







Facilitator Guide







Sector

Automotive

Sub-Sector

Manufacturing

Occupation

Welding

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NSQF Level: 3

Welding and Quality Technician

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Automotive Skills Development Council Sector Skill Council Contact Details:

Address: Sat Paul Mittal Building, 1/6, Siri Institutional Area,, Khel Gaon Road, New Delhi, Delhi

110049

Email: info@asdc.org.in Phone: 011 4186 8090

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Skilling is building a better India.
If we have to move India towards development then Skill Development should be our mission.

Shri Narendra Modi Prime Minister of India



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About this Guide —

Indian Auto Industry is one of the largest in the world. The industry is expected to contribute 10% to India's GDP as per Automotive Mission Plan 2016-26 and create 65 million additional jobs. The sector offers big potential for jobs across the length and breadth of the country. In line with the rapid technological advancement in this field, there are exciting prospects for a fulfilling career in this industry.

This book is designed for the facilitator help a candidate to acquire skills that are required for employment. The content of this book is completely aligned to the National Occupation Standards QP/NOS and conform to the National Skills Qualification Framework (NSQF).

- ASC/N3103 Understand welding job requirements and related processes
- ASC/N3104 Prepare the welding machine for the welding process
- ASC/N3105 Support the welder in the welding process
- ASC/N3106 Remove the finished goods and store them in the designated place
- ASC/N6301 Inspect and maintain the product quality
- ASC/N0006 Maintain a safe and healthy working environment
- ASC/N0007 Conduct quality checks and inspection of the finished metal cast products
- ASC/N0008 Conduct regular cleaning and maintenance of the equipment
- ASC/N0021 Maintain 5S at the work premises

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS. The symbols used in this book are described below.

Happy learning!!

Symbols Used



Steps



Resources





Notes



Objectives





Ask



Explain



Elaborate



Field Visit



Practical





Demonstrat



Summary



Team Activity





Facilitation Notes Learning Outcomes



Say

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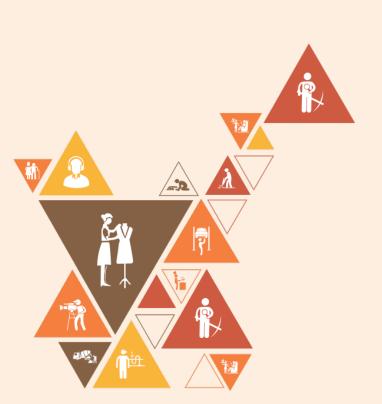




1. Introduction

Unit 1.1 – Welding: An Introduction

Unit 1.2 – Basics of Measurement: An Introduction



Key Learning Outcomes 👸



At the end of this module, You will be able to:

- 1. State the different types of joining processes;
- 2. Describe the welding process;
- 3. Explain the importance of welding;
- 4. Describe SMAW Welding;
- 5. Describe GMAW Welding;
- 6. Describe Electric Resistance Welding (ERW) process;
- 7. Describe Spot Welding process;
- 8. Describe Seam Welding process;
- 9. Identify and recognize basic measurement systems;
- 10. Differentiate between various measurement systems;
- 11. List the various measuring instruments and tools and its function;
- 12. Identify the required measuring tools for a task.

UNIT 1.1: Welding – An Introduction

Unit Objectives



At the end of this unit, Students will be able to:

- 1. State the different types of joining processes;
- 2. Describe the welding process;
- 3. Explain the importance of welding.

Resources to be Used



• Facilitator can use the available objects such as a marker, duster, pen, notebook etc.

Do



- Take a parcel, mention some details such as student name, hobbies, likes, dislikes etc.
- Make the students stand in a circle, close enough to the person each side of them that they can pass the parcel quickly.
- Say 'Stop' when the students least expect it. The person who has the parcel at that time should get out from the class.
- Those who get out should introduce themselves by providing the details mentioned in the parcel.
- The winner of the game should stand and introduce himself/herself at the end of the game.
- At last, say thanks to the students for their participation.
- Ask for feedback on the exercise of participation and what they derived out of it.



- You could ask the students who get out during the game to be the music keepers. They can start and stop the music as the game progresses.
- Encourage shy students to provide information about themselves by prompting them with questions such as 'what do you enjoy doing the most', 'what is your favorite movie or book' etc.
- Ask the students about the expectations from the course.
- Invite students to participate. List the expectations on the whiteboard.
- Give the students a brief overview of what all will be covered in the program.
- Start with a positive and happy note.

Say



- What they understand by the word welding.
- Welding is a material joining process in which at least two sections are joined by optimum use of heat as well as force.
- There are many types of joining processes:

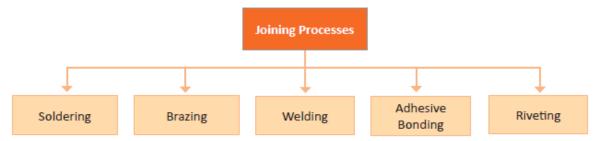


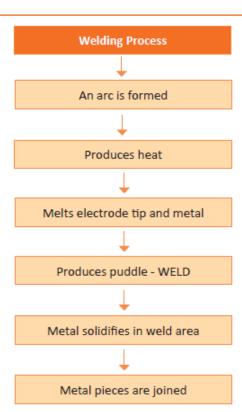
Fig. 1.1.1: Types of joining processes

- Among these the most widely used joining process is welding.
- Welding is popular because it is:
 - o Cost effective
 - o Versatile
 - o Permanent
 - o Strong
 - o Leak proof

Elaborate



Welding Process



Ask



- Ask them about their understanding for welding process.
- Ask about different joining processes



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

1.1.2: Shielded Metal Arc Welding (SMAW) - An Introduction

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook etc.
- PC with LCD Projector or Flip Chart

Do



• Greet and welcome the participants to the next session of the program.

Say



- It is an arc welding process where an electric arc is used to produce the heat required for the welding.
- The electric arc develops when electricity jumps across an air gap between the end of the metallic electrode and the welding job surface. The metallic electrode is generally coated with the flux which is consumable.
- The arc created due to the ionization of air between the electrode tip and the base metal generates an intense arc heat having a temperature between 3600C-4000 C.
- The welding current is provided by an AC or DC machine.
- The forceful heat of the arc melts a small portion (Molten pool) on the job directly under the arc and towards the end of the electrode instantaneously.
- The flux coating on the electrode also melts and provides a gaseous shield around the arc which secures the molten metal from atmospheric contamination. Hence this is called shielded metal arc welding (SMAW).
- The welding speed and feed of the electrode is controlled manually by the welder himself. It is also called manual metal arc welding (MMAW).

Ask



- Ask them about SMAW process
- Ask about difference between SMAW and MMAW process



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

1.1.3: Gas Metal Arc Welding (GMAW) - An Introduction

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook etc.
- PC with LCD Projector or Flip Chart



Greet and welcome the participants to the next session of the program.



- GMAW is a wielding process in which there is a formation of an electric arc between a consumable wire electrode and the work piece metal(s). This electric arc provides heat to the work piece metal(s), leading them to melt and join.
- Gas metal arc welding (GMAW) is also known as metal inert gas (MIG) welding or metal active gas (MAG) welding.
- The process can be semi-automatic or automatic.
- A constant voltage, direct current power source is generally used with GMAW; however, constant current systems, as well as alternating current, can be used.
- There are four main methods of metal transfer in GMAW, such as globular, short-circuit, spray, and pulsed-spray.
- At present, GMAW is the most preferred industrial welding process due to its speed and ability to adapt the process of robotic automation. Unlike welding process that do not employ a shielding gas, such as shielded metal arc welding, it is rarely used outdoors or in other areas of air volatility.
- Flux cored arc welding is an associated process that uses an electrode wire, which is hollow and filled with flux, however, it avoids the use of a shielding gas.



- Ask them about GMAW process
- Ask about different methods of metal transfer in GMAW



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

1.1.4: Resistance Welding Procedures - An Introduction

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook etc.
- PC with LCD Projector or Flip Chart

Do



Greet and welcome the participants to the next session of the program.

Say



• Like MMAW, GMAW, there are some other welding methods utilized in industry i.e. electric resistance welding, spot welding and fusion welding.

• Electric Resistance Welding (ERW)

This welding process produce coalescence of faying surfaces where heat to form the weld is generated by the electrical resistance of material combined with the time and the force used to hold the materials together during welding. Some factors influencing heat or welding temperatures are the proportions of the workpieces, the metal coating or the lack of coating, the electrode materials, electrode geometry, electrode pressing force, electrical current and length of welding time.

These methods are efficient and cause little pollution, however, their applications are limited to relatively thin materials and the equipment can be expensive

Spot Welding

It is a resistance welding method and helpful to weld two or more overlapping metal sheet, studs, projections, electrical wiring hangers, some heat exchanger fins and some tubing.

In this process, the output of the wielding power source restricts the thickness; as a result, the current required for each application causes the variation in the equipment. Generally, the metal sheets are held together by two copper electrodes and to transfer current through the sheets. The intense heat is produced when the current is transferred from the electrodes to the sheets. As the heat is collected in the work pieces between the copper electrodes because of the electrical resistance of the material, the increasing temperature affects a rising resistance, and causes a molten pool contained most of the time between the electrodes

Seam Welding

This process generates a weld at the connecting surfaces of two like metals is known as seam welding. The seam may be referred as a butt joint or an overlap joint and is usually a mechanized process. However, seam welding varies from butt welding. Similar to spot welding, seam welding depends

on two electrodes, usually made from copper, to apply pressure and current. The electrodes are disc shaped and rotate as the material passes between them. This allows the electrodes to stay in constant contact with the material to make long continuous welds.

Δsk



- Ask them about electric resistance welding
- Ask about seam and spot welding process



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

1.1.5: TIG Welding - Introduction

Resources to be Used



- Available objects such as white Board, white board marker pens, duster.
- PC with LCD Projector or Flip Chart
- Participant Manual

Do



 Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



- GAS-TUNGSTEN ARC WELDING (GTAW), also known as HeliArc and tungsten inert gas (TIG). In the late 1930s, TIG welding process was created when necessity to weld magnesium became obvious.
- GTAW **TIG Welding** should be possible in any welding position and in manual, semiautomatic and automatic modes.
- The melting temperature important to weld materials in manual, semiautomatic and (GTAW) process is acquired by maintaining an arc between a tungsten alloy electrode and the workpiece.
- Weld pool temperatures can approach 25000C (45300F).
- An inert gas maintains the arc and shields the molten metal from atmospheric pollution. The inert gas is ordinarily argon, helium, or mixture of helium and argon.
- The TIG Welding or GTAW process can be utilized to weld almost all metals and metal alloys i.e.
 - o Aluminium and aluminium alloys
 - o Copper and copper alloys
 - o Nickel and nickel alloys
 - o Magnesium and magnesium alloys
 - o Low alloy steel and carbon steels
 - o Volatile materials (for example, titanium and tantalum)
 - o Combining carbon and alloy steels
- To guard the welding area from atmospheric gases, for example, nitrogen and oxygen, which cause

deficiencies, shielding gases are essential in Gas Tungsten Arc Welding (GTAW).

