STUDIO CAMERA OPERATION

MULTIMEDIA PRODUCTION SECTOR

TRAINING MANUAL

November, 2022.

STUDIO CAMERA OPERATION

2022

TABLE OF CONTENTS

ACKNOWLEDGEMENT

Rwanda TVET Board **(RTB)** and Rwanda Polytechnic **(RP)** would like to recognize all parties who contributed actively to the preparation of this training manual that was developed under **the GIZ eco-emploi Programme**.

We wish to extend our thanks to **GIZ/GOPA** for the valuable financial and technical support throughout the implementation of this project.

We would like to express our sincere gratitude to various institutions (public and private) for their valuable support during the development of this training manual.

We would also wish to acknowledge different experts from public and private institutions for their huge contribution to the development of this training manual.

PRODUCTION TEAM

a) Authoring and Review

Film and Audio-Visual Sector
Armand Kajangwe

b) Conception, Adaptation, Review and Editing

Review	Editing
1. Muhire Jean Marie Vianney	1. John Paul KANYIKE
2. Jean Pierre MINANI	2. Vincent HAVUGIMANA
3. Assumani	3. Asuman KIZITO
	4. Gilbert MUTAGANZWA
	5. Onesphore NDAYAMBAJE
	6. Francine DUSABEMARIYA
	7. Charles KAMURU

c) Formatting, Layout design, Styles, and Graphics

Film and Audio-Visual Sector
1. Asoka Niyonsaba Jean Claude
2. NGAMIJE Hildebrand
3. SEMIVUMBI Paul

d) Technical Support

Management Consulting & Training (MCT)

ACRONYMS

CCU: Camera Control Unit

CV: Curriculum Vitae

DVD: Digital Versatile Disc

GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit

RBA: Rwanda Broadcasting Agency

RDB: Rwanda Development Board

RDF: Rwanda Defense Forces

RP: Rwanda Polytechnic

RRA: Rwanda revenue Authority

RTB: Rwanda Technical and Vocational Education and Training Board

COURSE PLAN

Unit 1: Camera Operations

Learning Outcomes

1. Operate a Studio Camera
2. Camera Settings
3. Safety and Operations Group Work

PRACTICUM LAB 1

UNIT 2: Footage Workflow

Learning Outcomes

1. Project Settings
2. Demonstrate proper care and storage of a television studio camera

PRACTICUM LAB 2

UNIT 3: Get work as a Camera Operator

Learning Outcomes

1. Footage Workflow
2. Set Setup or Staging - Camera positioning and Directing
3. Operate a Studio Camera

Performance Objective:

Upon completion of this course, trainees will be able to safely operate and store a television studio camera without assistance to the satisfaction of the instructor.

Specific Objectives

1. Identify key components of television studio cameras
2. Demonstrate steps necessary to set up and turn on a television studio camera

3. Demonstrate the operation of a television studio camera
4. Demonstrate proper care and storage of a television studio camera
5. Discuss safe operation of a television studio camera
6. Research additional information on specific camera models through operation manuals.

Unit 1: Camera Operations

Learning Outcomes

1. Operate a Studio Camera
2. Camera Settings
3. Safety and Operations Group Work

1.1. Introduction

Equipment Needed: 3-4 Television Camera & Tripod

➢ Note:

Television and Film productions must all use cameras to capture and tell the story. Whether it is reporting news or creating television programs in the studio, the camera is one of the key elements in the process, thus making it one of the most important pieces of equipment on set.

➢ Overview: Studio camera characteristics

- High quality cameras are heavy and cannot be properly manoeuvred without a camera mount
- They are used for studio productions or on big remotes
- They operate as part of a camera chain
- Other types of cameras are self contained and can deliver signals directly to a VTR
- Area of focus: ENG Camera (RBA), BlackMagic Camera (Ganza Filmz), DSLR/Camcoder HDV (BTN / IBTC Film School)

➢ Review: Parts of the camera

- Lens, selects a field of view, produces an optical image of this view. There are different types of lenses; Prime and Zoom lenses.

