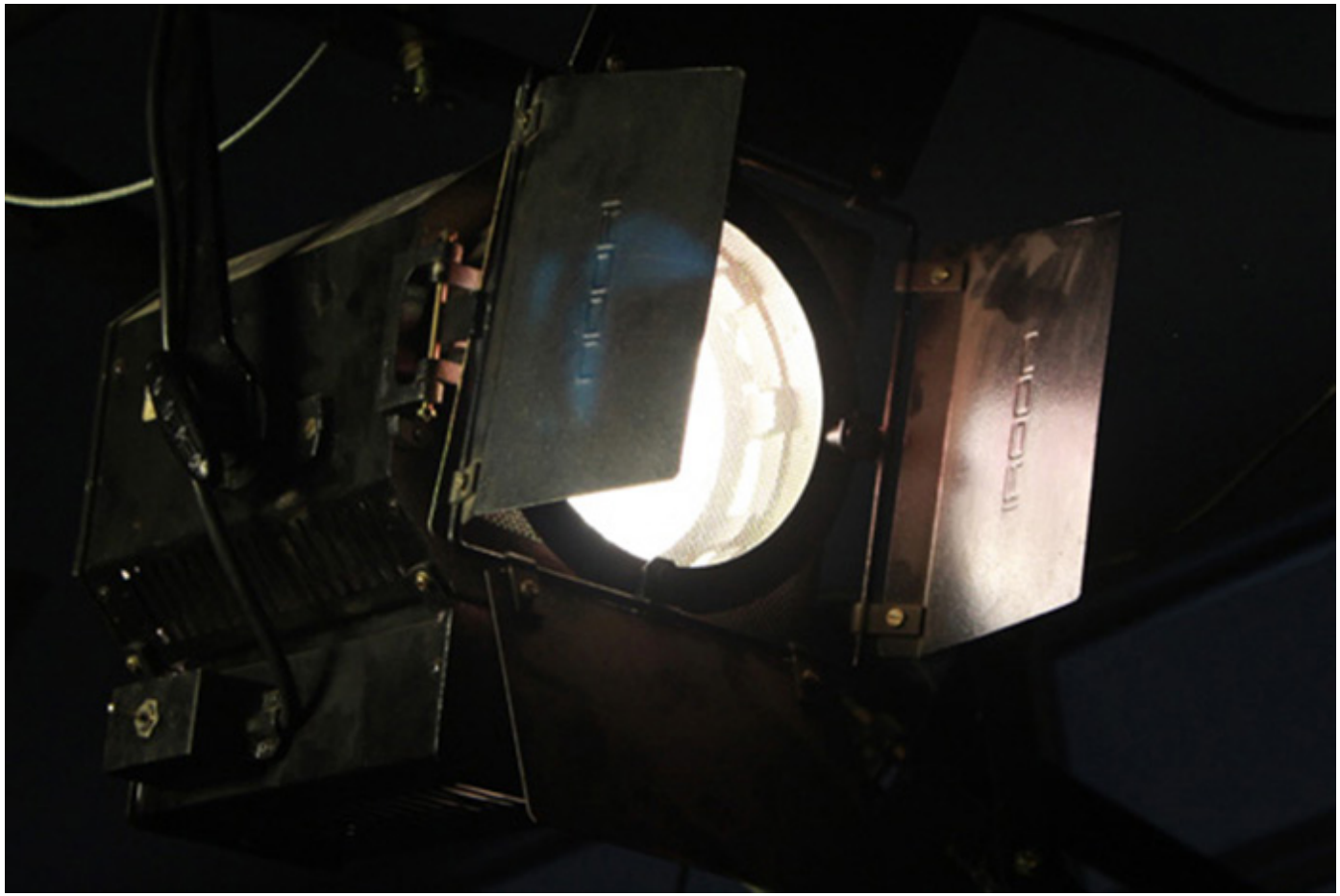

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This documentation for the course was done by Tonmoy Thakur and Professor Ravi Mokashi Punekar, Faculty at DoD, IIT Guwahati.

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