- Electrodes for gas tungsten arc welding can be either pure tungsten alloys; they are typically shading coded. The pure tungsten electrode is green in color. The alloyed tungsten electrodes can be brown, yellow, red or blue depend upon the alloying elements.
- GTAW torches are available in various sizes, shapes, amperage and volumes. **Gas Tungsten Arc Welding** (**GTAW**) torches gives a means for holding and changing the tungsten electrode that conducts the current to the arc and carry shielding gas, electricity and cooling water.
- There are two main types of GTAW torches; the gas cooled welding torches used for welding thin
 metals at currents under 200 amperes, and the water cooled torches used for welding medium and
 thick metals

Elaborate



TIG Welding Principle

In the **Gas Tungsten Arc Welding (GTAW)** metal are intertwined by warming them by an electric arc built up between a non-consumable (does not dissolve) tungsten electrode and the workpiece. A filler metal may not be utilized relying upon the plan of the joint. The molten metal, tungsten electrode and welding zone are protected from the climate (the air around it) by a surge of inert gas through the welding torch. The subsequent welds have an identical chemical integrity as the first base metal.

Shielding gas

A shielding gas can be selected on the following basis:

- the form of material being welded
- joint design
- required final weld presence

Advantages of GTAW

- Generate superior-quality, less-distortion welds
- Free of the spatter related with different strategies
- Can be utilized with or without filler wire
- Can be utilized with a scope of energy supplies
- Welds almost all metals, including disparate ones
- Provide exact control of welding heat

Limitations of GTAW

- Generates lesser deposition rates than consumable electrode arc welding methods.
- Needs a little more deftness and welder organization than gas metal arc welding (GMAW) or shielded metal arc welding (SMAW) for manual welding
- Difficult in draughty surroundings due to trouble in shielding the weld zone correctly
- Tungsten inclusions if the electrode is allowed to contact the weld pool
- Adulteration of the weld metal, if appropriate shielding of the filler metal by the gas stream is not kept
- Little acceptance for impurities on filler or base metals
- Adulteration or porosity, affected by coolant leakage from water-cooled torches
- Arc blow or arc deflection, as with other methods

Ask



- Ask about working principle of GTAW.
- Ask about industrial applications of GTAW.
- Ask about components required for TIG welding.
- Ask about advantages and limitations of GTAW process.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 1.2: Basics of Measurement: An Introduction

Unit Objectives



At the end of this unit, students will be able to:

- 1. Identify and recognize basic measurement systems;
- 2. Differentiate between various measurement systems;
- 3. List the various measuring tools and its function;
- 4. Identify the required measuring instruments and tools for a task.

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook, measuring instruments etc.
- PC with LCD Projector or Flip Chart

Do



• Greet and welcome the participants to the next session of the program.

Ask



- · You could ask the definition of Unit
- You could ask the body parts of a micrometer
- · You could ask the different types of rules available
- You could ask the concept of vernier caliper
- You could ask the following concepts



- You could ask about the SI unit of different physical quantities like length, mass, time etc
- You could ask how can the accuracy of a spirit level can be checked

1.2.1: Units of measurement

Say



- Measurement is the comparison of one quantity with standard quantity
- A unit of measurement is a definite magnitude of a physical quantity (length, Mass and Time).
- · A unit of measurement is definite

Ask



- You could ask the definition of Unit.
- Ask about systems of measurement.
- Ask about different types of units.

Elaborate



A unit of measurement is a definite magnitude of a physical quantity (length, Mass and Time). Example: 10 liter, 200 meter, 20 kg

However, now-a-days SI (International System of Units) is used across the globe as a standard system of measurement. It is an extension of MKS system of measurement.

S. No	Unit	Length (L)	Mass (M)	Time (T)
1.	CGS	Centimeter (cm)	Gram (gm)	Second (sec)
2.	FPS	Foot (ft.)	Pound (lb)	Second (sec)
3.	M K S	Meter (m)	Kilogram (Kg)	Second (sec)

Table 1.2.1: Systems of measurement

SI system has 7 fundamental units and 2 supplementary units, there are a number of derived units.

S. No	Measuring	S I Units
1.	Length	Meter
2.	Mass	Kilogram
3.	Time	Second
4.	Intensity of Electric current	Ampere
5.	Thermodynamic Temperature	Kelvin or degree Celsius
6.	Quantity of substance	Mole

Table 1.2.2: 7 fundamental units of SI system

Few Derived units in SI system are:

S. No	Physical units	S I Units
1.	Area	Sq. mtr
2.	Volume	Cu.mtr
3.	Speed	m/sec
4.	Acceleration	m/sq sec
5.	Density	Kg/cu.m
6.	Force	Newton
7.	Pressure	Pascal

 Table 1.2.3: Supplementary Units in SI system

1.2.2: Use of measuring instruments

Say



- A measuring instrument is a device used for measuring a physical amount. In the physical sciences, quality confirmation and engineering, estimation is the movement of getting and contrasting physical amounts of certifiable items and events.
- Measuring instruments are classified into types:
 - 1. **Linear Measurement:** Linear Measurement includes measurement of lengths, diameters, heights, depths, thickness etc.
 - 2. Angular Measurement: Angular Measurement includes measurement of angles, tapers etc.
- Some common instruments used in measurement are; steel rule, callipers, surface plate, plug gauge, micrometer, dial gauge etc.

Do



- Show different precision and non-precision instruments.
- Give the example of least count calculation.

Steel Rule

Say



- Steel Rule is a flat and thin linear measurement instrument. It is the most commonly used measuring instrument.
- There are different types of rules available. Few commonly used are: Engineer's rule, Folding rule,
- Flexible rule & Hook rule

Do



- Show different steel rules
- Demonstrate the use of steel rule

Elaborate



Steel Rule is a flat and thin linear measurement instrument. It is the most commonly used measuring instrument. Steel rule is manufactured from stainless steel. The edges of the rule are accurately ground to form straight edges. Steel rules are available in different sizes like 150 mm, 300 mm and 600 mm. usually; the reading accuracy is around 0.5 mm.



Fig. 1.2.1: Steel Rule

Calipers

Say



- Calipers are measurement devices used to measure distance between two opposite ends of an object.
- A caliper can be as simple as a drafting compass, with inwards or outward facing points. The tips of the caliper are adjusted to fit across the points to be measured, the caliper is then stretched and the separation between the tips is measured with a measuring device, such as a ruler.
- Few common types of calipers are:
 - **Inside Caliper:** These calipers are used to measure inside size of an object. The caliper can be manually adjusted or screw-adjusted.
 - **Outside Caliper:** These calipers are used to measure external size of an object. These are commonly used to measure pipe diameters.
 - **Divider Caliper:** In metal working, divider calipers are used for marking work-pieces. The tips are sharpened to act as scribers, one leg can then be located in the dimple made by a center or prick punch and the other leg pivoted so that it scribes a line on the work-piece's surface, thus forming an arc or circle.
 - Odd leg or Jenny Calipers: These calipers have one straight pointed leg and other inward curved leg. These are generally used for marking lines parallel to straight edges and also for transferring dimensions. Odd leg or Jenny calipers are also used to find center of a rod.

Do



- Show different types of calipers.
- Demonstrate how to use the caliper.

Micrometer

Say



- Micrometers are precision measurement devices that are used to measure small dimensions. There
 are two types of micrometers viz. inside and outside.
- Outside micrometers are used to measure shafts, pipe, plate thickness etc.
- Inside micrometers are used to obtain measurement of internal sizes like diameters of holes, pipes etc.
- Micrometers use the principle of a screw to increase small distances (that are too small to measure directly) into large rotations of the screw that are big enough to read from a scale.

Do



- Show micrometer.
- Show the parts of micrometer.
- Demonstrate how to take the reading from micrometer.

Elaborate



A micrometer is used to measure very small distances.

Body parts of a Micrometer

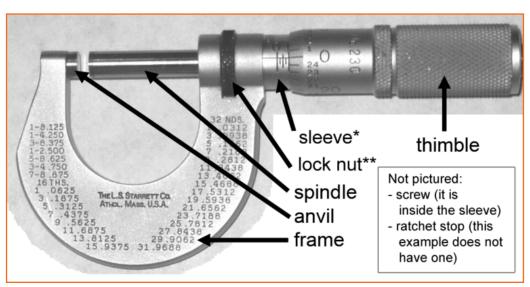


Fig. 1.2.2: Micrometer

- Frame: Frame of a micrometer is a C-shaped component that clamps the other parts of the micrometer. The frame is usually made of drop-forged steel and is heavy with high thermal mass. The high thermal mass is to prevent heating up and to reduce flexion, expansion and contraction.
- Anvil: The projected portion of the frame, which extends to at least 3mm, is known as anvil. It is one of the measuring faces. An anvil is manufactured from alloy steel and in finished to a perfectly flat surface.
- Spindle: The spindle of a micrometer grips the job against the anvil. The movement of the thimble causes the spindle to move towards the anvil.
- Sleeve: It is also known as barrel or stock. Sleeve is a stationary round part on which datum line and graduations are marked.
- Thimble: It is a cylindrical cover attached to the spindle and moves with the spindle. It is has a beveled edge and is divided into 50 equal parts. The divisions are marked as 0, 5, 10, 15...... 45.
- Ratchet Stop: It is an extension to the thimble. Ratchet stop ensures even pressure between the gauging surfaces.
- **Lock Lever or Lock Nut:** It is used to lock the spindle at a desired position.

Demonstrate 🛱



- Explain the parts of micrometer.
- Demonstrate how to do measurement from micrometer.

Steps: Using Micrometer



- Step1: First note the minimum range of the outside micrometer. For instance, while measuring a 50-75 mm micrometer, the minimum range in 50 mm.
- Step2: Now read the sleeve or barrel graduations. The value of the visible lines to the left of the thimble edge is to be read.
- Step3: The next step is to read the thimble graduations. The value of thimble graduation in line with sleeve or barrel is to be read,
- Step4: The value of the thimble reading is then multiplied by the least count, which is 0.01 mm.
- Step5: The final reading is the sum of the minimum range, sleeve reading and the thimble reading.

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- Do the measurement of given object by using micrometer

Skill Practice	Time	Resources
Using micrometer	2 hours	Micrometer
		Any object for measurement

Do



- Show different types of calipers.
- Demonstrate how to use the caliper.