- Camera Body; with internal optical system and imaging device converts the optical image from the lens into electrical (video) signal Imaging device (pickup device)

- Power Button - Eject button - Record Button: Important to know where these buttons are, to make sure you don't accidentally stop recording or power down the camera.
- View finder; Shows a small video image on a screen of what the lens is seeing.
- External Monitor is usually used instead of viewfinder in television productions.
- Battery; Powers the camera, must be charged. In some studio cases, power is provided through a power cable from a wall socket.

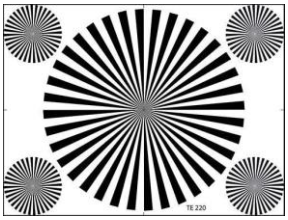
1.2. Learning outcome 1: Operate a Studio Camera

- Note:

  Television and film productions must all use cameras to capture and tell the story. Whether it is reporting news or creating television programs in the studio, the camera is one of the most important elements in the process, thus making it the most important piece of equipment on set.

- Setting up the Camera
  - ✓ Stages of operation
  - ✓ Tripod
  - ✓ Camera body
  - ✓ Lenses
  - ✓ I/O
  - ✓ Positioning

- Camera Settings
  - ✓ White Balance
  - ✓ Output Format Settings
  - ✓ ISO / Shutter Speed
  - ✓ Lighting and F-Stops
  - ✓ Sound Settings
  - ✓ Back Focus



➢ Basic Camera Shots

- ✓ Establishing shot
- ✓ Wide shot
- ✓ Medium shot
- ✓ Close Up
- ✓ Extreme Close up
- ✓ Pan
- ✓ Tilt

➢ Review: Setting up the Camera

Identify key components of television studio cameras.

- Tripod

  You should always consider the tripod as part of your camera as most of the shots you will take in a studio setting will be locked off or on dolly.

- Intercom headset

  Used to communicate with the director and other crew members

  If necessary, get the intercom headset and plug it into the intercom jack on the camera.

- Camera Output cables

  Carries video and audio signals to and from the CCU, contains numerous small cables.

  Uncoil ample camera cable. (You will need to know how much movement is required.)

  When moving your camera to your shooting area, always watch for AUDIO and VIDEO CABLES. Do not run over cables

- Control handles

  Used to move (tilt, pan, truck, or dolly) the camera. Unlock the pan then the tilt controls. Hold one of the CONTROL HANDLES. With the other hand first unlock the PAN, then the TILT. Do not let go of a

  camera's control handle.

- Pan and tilt locks

  Should be unlocked anytime you move the camera, unlock the pan then the tilt controls. (Unlock the pan first, so the camera doesn't accidentally tilt up or down and damage the camera).

  The pan and tilt control should be unlocked anytime you move the camera. (To avoid stripping the locking mechanisms).

- Camera Balance

  Check that the camera is properly balanced. (A properly balanced camera will stay in the horizontal position.)

- Studio view finder

  Usually five or seven inches, can tilt or turn to the sides. Make any necessary adjustments to the viewfinder's angle. Avoid touching the viewfinder screen.

- Lens Zoom control

  Usually a rocker lever located on the right control handle. Check the zoom lens; be sure it zooms in and out smoothly. Avoid touching the lens surface. The zoom control is

located on the right control handle (usually a rocker lever).

- Lens Focus control

  Usually a knob located on the left control handle. Check the focus control; be sure it moves smoothly and easily. The focus control is located on the left control handle (usually a knob that turns).

  Some cameras and lenses have focus assist and can automatically focus or manually focus.

- Tally light

  Mounted on top of the camera or viewfinder, indicates the camera is “on the air”

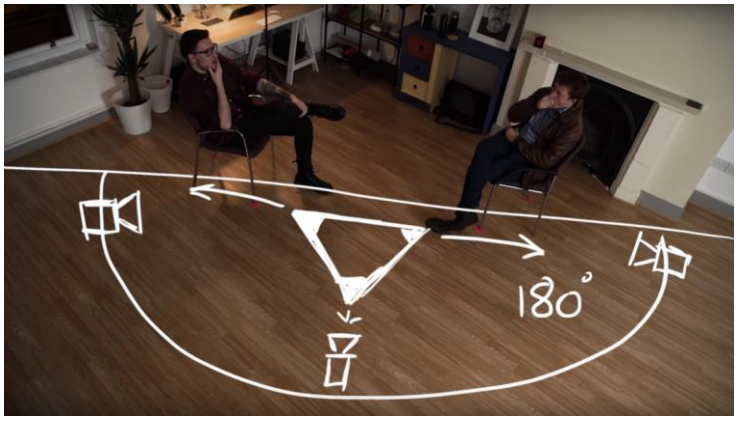
  Camera Support for Movement & Composition