Vernier caliper

Say



- A Vernier calliper is a measuring instrument that precisely measures (read) distances more accurately than a normal scale or rule. It is simply a Vernier scale mounted on a measuring instrument.
- Vernier Calipers are available in both digital and manual versions. This instrument can be used to measure internal as well as external dimensions.
- The Least Count of a Vernier Caliper can be calculated using the formula LC = 1 MSD 1 VSD (Value of one Main Scale Division Value of one Vernier Scale Division).

Do



- Show vernier caliper.
- Demonstrate how to take the reading from vernier caliper.

Elaborate



For using vernier caliper, move the position of the pointer on the scale. At the point where the pointer is between two markings, take the reading on the scale. This is basic caliper; expansion of vernier scale on the instrument gives more exact reading; this is the vernier caliper.

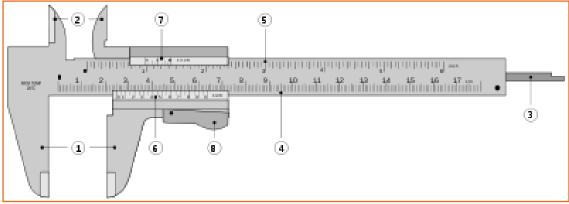


Fig. 1.2.3: Vernier Caliper

Parts of a vernier caliper:

- 1. Outside Jaw To measure outer dia. and width of an object.
- 2. Inside Jaw To measure inner dia.
- **3. Depth Probe** To measure depth of an object.
- 4. Main Scale Scale set apart in millimeter (mm)
- 5. Main Scale Scale set apart in inches
- 6. Vernier Scale Interpolated estimations in millimeter
- 7. Vernier Scale Interpolated estimations in millimeter
- 8. Retainer Used to lock movable parts

Demonstrate



- Explain the parts of vernier caliper.
- Demonstrate how to do measurement from vernier caliper

Steps: Using vernier caliper



Step1: Loosen the locking screw and move the slider to check if the Vernier scale works properly and ensure that the caliper displays or reads 0 when fully closed. If the reading is not 0, adjust the caliper's jaws until you get a 0 reading. If you can't adjust the caliper to 0, remember to add to subtract the correct offset from your final reading.

- Step2: Close the jaws lightly on the item which you want to measure (For example a round steel ball).
- Step3: The main metric scale is read first and for example says this shows that there are 13 whole divisions before the 0 on the hundredths scale. Therefore, the first number is 13.
- Step4: The 'hundredths of mm' scale is then read. The most ideal to check the quantity of divisions until you

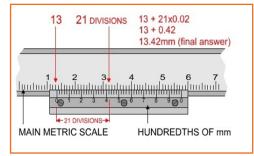


Fig. 1.2.4: Reading Vernier Caliper

get to the division that lines up with the fundamental metric scale. This is 21 divisions on the hundredths scale.

- Step5: This 21 is multiplied by 0.02 giving 0.42 as the appropriate response (each division on the hundredths scale is equal to 0.02mm)
- Step5: The 13 and the 0.42 are added to give the last result of 13.42mm (the diameter of the piece of round section steel).

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- Do the measurement of given object as per drawing by using vernier caliper

Skill Practice	Time	Resources
Using vernier caliper	2 hours	Vernier caliper
		Any object for measurement
		Drawing or sketch

Do



- Ask them to practice the activity alone.
- Go around and make sure they are doing it properly.
- Wrap the unit up after summarizing the key points and answering questions.

Height gauge

Say



- A digital height gauge is precision measuring device used specifically for measuring height of two
 points.
- Advanced electronic (digital) height gauges can be used to carry out different tasks like measuring step heights, internal/external diameters and centre-line distances.

Do



- Show height gauge.
- Demonstrate how to take the reading from height gauge.

- Elaborate



The electronic height gauge has a precision of up to 0.0254~mm and claims consistency of $\pm 0.00254~\text{mm}$. The conventional height gauges are similar to Vernier Callipers, except that the fixed jaw is shaped like a base. The scale is graduated on both sides, one side being graduated for internal measurement. The main scale for external measurement starts at 1 inch. This allows for the combined width of the base and movable jaw, when the jaws are in contact. The gauge can be converted into a form of scribing block (to mark the work piece) by attaching an extension arm, beveled to a sharp edge, to the movable jaw.



Fig. 1.2.5: Height Gauge

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Skill Practice	Time	Resources
Using height gauge	2 hours	Height gauge
		Any object for measurement
		Drawing or sketch



- Ask them to practice the activity alone.
- Go around and make sure they are doing it properly.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.









2. Gas Metal Arc Welding(GMAW) – Before Welding

Unit 2.1 - Why GMAW

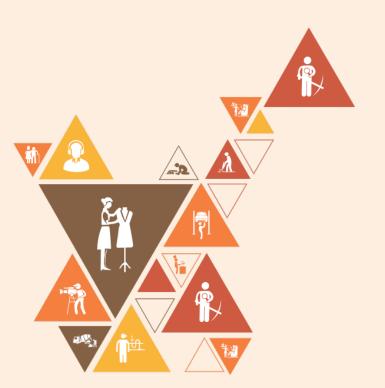
Unit 2.2 - Parts of a GMAW Machine and Accessories

Unit 2.3 – Setting Up a GMAW Outfit

Unit 2.4 - Operating Parameters of GMAW

Unit 2.5 - Process Parameters of GMAW

Unit 2.6 - Applications of GMAW



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- 1. List the reasons why GMAW is popular;
- 2. Identify the parts of a GMAW machine;
- 3. State the function of each part;
- 4. Set up a GMAW outfit such that it is ready for the welding process;
- 5. Implement maintenance of welding equipment;
- 6. List the parameters of a GMAW process;
- 7. Identify the part required to set the parameters of a GMAW process;
- List the modes of metal transfer in a GMAW process;
- 9. Select the process parameters based on the nature of the job;
- 10. Explain the various techniques of GMAW operation;
- 11. Explain applications of GMAW in different industries.

UNIT 2.1: Why GMAW

Unit Objectives



At the end of this unit, Students will be able to:

1. List the reasons why GMAW is popular.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart



- Greet and welcome the participants to the next session of the program.
- Before starting the session ask them do they have any doubts pertaining to the previous unit.
- Capture their responses on board and share them wherever necessary.



- GMAW or Gas Metal Arc Welding was introduced in the late 1940's and has been the most popular forms of welding till now.
- It is a mechanised process.
- As compared to other processes, GMAW proves to be more efficient and more reliable in terms of reducing defects and producing a strong weld.

Elaborate



Merits of GMAW

Usability: The degree of usability with the GMAW process is very high as compared to other processes. The GMAW process can be used to weld all metals with appropriate filler metal and gas. These include carbon steel, alloy steels, stainless steel, aluminium, cast iron, etc.

- **High Strength:** In the GMAW process, due to the small size of electrode, current density is very high and so is the strength of the weld metal is high.
- **High Productivity:** Productivity is defined by the rate of metal deposition. Metal deposition is governed by the current density. Since current density is much higher in GMAW process than in SMAW, the productivity is also very high.
- Less Distortion: The main reason for lesser distortion is less heat input. Heat input in GMAW is very less when compared to that in SMAW.
- **Savings in Consumables:** The consumable which is used in GMAW is considerably far less than in SMAW, for a job of similar nature.
- **Error Reduction:** The GMAW process is considerably enhanced and improved over other methods of welding. This is done by automation of the process. It is a mechanized process and the quality of the weld does not primarily depend on the skill of the welder.
- **Ease of Operation:** The basic reason for this is fewer starts and stops during welding by the GMAW process. This is because the welder needn't stop the welding process to change the electrode. The electrode is fed automatically. Therefore, the welder has to only concentrate on one motion, thus making it easier for him to operate the GMAW process.
- **Single Size of Consumable:** In GMAW process, we use a single size of consumable, to do welding on thin to thick plates. Thus, the GMAW process, not only saves the need for changing the electrodes, but it also saves on inventory.

Limitations of GMAW Process

- **Shielding Depletion:** A wind flow rate of 4 miles per hour can affect the welding and contaminate the weld.
- Approach for the Torch: If approach of torch to weld joint is restricted then the weld can't be

- Ask



- Ask about need of GMAW process
- Ask about advantages and limitations of GMAW process



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 2.2: Parts of a GMAW Machine and Accessories

- Unit Objectives 🥒



At the end of this unit, Students will be able to:

- 1. Identify the parts of a GMAW machine;
- 2. State the function of each part.

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook, participant manual
- PC with LCD Projector or Flip Chart
- GMAW machine and its associated parts.



Greet and welcome the participants to the next session of the program.



- GMAW machine has following parts:
 - Accessories,
 - return cable with earth clamp,
 - torch,
 - helmet with shaded glass,
 - welding cables,
 - wire feeder,
 - base plates,
 - gas cylinder,
 - power source,
 - work table,
 - interconnection cable and
 - PPE.

Elaborate



Various parts of a GMAW machine and their functions are:

- **Gas:** The gas shields the weld metal from atmosphere contamination; thus strengthen the weld. The selection of gas has to be made on the basis of material and process requirement.
 - The commonly used shielding gases for GMAW process are carbon dioxide, argon, helium and their mixtures.
- **Power Source:** The power source delivers the power to strike an arc for welding. The power source input supply is 440/220 volts from the Electricity Board.
 - For welding operation, high current, low voltage is required. The power source converts the input supply of high voltage, low current to low voltage, high current. All GMAW power sources are constant potential power sources. The types of power sources are rectifier power source, thyristor rectifier power source and inverter power source.
- Wire Feeder: Unlike SMAW process, GMAW has a wire feeding mechanism. Current is nothing but the wire feed rate, which is set on the wire feeder. The wire feeder is a two-roll/ four-roll/ planetary drive mechanism operating on pinch force effect.
- **Torch:** The torch is the business end of the operation. This is because the torch is where all the parameters come into action, allowing it to deliver the power to generate the arc.
 - Torches are available in gas-cooled and water-cooled, as well as in unitised and non-unitised versions. The appropriate torch is chosen on the basis of the duty cycle of operation. Torch conveys the wire from the outlet of the wire feeder to the arc zone through a contact tip. The wire is energised only at the contact tip, just before it arcs and gets deposited as weld metal. The torch also conveys the gas to the weld zone to provide a protective shield.
 - Since the torch is directly in the heat area, certain components of it are classified as consumable spares. These are bound to wear off over a period of usage. Eg., contact tip, nozzle, tip holder, etc.
- Continuous Filler Wire Welding Consumable: The continuous filler wire draws the current to generate the heat on striking an arc. Welding consumable is selected based on the base material. Normally, for carbon steel, the continuous filler wire is of the grade ER 70S6. For 308 stainless steel grade material, ER308L grade material filler is used.
- Gas Cylinder with Regulator and Flow Meter: The gas cylinder provides the shielding gas, which is needed to secure the weld metal. The gas is filled in the cylinder under high pressure. A regulator is used to release the gas at operating low pressure range. The flow of the gas is further regulated using a flow meter, which is attached to the outlet of the regulator.
- **Welding Cables:** The welding cable conveys the power from the power source to the torch which is connected to the wire feeder. Correct size of cables as per recommendation, based on the current delivered, has to be used.
- Interconnection Cable: The interconnection cable or control cable delivers the power required for the wire feeder from the power source. It delivers the power required for the function of

the wire feeder motor. It also delivers the power for the operation of solenoid valve, which controls gas flow.