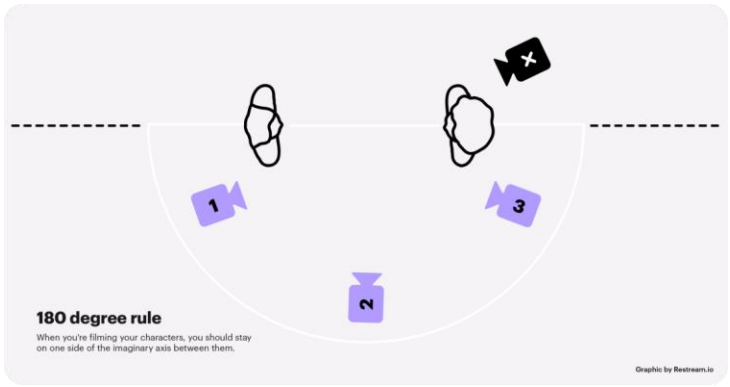
- Sliders
- Jib
- Steadicam
- Dolly
- Gimbal

➢ CAMERA ANGLES/COMPOSITION

1. Rule of Thirds,

2. Eye Line, 180-degree rule





The 180-degree rule is used to make sure that the framing from one camera (is a basic guideline regarding the on-screen spatial relationship between a character and another character or object within a scene)

3. Over the Shoulder
4. Low angle
5. High angle
6. Bird's eye view
7. Dutchy

➢ PRACTICUM LAB

Part 1

Instructors will give trainees the opportunity to produce, film, edit and showcase a short studio panel programme or news bulletin.

- Groups of 4, At least 2 on Panel
- 5-6 hours
- Project Settings: 1080p

1. Show me how to unlock the pan first and then the tilt?
   [Unlock the pan first, so the camera doesn't accidentally tilt up or down and damage the camera.]
2. Why do you need to have the pan and tilt controls locked when you move the camera?
   [To avoid stripping the locking mechanisms and ruining them.]
3. Why should you avoid running over the camera cables?
   [The wires in the cable might break if you step on, run over with the camera or bend the cable.]

4. Why should you lock the pan and tilt anytime you leave the camera?

   [So the camera doesn't accidentally tilt up or down and damage the camera.]

   Balance your camera after placing it on your tripod.

   [Trainee will perform task and show Teacher a balanced camera on tripod].

5. What is the 180 degree rule and why do we use it?

   The 180 degree rule is used to make sure that the framing from one camera (is a basic guideline regarding the on-screen spatial relationship between a character and another character or object within a scene)

1.3. Learning Outcome 2: Camera Settings

- Review: Camera Settings

  Identify key components of television studio cameras. In a professional studio set-up, a video engineer performs all electronic adjustments as they operate and control the CCU (Camera Control Unit). However it is good to know what each of these settings does.

- Output Format Settings

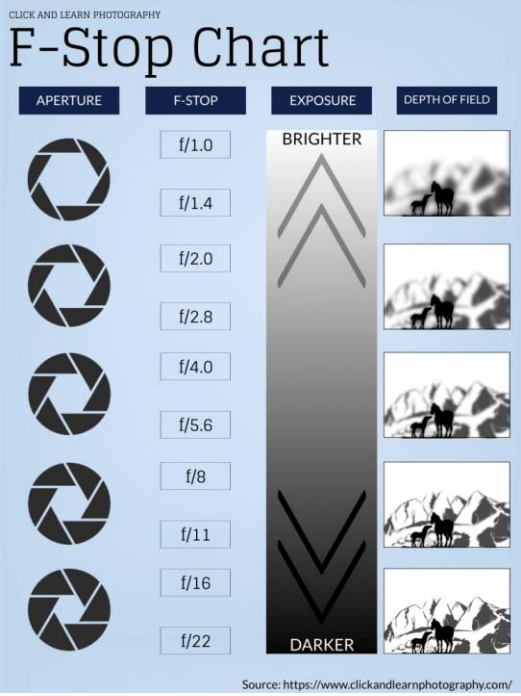
  What format is the production you are working on shooting in? 720p, 1080p, 4K and what codec? RAW or HD?