- **Gas Hoses:** The gas hoses deliver the gas from the cylinder to the welding area through the wire feeder and torch.
- **Helmet with Shaded Glass:** The helmet is used to view the arc through the suggested shaded glass as per the recommendation. It facilitates the use of both hands for effectively controlling the weld puddle.
- Accessories: Welding accessories include the earth clamp with cable, wire brush and chipping hammer. The accessories are used to finish the post operations after welding.
- **Personal Protective Equipment (PPE):** The PPE protects the welder from the ill-effects of heat and light.

Do



- Show all the parts of GMAW machine.
- Demonstrate the functioning of GMAW machine Parts.
- Allow students to use and operate the GMAW machine Parts.

Activity



- Place all the Parts of GMAW machine on a table.
- Call each student one by one and ask them to identify the Parts you called.
- Tell the student to brief the functioning and required parameter of that Parts.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 2.3: Setting Up a GMAW Outfit

Unit Objectives



At the end of this unit, Students will be able to:

- 1. Set up a GMAW outfit such that it is ready for the welding process;
- 2. Implement maintenance of welding equipment.

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook, participant manual etc.
- PC with LCD Projector or Flip Chart
- Welding accessories, return cable with earth clamp, torch, helmet with shaded glass, welding cables, wire feeder, base plates, gas cylinder, power source, work table, interconnection cable and PPE.
- Parts to be welded and their drawings.

Do



• Greet and welcome the participants to the next session of the program.

Say



- Different components are required for setting up a GMAW outfit i.e.
 - o Accessories,
 - o return cable with earth clamp,
 - o torch,
 - o helmet with shaded glass,
 - o welding cables,
 - o wire feeder,
 - o base plates,
 - o gas cylinder,
 - o power source,
 - o work table,

- o interconnection cable and
- o PPE.
- For setting up the GMAW outfit:
 - o First setup the cylinder.
 - o Then set the MIG torch
 - o Then set the wire feeder and
 - o Last set the power source

Demonstrate |



Setting up the Cylinder

- 1. Attach the cylinder to the stand.
 - 2. Flush out some gas to clear the valve of dust.
 - 3. Connect the regulator to the outlet valve of the cylinder.
 - 4. Open the cylinder slightly so that the regulator registers the cylinder pressure at the inlet gauge.
 - 5. Connect the flow meter to the regulator.
 - 6. Connect the gas hose to the flow meter and power source or wire feeder.
 - 7. Engage the knob in the regulator.

Setting up the Torch

- 1. Feed the liner carefully through the cable.
- 2. Connect the contact tip holder, contact tip and nozzle on to the neck.

Setting up the Wire Feeder

- 1. Connect the wire feeder to the power source using the interconnection cable.
- 2. Connect the positive terminal of the power source through the welding cable to the wire feeder.
- 3. Mount the MIG welding wire coil on the wire feeder and pull out the wire through the coil.
- 4. Set the pressure on the rollers.
- 5. Connect the torch to the wire feeder.

Setting up the Power Source

1. Connect the input power cable to the main power supply while the power supply is switched off.

- 2. Ensure that the welding cable from the positive terminal has been connected to the wire feeder without any loose connection.
- 3. Ensure that the control cable or interconnection cable from the wire feeder is joined to the power source rigidly.
- 4. Connect the return earth cable from the negative terminal of the power source using an earth clamp onto the work table.
- 5. Turn on the main switch to enable the power source to be connected with the electricity board supply.
- 6. Set the ON/OFF switch in the 'ON' position to energise the power source.

Elaborate



Preventive or Self Maintenance of Welding Equipment

Five common problems can occur with MIG equipment:

- Drive Rolls Not Cleaned or Adjusted Properly: This can cause the tensioning and hold on the wire. Knurled rolls used for FCAW wires are more influenced than Smooth rolls used for solid wire.
 - Solution: To remove the accumulation of drawings compound, dust and dirt that would cause the pressure and grip the rolls would have on the wire, clean the drive rolls with a wire brush occasionally by removing them.
- 2. **Drive Roll Pressure Too High:** When a feeding problem arises, to tighten the drive rolls in order to grip the wire better. Using drive roll pressure, the flux-cored wire can change its shape from round to oval, which is possible due to its construction. This wire also develops 'teeth' when knurled rolls are used. These teeth wears the liner, guides, and tip like a saw.
 - Solution: Occasionally, an air nozzle and shop air pressure to blow out the liner can be used before feeding the wire through the cable/hose assembly. This can be done initially from the torch end and then, if possible, from the feeder end.
- 3. Worn Spring Liner: The spring liner can be utilized for almost all cable/hose assemblies since it is detachable and replaceable. Nearly all spring liners have at least two constant bends. One coming out of the feeder, the other in the torch neck. The wire brushes the same spot and wears a groove in the liner. This turns out to be a high-friction area as the groove deepens, and the more bends that are permanent increases the drag on the wire, causing it to "birdnest" at the torch inlet or just stop feeding.
 - Solution: A kink in the liner will cause a feeding problem. Blow out the liner guide, turn the liner 90°-180° and reinstall it, this will present a fresh area in the liner to the wear of the moving wire.
- 4. **Diffuser / Tip Problems:** The most commonly replaced item in a torch assembly is the tip.

Solution: Besides from normal wear that results in the need for replacement, the tip is rarely the cause of feeding problems. But, it does show the results of the problem. There is a guarantee that the issue is developed in one of the discussed areas if the tip has been supplanted and feeding problems continue.

5. **Check Your Ground:** A bad ground can introduce itself as a stutter and make the wire execute as if it needs voltage or speed change. A lack of shielding gas coverage, liner or tip grab, or base metal contamination, will cause porosity.

Solution: Intermittently check the ground at the power source, wire feeder, and work clamp. A tip with burn-back and spatter can be abolished by a bad ground.

The utilization of commonly available wire lube and cleaner, good for MIG and FCAW is one of the easiest approaches to keep up feeding characteristics, if everything else is correct. Another good idea for protecting the consumables (nozzle and tip) is nozzle dip. These products won't correct for drive rolls issues, worn liners, or weak grounds, however, when utilized by the manufacturer's suggestions and the previously mentioned tips, they will promote much longer component life, fewer feeding problems, and many more effective working hours than bad ones.

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Skill Practice	Time	Resources
Setting up GMAW outfit	2 hours	Welding accessories, return cable with earth clamp, torch, helmet with shaded glass, welding cables, wire feeder, base plates, gas cylinder, power source, work table, interconnection cable and PPE. parts to weld and their drawings.

Do



- Divide the class into pairs.
- Go around and make sure they are doing it properly.
- Wrap the unit up after summarizing the key points and answering questions.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 2.4: Operating Parameters of GMAW

Unit Objectives



At the end of this unit, students will be able to:

- 1. List the parameters of a GMAW process;
- 2. Identify the part required to set the parameters of a GMAW process.

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook, participant manual
- PC with LCD Projector or Flip Chart



Greet and welcome the participants to the next session of the program.



- Current, current density, voltage, stickout, gas flow rate and travel speed are the key operating parameters of GMAW.
- Current is responsible for melting the wire and the base plate.
- Voltage is the pressure or the force which drives the current.
- Stickout is defined as the length of the wire which is protruding outside from the contact tip.
- Gas flow rate defines the amount of shielding gas flowing through the nozzle to provide effective shielding for the weld metal from atmospheric contamination.
- Travel Speed is defined as the speed at which the welding progresses. Its unit is normally in millimetres per minute (mm/m).

Elaborate



Current

In GMAW, the current is nothing but the wire feed speed. In other words, the more the wire that comes

out of the torch, more current is required to melt the wire and deposit it as a weld metal. More wire requires more current, and less requires less current.

Current is set by the current potentiometer knob, which is usually on the wire feeder. This knob controls the wire feeder motor speed.

Welding area thickness of the job is required for calculating current

For example, say you are welding two 10 mm plates edge prepared so as to form a single V joint with an included angle of 60 degrees and with a root face of 2 mm. A fit up for groove welding is made with the above plates with a root gap of 2 mm. The root run is made on the root face so as to bridge the gap with full penetration. Hence, the effective thickness for the root run is 2 mm in spite of the plate thickness being 10 mm. So the welding area thickness for the root run is 2 mm.

The thumb rule for current calculation is 40 A/ mm welding area thickness. So, the required current for root run is 80 amps.

Voltage

In all forms of welding, voltage digs a pit and current melts the metal to fill the pit. Hence, current and voltage are related to ensure that the pit dug by the voltage is filled with adequate metal by current.

The voltage is set using a potentiometer or multi-position switch on the power source.

Voltage can be calculated by using an empirical formula from the above calculated current. The empirical formula varies for different shielding gases.

• When carbon dioxide (CO₂) shielding gas is used,

$$V = 14 + 0.05I$$

• When argon or argon-CO₂ (ACM) shielding gas is used,

$$V = 12 + 0.05I$$

Stickout

The actual operating voltage is the outcome of the set voltage and stickout. If the stickout increases, the actual operating voltage will decrease for a set voltage, and vice versa.

The normal stickout range tends to vary from 10 to 15 mm. However, larger stickouts, more than 15 mm can also be utilized by bringing in corresponding change in the gas flow rate, if needed.

Gas Flow Rate

The gas flow rate is set on the flow meter which is fitted onto the regulator. The regulator regulates the pressure of the gas from the cylinder to operating pressures.

The normal range of gas flow rate for a stickout of 15 mm shall be around 12 to 15 litres per minute when operating in a closed welding shed.

Exposure of the weld metal to atmosphere leads to porosity, which leads to a weak weld. Hence, utmost precaution has to be taken to avoid direct exposure of the welding area to the wind path.

In case of higher stickout, a small increment in gas flow rate is needed to ensure effective shielding.

Travel Speed

The travel speed depends totally on the welder's hand movement, which depends on the metal deposition.

In GMAW, the operating travel speed is influenced by technique, current, voltage and stickout. Being a high productive process, the normal travel speed for semi-automatic operation shall be in the range of 250 to 300 millimetres per minute.

- Ask



- You could ask about different operating parameters of GMAW.
- Ask about operating ranges of parameters for different welding thicknesses.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 2.5: Process Parameters of GMAW

Unit Objectives



At the end of this unit, students will be able to:

- 1. List the modes of metal transfer in a GMAW process;
- 2. Select the process parameters based on the nature of the job.