➢ ISO / Shutter Speed

What sensitivity should your camera be set to? Ideally, all cameras should output an image that looks similar in brightness, contrast and colour. The ISO allows you to limit the camera's intake of light.

ISO usually ranges between 100-12500 or higher.

Shutter = Exposure time



➢ Aperture or F-Stops

Now that you have set up the ISO, how much light would you like to allow through the lens? You can close down or open up the lens to make sure you capture an image that is visible.

➢ ND Filters

Controls light within camera and drops by "variable Stops" eg. ½ , ¼, ⅛

➢ Zebra and Peaking

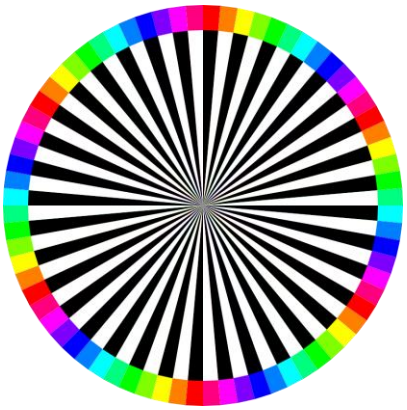
Used to see over exposure and peaking to see if your object is in focus.

- ### Sound Settings

  Though sound settings will be controlled by the sound engineer it is good to know your peak decibel levels and monitor them if you have access to see this. Highest is 6db's and Lowest is -12db's

- ### Back Focus

  Back focusing the lens is a test you must do to identify whether your camera can perform the necessary focus pulls you will need.



- ### White Balance

  Also performed by the video engineer on the CCU, but with the assistance of the camera operator. A white paper is placed directly in front of the lens in the space where the program will be filmed and where the lighting has already been turned on. This allows the video engineer to set the cameras to the same colour temperature so that all cameras output an image that looks exactly the same.

1.4. Learning Outcome 3: Safety and Operations Group Work.

Before the class is given 1-2hrs of hands on camera operation

- We discuss the safe operation of a television studio camera.
- Avoid any unnecessary talking on the intercom headset
- Do not bend or tightly coil the cable; this may damage or break small wires in the cable.
- Do not let go of the control handles or leave the camera if the pan and tilt locks are unlocked

- Always unlock pan first, then tilt; this reduces the chances of the camera accidentally tilting up or down and damaging the camera
- Avoid touching the viewfinder screen
- Avoid touching the lens surface or cleaning it with your shirt.
- Be sure tally light it is off before focusing or moving
- Be sure to dress for work, with closed shoes preferably.

➢ PRACTICUM LAB 1

Practical Test 2

1. Why doesn't the studio camera operator control the white balance, colour and exposure?

   [The CCU is in another area of the TV studio/station and is the responsibility of the video operator.]

2. Why should you avoid talking on the headset?

   [Need to listen and not interfere with other people hearing commands from the director.]

3. Why do you have to use caution when winding the cables?

   [The wires in the cable might break if you step on, run over with the camera, or bend the cable .]

4. Why should you avoid touching the lens?

   [Can get fingerprints on the lens or scratch the lens.]

5. What is the purpose of the tally light?

   [To let the camera operator and the talent know which camera is "on".]

UNIT 2: Footage Workflow

Learning Outcomes

1. Project Settings
2. Demonstrate proper care and storage of a television studio camera

2.1. Learning Outcome 1: Project settings

Check to make sure that your camera is set to the correct settings for the project you are working on.

➢ Basic Studio Camera Operation Handout

NOTE: These steps should be completed in order to ensure safe operation of the studio cameras.

- Avoid any unnecessary talking on the intercom headset.
- Listen to the director's instructions.
- When you focus, focus on the talent's eyes.
- Keep your camera at the talent's eye level unless instructed to get a low or high angle shot.
- Always be ready.
- Watch the tally light.
- Be sure it is off before focusing or moving.
- Be aware of the camera cable during moves.

2.2. Learning Outcome 2: Demonstrate proper care and storage of a television studio camera

NOTE: This step may vary depending on the required procedure of the studio and the requirement of the particular studio camera.)

- Ask the video operator for permission to cap the camera, and then cap the lens.
- Return your camera to its storage position. Put one hand on the pedestal or a leg of the tripod to move the camera. (Keeps the tripod or pedestal from spinning.
- After you return the camera to the storage area, first lock the tilt control, then the pan, and pedestal controls. (Lock the tilt first, so the camera doesn't accidentally tilt up or down and damage the camera.)
- The friction/drag controls should be loose when the camera is stored.
- Always leave the camera stored in a HORIZONTAL position.
- Neatly coil the CAMERA CABLE.
- A figure eight coil will not twist the cable and risk twisting and breaking the small wires inside.
- Put the INTERCOM HEAD SET away.

➢ Practice 1

The Trainer will walk trainees through the TELEVISION STUDIO CAMERA OPERATING PRACTICUM 1,Trainees use the instructions through the operation of the camera.

The teacher should intentionally make some mistakes to see if trainees catch the errors.

If no trainees catch the errors, the teacher should point out the errors and then demonstrate the correct process.

➢ Practice 2

Trainees work in pairs to practice TELEVISION STUDIO CAMERA OPERATING PRACTICUM 2.

One trainee plays the role of the trainer but does not assist the other trainee as he/she operates the camera.

➢ Review

Trainer reviews the following key points to remember when operating the studio camera:

- Check the headset
- Complete the proper steps before moving the camera
- Move the camera
- Get the camera ready to shoot
- Complete the proper steps before moving the camera
- Put the camera away

➢ Assessment 1

Trainer reviews written assignment;

- Studio Camera Operation Written Assignment and
- Studio Camera Operation Written Review and
- Monitor Participants as they perform steps in the Studio Camera Operating Practicum

➢ Assessment 2

Studio Camera Operating Practicum

On the job training, trainees should operate a studio camera in actual television production.

UNIT 3: Getting work as a Camera Operator

Learning Outcomes

1. Footage Workflow
2. Set Setup or Staging - Camera positioning and Directing
3. Operate a Studio Camera

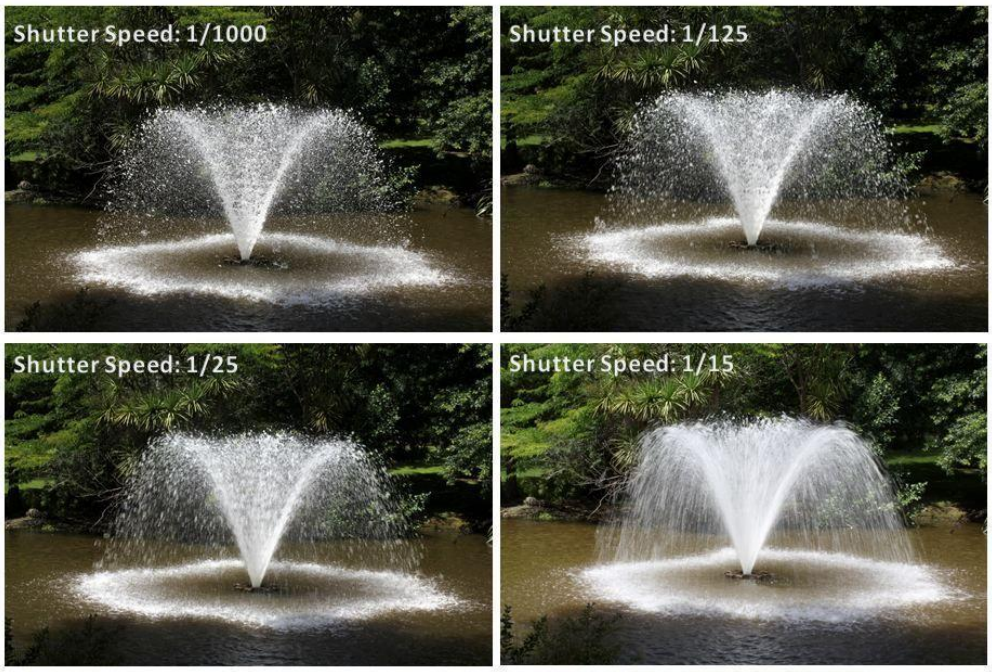
3.1. Learning Outcome 1: Footage Workflow

Check to make sure that your camera is set to the correct settings for the project you are working on.