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook, participant manual
- PC with LCD Projector or Flip Chart



Greet and welcome the participants to the next session of the program.



- The process parameters for GMAW are defined with different types of metal transfers.
- In SMAW, different sizes of electrodes are utilized for different operations. Whereas, in GMAW; single size of electrode can utilize for all operations in the different types of welding processes.
- There are different modes of metal transfers, depending upon the various operating parameters: short circuit transfer, globular transfer and spray transfer.

Elaborate



Modes of Metal Transfers

1. Short Circuit Transfer: In this metal is transferred by literally short circuiting the wire and the base plate. This is also called as 'dip transfer'. This transfer mode is achievable with all shielding gases and operates with low currents and low voltages. This mode of transfer is used to bridge gaps, in sheet metal operations and root runs.

Since the main operating parameters are current and voltage, other parameters can be defined easily with help of these two parameters. The following chart gives a relationship between current, voltage and wire size.

	Wire Size 0.8 mm	Wire Size 1.2 mm		
Current	0 –140 amps	0 – 200 amps		
Voltage	16 – 22 volts	17 – 23 volts		

2. Globular Transfer: In this, the metal is transferred by means of big globules. This is medium current, medium voltage transfer. Globular transfer is normally used after root welding for higher productivity. Since metal is transferred in globules, there is possibility of spatter to occur in this mode of transfer. In globular transfer mode, 100% carbon dioxide is used. It can be used only in down hand and horizontal positions. The following chart gives a relationship between current, voltage and wire size.

	Wire Size 0.8 mm	Wire Size 1.2 mm		
Current	140 amps and above	200 amps and above		
Voltage	23 volts and above	24 volts and above		

3. **Spray Transfer:** In this, the metal is sprayed from the torch to the base plate in the form of fine droplets. This is a high current, high voltage transfer process. Spray transfer is normally used after root welding for high productivity. The gases used are argon and its mixture, where the percentage of argon is more than 80%. This mode is used only in the down hand position. The following chart gives a relationship between current, voltage and wire size.

	Wire Size 0.8 mm	Wire Size 1.2 mm		
Current	150 amps and above	240 amps and above		
Voltage	25 volts and above	27 volts and above		

- Ask



- You could ask about various metal transfer methods used.
- Ask about current and voltage parameters of different metal transfer methods.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 2.6: Applications of GMAW

- Unit Objectives



At the end of this unit, Students will be able to:

1. Explain applications of GMAW in different industries.

Resources to be Used



- Facilitator can use the available objects such as a marker, duster, pen, notebook, participant manual etc.
- PC with LCD Projector or Flip Chart

Do



• Greet and welcome the participants to the next session of the program.

Say



- GMAW is popular due to its speed and versatility in various industries.
- GMAW Applications

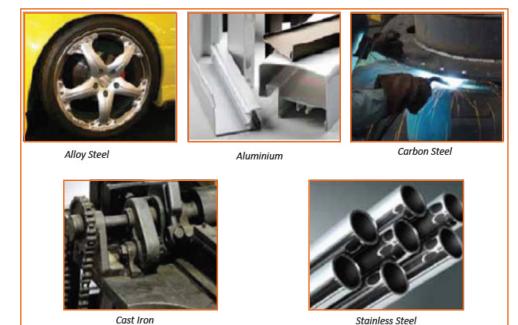


Fig. 2.6.1: Applications of GMAW



• You could ask about industrial use of GMAW.

— Field Visit 🖄



- Take the trainees to industries.
- Show them the use of GMAW in industries.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

— Notes 📋 —	
Notes 🗐	









3. Shielding Gas

Unit 3.1 - Why Shielding Gas

Unit 3.2 – Shielding Gas Selection



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- 1. Describe the functions of shielding gas;
- 2. Explain the types of shielding gas;
- 3. List the metals that can be welded;
- 4. Select shielding gas for the identified base material (metal).

UNIT 3.1: Why Shielding Gas

Unit Objectives



At the end of this unit, Students will be able to:

- 1. Describe the functions of shielding gas;
- 2. Explain the types of shielding gas.

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual etc.
- PC with LCD Projector or Flip Chart



- Greet and welcome the participants to the next session of the program.
- Before starting the session ask them do they have any doubts pertaining to the previous unit.
- Capture their responses on board and share them wherever necessary.



- Shielding gas provides shielding for liquid metal from atmosphere.
- It also provides
 - Ignition of arc;
 - o Arc stability;
 - o Wetting between the solid material and the weld pool;
 - o Penetration Depth and shape of the weld bead;
 - o Spatter formation
- Shielding gas is classified into two types: Active Gas and Inert Gas

Elaborate



Types of Shielding Gas

1. Active Shielding Gas: e.g.: CO,

CO₂ gas at arc zone disassociates into carbon monoxides and oxygen, and immediately recombines to form CO₂ slightly above the arc zone. This reaction produces extra amount of heat (exothermic reaction) which is utilized for welding operations.

2. Inert Shielding Gas: e.g.: Argon, Helium

Inert gases do not participate in the dynamics of arc welding and restrict themselves only to the extent of providing shielding to the liquid metal. They also contribute to the arc stability.

Ask



- Ask students about need of shielding gas
- Ask about different types of shielding gases utilized



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 3.2: Shielding Gas Selection

Unit Objectives



At the end of this unit, students will be able to:

- 1. List the metals that can be welded;
- 2. Select shielding gas for the identified base material (metal).

Resources to be Used



- Available objects such as white board, marker pens, duster, participant manual etc.
- PC with LCD Projector or Flip Chart



- Greet and welcome the participants to the next session of the program.
- Before starting the session ask them do they have any doubts pertaining to the previous unit.



- All types of material can be welded by right type of filler material and gas combinations.
- List of shielding gases available are:
 - o CO,
 - o Argon
 - o Argon CO₂ gas mixer (ACM) in various combinations like: 80/20, 95/5, 90/10 etc.
 - o Argon oxygen gas mixer 98/2 (Argon -98/Oxygen-2)
 - o Argon/Helium
 - o Argon/Helium/Oxygen
 - Argon/Helium/ CO₃/H₃

Elaborate



Selection of Shielding Gas

Base Material	Ar	Ar / He	Ar/He/CO ₂ /H ₂	Ar/He/CO ₂	Ar/He/O ₂	Ar/CO ₂ /O ₂	CO ₂
Unalloyed and low- alloyed steels						•	•
Austenitic stainless steels	0	0	•	•	•		
Other stainless steels	0	0		•	•		
Aluminium and alloys	•	•					
Copper and alloys	•	•	0				
Nickel and alloys	•	•					
Titanium	•	•					
normally used							
O sometimes also used							

Table 2.2.1: Selection of Shielding Gas



- Ask students about need of correct selection of shielding gas
- Ask about selection criteria of shielding gases



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.









4. Safety

Unit 4.1 - Hazards in Welding

Unit 4.2 – Personal Protective Equipment (PPE)

Unit 4.3 – Fire Safety

Unit 4.4 – First Aid for Electric Shock and Burns

Unit 4.5 - 5S



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- Identify different kinds of hazards that a welder faces;
- 2. State the ways to avoid these hazards;
- 3. List the different kinds of protective equipment that a welder must use;
- 4. Identify the use of each piece of protective equipment;
- 5. Identify the causes of fire at the shop floor;
- 6. List the dos and don'ts to prevent fire;
- 7. Explain how to deal with a fire accident;
- 8. Describe the different safety precautions at workplace;
- 9. Describe how to give first aid in case of burns and shocks;
- 10. Explain importance of 5S;
- 11. Describe 5S activities.

UNIT 4.1: Hazards in Welding

Unit Objectives



At the end of this unit, you will be able to:

- 1. Identify different kinds of hazards that a welder faces;
- 2. State the ways to avoid these hazards.

Resources to be Used



Available objects such as a duster, pen, notebook, hazard warning sign etc.



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- A hazard is something that has the potential to cause injury, disease or death in a workplace.
- There are a number of aspects to the development of a safe workplace environment.
 - o The development of policies
 - The development of consultative processes
 - Hazard identification, assessment and control.
- A welding shop is full of hazards at every step of its operation. These hazards are to be tackled for the sake of safety in the workshop.
- Environment protection and hazardous material.

Elaborate



Different Types of Hazards

Fumes and Gases: Fumes and gases can be hazardous to your health as they contain various poisonous chemicals.

- Electric Shock: An electric shock can kill or cause serious injury.
- Arc Rays: Arc rays can injure eyes and burn skin just like the Sun's rays because they are as powerful.
- **Fire and Explosion:** Welding sparks can affect fires and explosions. The height of the sparks can be as much as 35 feet and cause serious damage to yourself and the workplace.
- Noise: Loud noises can damage your hearing.
- Hot Objects: Hot objects can cause severe burns.

Rules for Environment protection

- **Fumes and Gases:** To protect yourself from fumes and gases keep your head away from the exhaust. Make sure there is proper ventilation and exhaust systems so that the fumes can escape.
- **Electric Shock:** Do not touch any live electrical parts. Protect yourself from the open wires and electrical equipments and follow all the warnings given on the welding equipment.
- Arc Rays: Arc rays contain UV rays so you must guard your eyes and skin by wearing the right type of eye and body protection.
- **Fire and Explosion:** To avoid fire and explosion, either remove all materials that burn easily from the welding area. Fire extinguishers should be kept ready at designated places.
- **Noise:** Guard your ears by using appropriate hearing protection, such as ear plugs and ear muffs as and when required.
- **Hot Objects:** Never touch the electrode or other "electrically hot" parts of the welding machine without proper insulation.

Ask



- You can ask the different types of hazard
- You can pick the students and ask the hazard warning sign.
- You can ask the different ideas to control the hazard.
- You could ask the most common hazard in welding shop.

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.

- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Skill Practice	Time	Resources
Identification of Hazards sign	20 min	Hazard sign

Do



- Ask them to get into pairs for practice.
- Go around and make sure they are doing it properly.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 4.2: Personal Protective Equipment (PPE)

Unit Objectives



At the end of this unit, you will be able to:

- 1. List the different kinds of protective equipment that a welder must use;
- 2. Identify the use of each piece of protective equipment.

Resources to be Used



Available objects such as a duster, pen, notebook, PPE etc.



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- Personal protective equipment serves as the last resort for controlling hazards and is one, but not the only, ancillary or temporary measure.
- To make full and proper use of personal protective equipment, one should first make sure that the equipment can fulfill the working requirements, conform to the required standards, fit the body shape of the user, be user-friendly, and is under regular maintenance and can be replaced if necessary.