➢ Output Format Settings

Though camera outputs will be controlled by the video engineer it is important to know what your camera is outputting to the gallery

➢ ISO / Shutter Speed



See Learning Outcome 2 for information on ISO and Shutter speed. These will also be set by the video engineer in the gallery.

➢ Types of Camera Storage

- ✓ Internal Memory
- ✓ Magnetic Tape
- ✓ SD Cards
- ✓ CF Cards
- ✓ Type C Disk
- ✓ CF Fast 2.0
- ✓ CF Express

➢ Activity and Assessment

- Capture wide array of footage

  As you begin working for different productions, retain your best work.

- Create a Reel / CV

With the footage you have created, edit it into a short reel (video) not longer than 3 minutes. It is good to also have your work written down in a CV format with all the links to your work on easily accessible websites.

- Opportunities as a Camera Operator in Rwanda

With the steady growth of television in Rwanda and the region, YouTube and other media platforms, there is no better time to enter the market than today. Here is a list of some employers of camera operators in Rwanda.

- Rwanda Broadcasting Agency RTV and KC2
- TV10
- TV1
- BTN
- Victory TV
- Prime TV
- Isibo TV
- Isango TV
- Flash TV
- Izuba TV
- Pacis TV
- Family TV
- Production Companies (Ganza Films/Isonga Media)
- Marketing Companies
- MICE Events (Live Streaming services)

3.2. Learning outcome 2: Set Setup or Staging - Camera positioning and directing

- Communication with your team on set
- Attention to detail.
- Studio language
- Camera repairing hacks - problem solving (Proactive)
- Camera Shooting techniques for different events (studio/program)
- OB VAN and Live Streaming (Outdoor Broadcasting Van)
- Sports Filming
- Different Live events (eg; Football game/Miss Rwanda)

➢ Team Structure of a Studio Camera Team

- Producer
- Director

- Director of Photography
- Camera Operator
- 1st Assistant Camera
- 2nd Assistant Camera
- Camera Categories

➢ Consumer Cameras

- Fully automatic (few options or features to manually control the camera)
- Affordable
- Imaging sensor (chip) is of low quality.
- Lacking Audio inputs
- Lens is fixed to the camera. Unable to change the lens.
- Types (Phones, Tablets, GoPro)
- Standard Definition (SD) and Full HD 1080p
- Prosumer Cameras

- Fully automatic
- Affordable
- Imaging sensor (chip) is of mid quality.
- Some may have audio inputs
- Lens is fixed to the camera. Unable to change the lens.
- Manually can focus and zoom on the lens.
- Types (HDV, Camcorders)
- Tape instead of cards
- Standard Definition (SD) and Full HD 1080p

➢ DSLR Cameras (Mainly used smaller productions, music videos, one man crew)

- Can be fully manual or automatic.

- Mid range price to buy
- Some may have full frame Imaging sensor (chip) 3/4
- May have to buy each lens separately (interchangeable lens capability)
- May have audio inputs XLR or Mic in.
- Video inputs (HDMI, SDI, BNC)
- May have internal ND filters (can add it outside of the lens)
- Full HD 1080p, 4K

➢ Professional Cameras

- Fully manual
- Expensive to buy
- Full Frame Imaging sensor (chip)
- Must buy each lens separately (interchangeable lens capability)
- ND Filters built in (Gain control)
- Audio inputs XLR or Mic in.
- Video inputs (HDMI, SDI, BNC)
- Full HD 1080p, 4K, 6K - 12K

- Super chip cameras (Mainly used in Feature Films and documentaries, Full Crew)

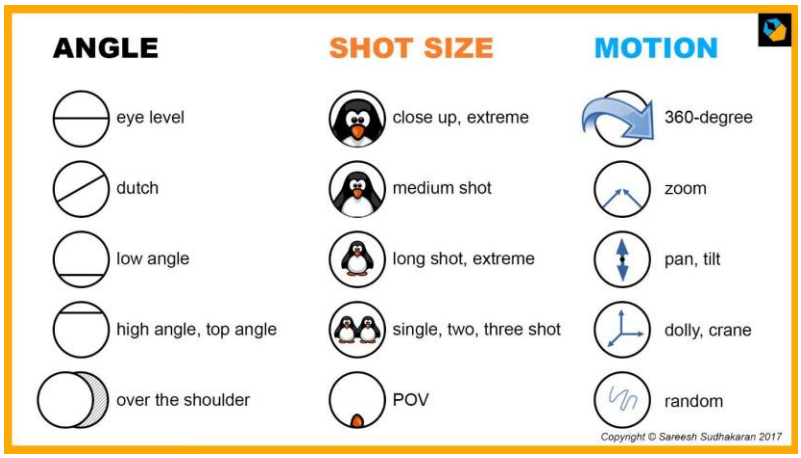
- Fully manual
- Expensive to buy
- Full Frame Imaging sensor (chip)
- Must buy each lens separately (interchangeable lens capability)
- ND Filters built in (Gain control)
- Audio inputs XLR or Mic in.
- Video inputs (HDMI, SDI, BNC)
- RAW, Full HD 1080p, 4K, 6K - 12K

- ENG Cameras (Studio Cameras for television and sports events, 3 man crew)

- Fully manual

- Expensive to buy
- Some may have Full Frame Imaging sensor (chip)
- Must buy each lens separately (interchangeable lens capability)
- ND Filters built in (Gain control)
- Audio inputs XLR or Mic in.
- Video inputs (HDMI, SDI, BNC)
- RAW, Full HD 1080p, 4K, 6K - 12K
- Can be powered and control by the CCU (Camera Control Unit)

➢ 15 Essential Camera Shots, Angles and Movements



❖ **GROUP DISCUSSION 1** - Assembling and setting up the camera for studio production.

Let's begin by brainstorming on different types of cameras.

In your groups discuss your experiences using different cameras and write down any questions you may have?

1. What do you know about television ENG Studio Cameras, DSLR and HDV?
2. Have you ever used any camera, and how would you describe your experience?
3. Describe how a television studio works; in terms of camera, lighting and sound.
4. Identify the crew members of a television studio program and their assignments.
5. What do professional camera men look for in a camera?

6. What types of shots do you know or see in studio television programs? Especially Live.

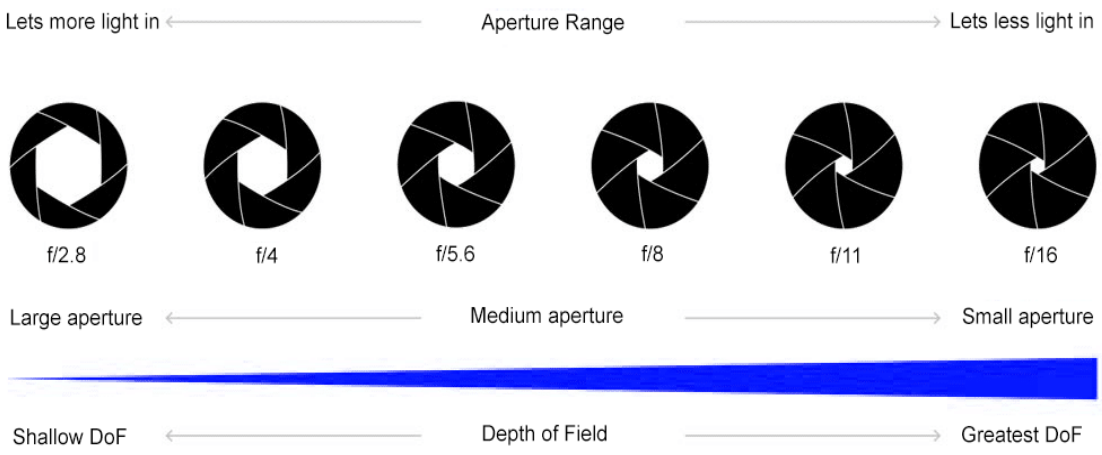
3.3. Learning Outcome 3: Operate a Studio Camera

Needed Resources; 3-4 Camera Systems and Tripods

Assemble the camera on a tripod with a lens and balance the camera on set ready for filming. (You have 3mins maximum).