Elaborate



Personal Protective Equipment and accessories required

- Welding Helmet: A welding helmet is worn on the head to protect the welder during welding.
- Filter Lens: The filter lens enables the welder to see the weld pool at the same time its dark. The lens protects the welder's eye from extreme bright light.
- Leather Apron: Leather is worn to protect the welder from spatters during welding and from arc rays.

- **Leather Gloves:** They protect the welder from sparks, arc rays and spatters during welding. Gloves also protect the welder from hot objects.
- **Leather Sleeves:** Leather sleeves are worn by the welder to protect him from spatter, arc rays and sparks during welding.
- Leggings: Leggings are worn over the ankle. They stop hot spatter or sparks from entering the shoe.
- **Safety Shoes:** Safety shoes serve as an insulator. They also save the foot from spatters; arc rays and sparks during welding.
- **Safety Helmet:** A safety helmet is worn on the shop floor during grinding etc. to guard the wearer from falling objects or flying splinters.
- **Clear Glass Goggles:** Clear glass goggles are worn during operations like grinding to protect the eyes from flying splinters.
- **Ear Muffs/Plugs:** They protect the welder from high noise levels on the shop floor. They also stop any splinters from entering the ears.
- **Dust Mask:** A dust mask is worn to protect the wearer from fine dust which is made up mainly of fine metal particles.
- **Gas Mask:** A gas mask is a mask put on over the face to protect the welder from inhaling pollutants and toxic gases.

Ask



- You can pick the students and ask the safe practices for avoiding general shop hazards.
- You can ask the various types of personal protective equipment.

Do



- Show them the PPE
- Demonstrate the use and requirement of PPE



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 4.3: Fire Safety

Unit Objectives



At the end of this unit, You will be able to:

- 1. Identify the causes of fire at the shop floor;
- 2. List the dos and don'ts to prevent fire;
- 3. Explain how to deal with a fire accident;
- 4. Describe the different safety precautions at workplace.

Resources to be Used



Available objects such as a duster, pen, notebook, fire extinguisher and fire safety equipments etc.



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- Fire is defined as a self-sustaining combustion process in which a substance (fuel) combines with oxygen in air to produce immense heat and light.
- Spatter, arc rays and sparks can cause fire during welding if they fall on combustible materials like petrol, wood, acetylene, hydrogen or oxygen cylinders and electrical fittings.
- In case a fire breaks out
 - use a fire extinguisher
 - o If fire is big, call fire brigade
- Electrical fires are different from regular fires. They cannot be extinguished with water. To put out an electrical fire, the right type of fire extinguisher must be used.
- A fire extinguisher, or extinguisher, is an active fire protection device used to extinguish or control small fires, often in emergency situations.

- Types of fire extinguisher relevant to welding shop are sand, water, foam, dry chemical powder (DCP) and CO₂.
- One of the essential responsibilities of an individual is reporting hazards.
- Every worker should be aware of:
 - o the people responsible for health and safety at the work place;
 - o the name, designation and location of the person responsible to contact at the time of emergency;
 - o the names and location of the documents that refer to health and safety.
- Efforts should be taken to reduce the scale & probability of hazards. Effective action is required during
 emergency situation. For dealing emergencies, effective action is possible with good training and
 actual practice on the procedure for dealing such emergencies.
- Mock Drills is a situation in which fake emergency is announced and workmen are asked to follow emergency evacuation plan. This allows the workman to familiarize with the emergency situation and act according to plan.

Elaborate



Safety Precautions

In case a fire breaks out, then

- If it is a small fire use a fire extinguisher.
- If the fire is big, call the fire brigade.
- All those on the shop floor should move towards the exit.

Electric Shock

- Make sure the machine is properly grounded.
- Never permit "live" parts of the electric welding machine to touch bare skin or wet clothing.
- Do not cool electrode holders by putting them in water.
- Turn off power supply when the welding machine is not in use.
- Avoid standing on damp areas while welding.
- Wear leather gloves.
- Ensure that the cables are protected and are in good condition.
- Ensure that electrode holders are correctly insulated.

Burns

- Guard your eyes and face from flying particles of slag by using safety glasses or face shield.
- Always wear leather gloves.
- Wear safety shoes.
- Avoid touching the electrode or metal where welding has taken place.
- Hold hot metal with pliers or tongs.
- Keep electrode stubs appropriately arranged off.

Radiant Energy

- Protect your head and eyes with a welding helmet and the right shade lens.
- Avoid leaving bare skin exposed to the rays of the arc, wear suitable clothing.
- Never strike the arc without protecting the face and eyes.
- Never look directly at the arc where others are welding without suitable eye protection.

Gases & Fumes

- Work only in well-ventilated areas and work on stations with exhaust systems.
- Be extra careful when working on metals covered with lead or zinc.
- Use respirator or other approved breathing devices if operating in a restricted area.

Combustible Materials

- Keep shop clean in areas where welding is to be done.
- Never weld near inflammable materials of any kind.
- Never weld on shielded containers which may have held inflammable materials without first taking appropriate safety precautions.

Fire Protection

- Get acquainted with location and types of fire extinguishers.
- Report any risky conditions that may begin a fire.
- Never weld near combustible materials.
- Never weld near electrical fittings or lines.
- Attend training on evacuation procedures during mock practice.

Trips & Falls

- Keep work areas clear of equipment, machines, cables and hoses.
- Always properly maintain and use handrails.
- Always use and maintain safety lines, harnesses and lanyards.

Classes of type of fire extinguisher

1. Water (Class A)

- Suitable for Class "A" fires only.
- To allow visual capacity check, there is a pressure gauge
- 30-40 ft. maximum effective range.
- Can be started and stopped as necessary.
- Extinguishes by cooling burning material below the ignition point

2. Carbon Dioxide CO₂ (Class B, C)

- Suitable for Class "B" or "C" fires.
- 2.5-100 lb. of CO₂ (8-30 seconds discharge time).
- Has NO pressure gauge--capacity verified by weight.
- 3-8 ft. maximum effective range.
- Extinguishes by smothering burning materials.
- Effectiveness decreases as temperature of burning material increases.

 CO_2 extinguishers are specially designed to put out electrical fires. They have a wide nozzle that expels the CO_2 gas.

3. Dry Chemical or Powder (Class A,B,C)

- Suitable for Class "A", "B", and "C" fires.
- 2.5-20 lb. dry chemical (ammonium phosphate).
- 8-25 seconds discharge time.
- To allow visual capacity check, it has pressure gauge.

Dry chemical extinguishers are also designed to put out electrical fires. These extinguishers are better than CO_2 extinguishers as they prevent fires from reigniting.

Safety Signages

It is important to know the meaning of safety signs. Such signs warn us of danger and allow us to take precautions to keep safe. There are four main types of safety signs:

- Prohibition signs
- Mandatory signs
- Warning signs
- Information signs



Smoking and Naked Flames Prohibited





Table 4.3.1: Safety Signages

Demonstrate



Steps for using the fire extinguisher



- **STEP 1:** Pull the Pin at the top of the extinguisher. The pin releases a locking mechanism and will allow you to discharge the extinguisher.
- STEP 2: Aim at the base of the fire, not the flames. This is important in order to put out the fire, you must extinguish the fuel.
- **STEP 3:** Squeeze the lever slowly. This will release the extinguishing agent in the extinguisher. If the handle is released, the discharge will stop.
- **STEP 4:** Sweep from side to side. Using a sweeping motion, move the fire extinguisher back and forth until the fire is completely out.



Procedure for Reporting and Responding to Accidents and other Emergencies



STEP 1: Gathering Facts: Collect and note all the facts, including -

- Date, time, and location of accident
- Names, job titles, workers and immediate supervisor involved
- Events leading up to the accident
- Job that a worker was handling at the time of the accident
- Names of workers/supervisor who witnessed the accident
- Surrounding conditions (e.g. greasy floor, insufficient lighting, noise, etc.)
- Circumstances at the time of accident (including tasks, equipment, tools, materials, etc.)
- PPE worn by the worker at the time of the accident
- Injuries that occurred (name of the injured body part and characteristics and extent of injuries)
- Type of treatment for injuries (first aid if given)
- Damage to equipment, materials, and the worker was working on or any other equipment or material around it.

STEP 2: Determining the Sequence: Describe this sequence in events after gathering the facts –

- Events leading up to the accident: Task the worker was performing at the time of accident. For example: bending over, climbing, lifting operating machinery, etc.
- Events involved in the accident: Was the employee struck/caught in the machine or caught in the fire? Did the worker fall on the same level or from a height?
- Events immediately following the accident: What did the employee do: started bleeding? Body caught fire? Complain about back pain? Put Response from other workers/supervisor. Did they call for help, administer first aid, shut down equipment etc.?

STEP 3: Analysing: Analyse of the causes of the accident.

- Primary cause (e.g., a slip and fall from a ladder)
- Secondary causes (e.g., employee not wearing appropriate goggles or helmet)
- Other contributing factors (e.g., poor ventilation).

STEP 4: Recommending: Recommendations for corrective action

- Training on safe work practices
- Preventive maintenance exercises that keep equipment in great working condition
- Assessment of job techniques with a proposal for changes
- Conducting a job hazard analysis to evaluate the task for any other hazards
- Engineering changes that make the task safer or administrative changes that might include changing the way the task is performed.

Tips 🖳

How to Prevent Fire

Dos	Don'ts
Keep welding area clean.	Do not wear inflammable materials like nylon etc.
If empty containers contain flammable materials, fill them with water.	Never weld near electrical lines.
Report any unsafe situation that may cause a fire.	Never weld near combustible materials.
Watch where the sparks and metals are falling from your work.	Never leave any cable without insulation.

At the time of emergency evacuation one must:

- Raise the alert by crushing the glass cover of the closest break-glass alarm unit.
- Be calm and composed. Switch off all electrical apparatus except lights.
- If possible, shut doors around the fire area to stop it from spreading.
- Leave the Building/site area immediately. Follow the evacuation queue.
- Give first preference to the physically handicapped, expectant mothers and the elderly
- If it's dark and smoky, get down on your hands and knees and crawl to the nearest exit by counting the number of door.
- Be acquainted with the hot exit door and pay attention for the thick smoke in the staircase. In the event that the staircase is free from smoke, follow the directional signs and handrails.
- Gather at the designated assembly point.
- Do not re enter the building until the signal is given
- Max. time for evacuation 2.5 to 3.0 minutes.

- Ask



- You could ask the common fire extinguisher.
- You could ask the type of fire extinguisher and their role?
- You could ask what all information contains fire drill report.

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Skill Practice	Time	Resources
Use of fire extinguisher	1 hour	Fire extinguisher
		PPE



- Ask them to get into pairs for practice.
- Go around and make sure they are doing it properly.
- Wrap the unit up after summarizing the key points and answering questions.