The Client has requested your company to film an event in 4K and deliver it in HD 1080p. Set essential camera settings to be ready to film. (2mins)

- Answer Key:



- ✓ [ISO & Shutter Speed]
- ✓ [F-stop/Aperture]
- ✓ [White Balance]
- ✓ [Video Format & TV Standard (PAL or NTSC)]
- ✓ [Format Card]
- ✓ [Sound Settings]
- ✓ [Viewfinder Calibration] - Advanced

1. Show me how to unlock the pan first and then the tilt?
   - ✓ [Unlock the pan first, so the camera doesn't accidentally tilt up or down and damage the camera.]

2. Why should you avoid running over the camera cables?
    - ✓ [The wires in the cable might break if you step on them or lose the video/sound signal]
3. Why should you lock the pan and tilt anytime you leave the camera?
    - ✓ [So the camera doesn't accidentally tilt up or down and damage the camera.]
4. Balance your camera after placing it on your tripod.
    - ✓ [Trainee will perform task and show Teacher a balanced camera on tripod].
5. Show me how you apply the 180 degree rule and why we use it?
    - ✓ Case Study: Show video of a football match or of two people sitting down.
    - ✓ The 180 degree rule is used to make sure that the framing from one camera to another and is a basic guideline regarding the on-screen spatial relationship between a character and another character or object within a scene.

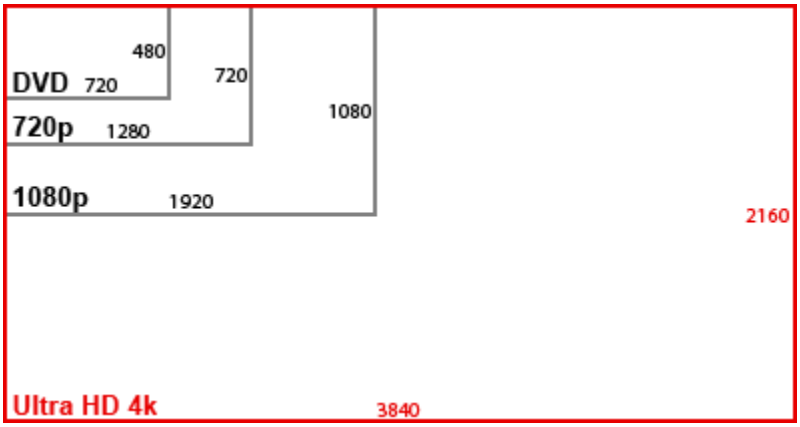
ROLE PLAY 1: Instructor creates 3 groups of 5 individuals. Each group will take a turn in protruding and filming a short tv show, while the others act.

As a production team, produce a short tv show of 5 minutes. Your team should consist of;

1. Producer/Director
2. Director of Photography
3. Camera Operator
4. 1st Assistant Camera
5. Sound Engineer
6. Challenge Requirements.
7. Have 1 presenter and 3 guests
8. Use only 3 cameras
9. Add 3 Light Setup
10. Lavalier Microphone

❖ **GROUP DISCUSSION 2:** Footage Workflow

Let's begin by brainstorming on different types of camera formats and resolutions.



In your groups (3-4 people), discuss your experiences using different cameras systems, resolutions and their formats. Present your findings and highlight any area of concern for more clarification.

1. What gives a camera it's resolution? [Imaging sensor/chip].
2. What are the commonly used formats in television productions?
3. What are the commonly used resolutions in television productions?
4. Discuss at least 3-5 camera categories and their resolutions.
5. What are the most commonly used professional editing softwares?

❖ **PRACTICAL ACTIVITY 2**: Learning outcomes: Footage Workflow

Needed Resources; Computer & Editing Software installed (Premiere Pro/Final Cut Pro)

Capture your footage and create a new Project in the editing software. (You have 30-45mins maximum).

- Transcode and back up your footage

The Client has requested your company to film an event in 4K and deliver it in HD 1080p. Set Project settings, sequence to be ready to edit. (2mins)

6. What is the most common video codec that will meet most of your needs?
    - HEVC/H.265

- H.264
- MPEG-4
- DIVx
- MP4
- AVI
- MOV (Quicktime)
- FLV (Flash
- Render and deliver your project
- Share the project with editor/client