– Field Visit 🕅



You could visit any of the industry and show the firefighting equipment. With the help of field visit you could show the where we need to fit various firefighting equipment and its role.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 4.4: First Aid for Electric Shock and Burns

Unit Objectives



At the end of this unit, You will be able to:

1. Describe how to give first aid in case of burns and shocks.

Resources to be Used



Available objects such as a duster, pen, notebook, first aid box etc.



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- Burns are caused by coming in contact with hot objects accidentally. Burns can be minor or major.
- You can get an electric shock if current passes through your body or hair. When a person gets a severe shock his or her skin turns white or pale blue. The first aid has to be given to the victim

Demonstrate



First aid steps



For Minor Burns

STEP 1: Pour cold water on the burnt area.

STEP 2: Apply a paste of baking soda and water or use a wet compress of baking soda solution in water.

STEP 3: Cover the burnt area with a thin cloth to keep it free of dust.

For Major Burns

STEP 1: In case a person's clothes are on fire drop him to the ground and roll him over until the fire is put out.

- **STEP 2**: Do not wrap any blanket around him because that will raise the temperature of the burnt area.
- STEP 3: Call the doctor immediately.
- **STEP 4:** Till the time the doctor arrives, make the victim to lie down in a quiet place but keep the feet slightly raised.

First Aid for Electric Shocks

- **STEP 1:** Turn off the electric supply.
- **STEP 2:** Pull out the plug if you cannot find the switch.
- STEP 3: Use rubber gloves and stand on paper or wood when you are cutting off the electric supply.
- **STEP 4:** You should go near the victim, ONLY after the electric supply is cut off, otherwise you may also get a shock.
- STEP 5: Help the victim if he cannot breathe properly.
- **STEP 6:** If there is a wound apply medicine.
- **STEP 7:** Call the ambulance or the doctor immediately.

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Skill Practice	Time	Resources
First aid practices	3 hours	Mannequin
		First aid box

Do



- Ask them to get into pairs for practice.
- Go around and make sure they are doing it properly.
- Wrap the unit up after summarizing the key points and answering questions.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 4.5: 5S

Unit Objectives



At the end of this unit, students will be able to:

- 1. Explain importance of 5S;
- 2. Describe 5S activities.

Resources to be Used



- Available objects such as white board, marker pens, duster, participant manual etc.
- PC with LCD Projector or Flip Chart



- Greet and welcome the participants to the next session of the program.
- Before starting the session ask them do they have any doubts pertaining to the previous unit.



- 5S is designed as a visually-oriented system of cleanliness, organization and arrangement.
- 5S establishes a strong framework for achieving operational magnificence. Self-discipline and teamwork built through 5S improves worker-to-worker and worker-to-manager relationship.

Elaborate



5S Approach: 5S is created by a list of five Japanese words: seiri, seiton, seiso, seiketsu, and shitsuke. 5S system is implemented for organizing the workplace for increasing effectiveness and efficiency by maintaining the area and items, storing the items used, and sustaining the new practices.

Benefits of 5S are:

- Cleaner and safety work
- Reduced waste of time through more workplace organization

- Organised space
- Improved self-discipline
- Improved workplace culture

5S consist of:

- **Sorting** Sorting and separating tools removes unnecessary items from the work area and keep the place clean.
- **Simplifying** Tools kept at the appropriate storage area are clean and ready to use.
- Systematic Cleaning Organized daily cleaning and inspection of the workplace.
- Standardizing Standardizing makes unusual and out-of-the-ordinary conditions noticeable.
- Sustaining It is aimed to maintain the improvements from the other 5S activities.

Phases of 5S:

Japanese term	English Term	Meaning in Japanese Context
Seiri	Sort	Dispose off unnecessary items or properly remove.
		Do work simply by removing obstructions.
		Stop buildup of unnecessary things.
		Calculate necessary items for costing and other factors.
		Remove all parts not in use.
		Separate unwanted items from the workplace.
		Define a red-tagged area to keep unnecessary items.
		Waste removal.
Seiton	Set	For items to be easily available arrange them all properly
		By arranging work station in such a way that all tooling / equipment is in close proximity
		Work on first come and first serve basis method
		All work should be complete on regular basis
Seiso	Shine	Workplace should be completely clean and clear
		Stop weakening of machinery and equipment
		Keep workplace safe and clean
Seiketsu	Standardize	Regulate the best practices in the work area.
		Keep high standards at workplace organization at all times.
		Keep everything in order and according to its standard.
		Everything in its right place.

Shitsuke	Sustain	•	To maintain in working order
		•	Also translates as "do without being told"
		•	Regular audits to be perform
		•	Discipline and Training

Measuring the 5S Level of Achievement: Check the level of 5S from I to V for Simplifying.

5S Levels of A	chievement				
Level V: Continuously Improve	Cleanliness problems are identified and mess prevention actions are in place.	Needed items can be recovered within 30 seconds and need a less number of steps.	Possible problems are recognized and counter measures are recorded.	Well-grounded approaches and standards for housekeeping, routine supervisions and workspace arrangement are shared and are used throughout similar work areas.	Root causes are removed and improvement actions concentrate on developing precautionary methods.
Level IV: Focus on Reliability	Work area has recorded housekeeping tasks and agendas and the jobs are consistently followed.	Needed items in work area are minimized in number and are well organized for recovery and use.	Inspection occurs during daily cleaning of work areas and equipment and supplies	Dependable procedures and standards for housekeeping, routine supervisions and workplace plan are recorded and abided by all members of the work group.	Sources and recurrence of issues are recorded as a component of routine work. root causes are identified and corrective action plans are developed.
Level III: Make It Visual	Preliminary cleaning has been completed and clutters are recognized and improved.	Needed items are outlined, dedicated locations are properly labeled and required quantities are determined.	Visual controls and identifires are established and marked for the work area, equipment files and supplies.	Work Group has recorded arrangements on visual controls tagging of items and desired amounts of necessary items.	Work group is regularly examining area to sustain 5S agreements.
Level II: Focus on Basics	Essesntial and non-essential items are identified. Those non-essential items are withdrawn from work area.	Essential items are carefully stored and organized as per occurrence of use.	Important work area items to be checked are recognized and adequate performance levels recorded.	Work group has recorded arrangements for essential items, organization and work area controls.	Initial 5S level has been decided, and performance is recorded and displayed in work area.
Level I Just Beginning	Essential and non- essential items are mixed throughout the work area.	Items are located arbitrarily all over the workplace.	Important work area items checked are not recognized and are not marked.	are not regularly abided and are unrecorded.	Work area checks are haphazardly executed and there is no visual measurement of 5S.
Place yellow box where each area is on the 5S levels of Achievement	Sorting	Simplifying	Systematic Cleaning	Standardizing	Sustaining

Table 4.5.1: 5S Levels of Achievement



- You could ask the objectives and advantages of 5S
- You could ask the 5 levels of checking 5S

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Do the 5S audit of your training center and check the level of center

Field Visit



You could visit any of the industry and show the firefighting equipment. With the help of field visit you could show the where we need to fit various firefighting equipment and its role.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.









5. Welding Operation

Unit 5.1 – Types of Weld - Fillet and Groove

Unit 5.2 – Types of Joints

Unit 5.3 – Welding Positions

Unit 5.4 - Material Preparation

Unit 5.5 – Edge Preparation

Unit 5.6 - Fit Up

Unit 5.7 – Welding Demonstration

Unit 5.8 – Welding Practice



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- Identify the different types of weld;
- 2. List the different parts of weld;
- 3. Identify the different types of joints;
- 4. Describe the different welding positions;
- 5. State the norms of position classification;
- 6. Define material preparation;
- 7. Describe the different methods of cleaning and cutting metals;
- 8. Explain edge preparation;
- 9. State the methods of edge preparation;
- 10. List the types of edges;
- 11. Understand purpose and method of fit up;
- 12. To form the component as per the drawing.

UNIT 5.1: Types of Weld – Fillet and Groove

Unit Objectives



At the end of this unit, you will be able to:

- 1. Identify the different types of weld;
- 2. List the different parts of weld.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster.
- PC with LCD Projector or Flip Chart
- Participant Manual



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- Welds can be broadly classified into fillet and groove weld
- A fillet weld is the one in which the weld beads are deposited on the edge of the two surfaces to be joined. These surfaces do not have any groove.
- Groove welds are welds made in the groove between two pieces to be joined.
- A single run of electrode on a metal during welding is called a pass. When the base metal pieces to be welded are thick, then a single pass is not enough to fill the gap between the two pieces. Therefore multiple passes are required.

Elaborate



Parts of Weld

Base Metal: The metal pieces that are being welded are known as "base metal" or "work piece"

- Root: The root is the point at which the backside of the weld intersects the base metal surface.
- **Root Run:** The first run deposited in the root of a joint is the root run.
- **Root Gap:** The distance between the parts to be joined is called the root gap.
- Toe: The point where the weld face and the base metal are connected is called the toe.
- **Leg Length:** The space between the junction of the metals and the point where the weld metal connects the base metal is the leg length.
- **Throat Thickness:** The space between the junction of the metals and the midpoint of the line connecting the two toes is called throat thickness.
- **Heat Affected Zone:** The heat affected zone is the place under the weld or around it which has not welded but the heat of welding has changed its properties.
- **Depth of Penetration:** The depth a weld ranges into a joint from the metal surface is called the depth of penetration.
- **Weld Junction:** The boundary between the fusion zone and the heat affected zone is the weld junction.
- **Weld Face:** The surface of a weld as viewed from the side from which the weld was made is the weld face.

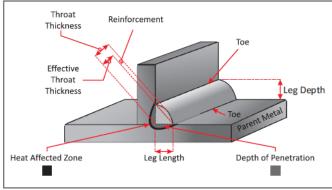


Fig. 5.1.1: Fillet Weld

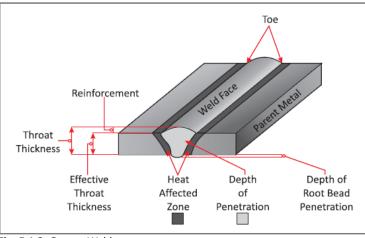


Fig. 5.1.2: Groove Weld

Different layers in multipass welding

- The Root Pass: The first weld run is known as Root Pass or Root Run.
- **Hot Pass:** The run above the root run is called hot pass.
- **Filler Runs:** All the runs above the hot pass, except the top ones are called filler runs.
- **Cover Runs:** The top layer runs are known as cover runs.

- Ask



- You could ask about different types of weld.
- You could ask about multipass welding



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 5.2: Types of Joints

Unit Objectives



At the end of this unit, Students will be able to:

1. Identify the different types of joints.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant Manual.
- PC with LCD Projector or Flip Chart
- Samples of different types of welding joints

Do



• Greet and welcome the participants to the next unit of the program.

Say



• There are five basic types of joints: corner joint, butt joint, lap joint, tee joint and edge joint.

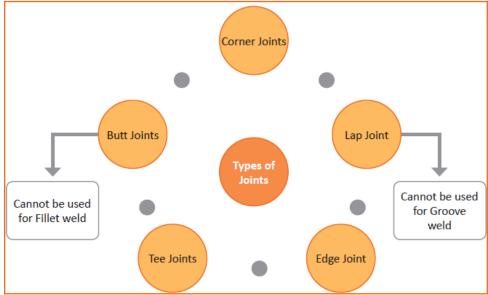


Fig. 5.2.1: Types of Joints

Elaborate



Butt Joint: A joint between two members lying almost in the same plane.

Corner Joint: A joint between two members located almost at right angles to each other in the form of an angle.

Edge Joint: A joint between two edge of two or more parallel or almost parallel members.

Lap Joint: A joint between two overlapping members.

Tee Joint: A joint between two members located almost at right angles to each other in the form of a T.

Do



• Explain different types of joints.

• Ask their understanding about welding joints.

• Show them the samples of all types of welding joints.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 5.3: Welding Positions

Unit Objectives



At the end of this unit, you will be able to:

- 1. Describe the different welding positions;
- 2. State the norms of position classification

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant Manual.
- PC with LCD Projector or Flip Chart

Do



Greet and welcome the participants to the next unit of the program.

Say



Generally welding is done in four positions

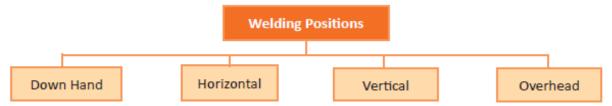


Fig. 5.3.1: Different Welding Positions

- Weld symbol is indicating the type of weld.
- **Welding symbol** is a method of demonstrating the weld on diagrams.
- ISO/AS/AWS standards for plate and pipe welding positions are:
 - o ISO STANDARD 6947
 - o AUSTRALIAN STANDARD AS 3545
 - o AMERICAN WELDING SOCIETY AWS A3.0

Elaborate



The position classification for welding is done as per following rules:

- If the position is flat or down hand it is numbered 1
- If the position is horizontal the number given is 2.
- If the position is vertical the nomenclature given is 3.
- If the position is overhead the nomenclature is given as 4.

Type of Weld

- If the weld is fillet type it is named F.
- If the weld is groove type it is named G.



Plate and Pipe Welding Positions to ISO

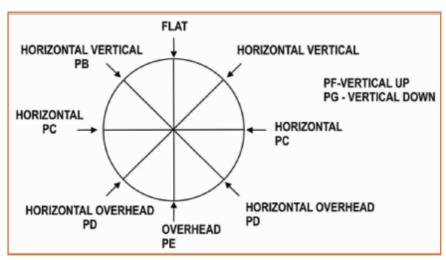


Fig. 5.3.2: Plate and Pipe Welding Positions to ISO

Plate Positions

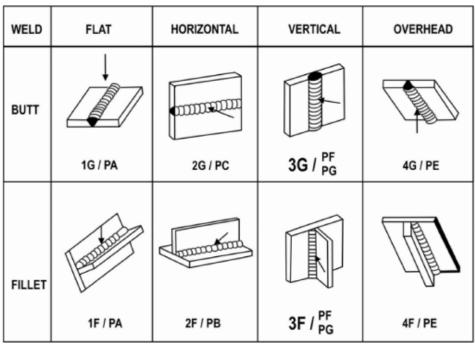


Fig. 5.3.3: Plate Positions

Pipe Positions - Rotated or Rolled

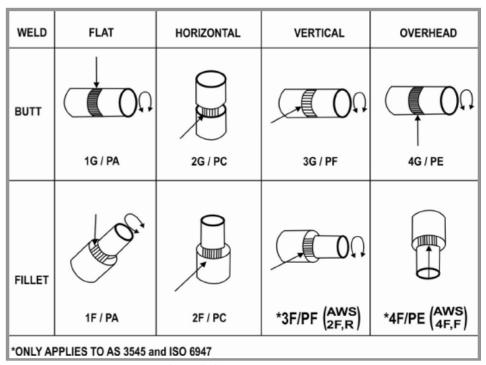


Fig. 5.3.4: Pipe Positions - Rotated or Rolled

Pipe Positions - Fixed Position

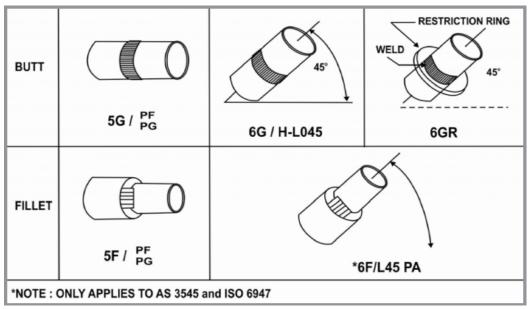


Fig. 5.3.5: Pipe Positions - Fixed Position

Welding Directions or Positions

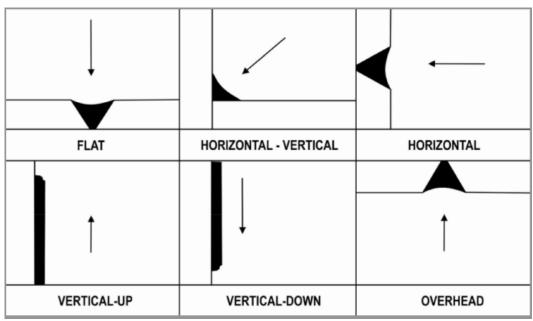
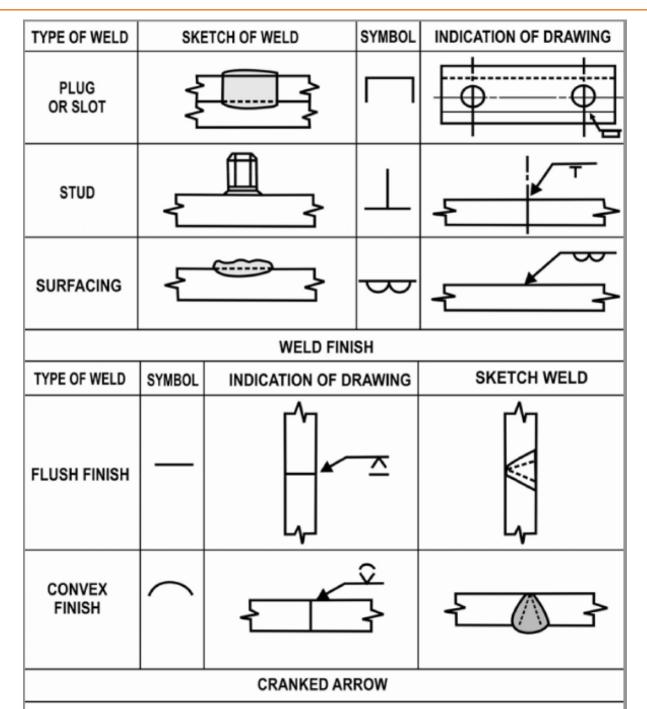


Fig. 5.3.6: Welding Directions or Positions

How Welding Symbols are used:

TYPE OF WELD	SKETCH OF WELD	SYMBOL	INDICATION OF DRAWING
FILLET WELD	₹ <u></u>		↑
BEAD	{ }		EDGE SEAL BACKING WELD WELD RUN
BUTT WELDS			
GENERAL BUTT	FULL PENETRATION BUTT WELD BY A WELDING PROCEDURE TO BE AGREED	2	₹ ¹
SQUARE BUTT	- (1) ->	=	₹
SINGLE 'V' BUTT	{ \	>	<
SINGLE BEVEL BUTT	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	V	
SINGLE 'U' BUTT	E	Y	<hr/>
SINGLE 'J' BUTT		h	\



- 1. A cranked arrow is used with a bevel or "J" weld symbol pointing towards the plate which is prepared. Refer to image 1.
- 2. If plate to be prepared is obvious the crank is omitted. Refer to image 2.

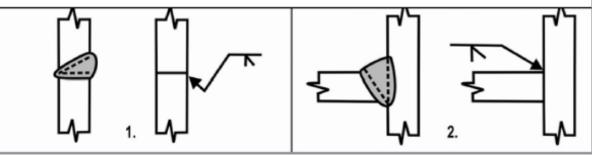


Fig. 5.3.7: How Welding Symbols are used

Basic Weld Symbols:

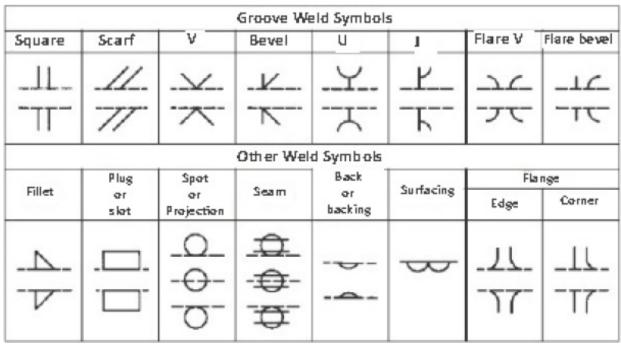


Fig. 5.3.8: Basic Weld Symbols

Other Symbols

SYMBOL FOR:	ANSI Y14.5
STRAIGHTNESS	
FLATNESS	
CIRCULARITY	0
CYLINDRICITY	\nearrow
PROFILE OF A LINE	
PROFILE OF A SURFACE	
ALL AROUND- PROFILE	P
ANGULARITY	_
PERPENDICULARITY	
PARALLELISM	//
POSITION	+

SYMBOL FOR:	ANSI Y14.5
DIAMETER	Ø
BASIC DIMENSION	50
REFERENCE DIMENSION	(50)
DATUM FEATURE	A
DATUM TARGET	Ø1 A1
TARGET POINT	\times
DIMENSION ORIGIN	\bigoplus
CONICAL TAPER	\Rightarrow
SLOPE	
COUNTERBORE/SPOTFACE	Ш
COUNTER SINK	~
DEPTH/DEEP	$\overline{\mathbf{v}}$
SQUARE (SHAPE)	

CONCENTRICITY/ COAXIALITY	\bigcirc
SYMMETRY ‡	None
CIRCULAR RUNOUT	A
TOTAL RUNOUT	21
AT MAXIMUM MATERIAL CONDITION	M
AT LEAST MATERIAL CONDITION	(L)
REGARDLESS OF FEATURE SIZE	(§)
PROJECTED TOLERENCE ZONE	P

DIMENSION NOT OT SCALE	<u>15</u>
NUMBER OF TIME/PLACES	8X
ARC LENGTH	105
RADIUS	R
SPHERICAL RADIUS	SR
SPHERICAL DIAMETER	S

Fig. 5.3.9: Other Symbols



- Explain different welding positions.
- Show them different welding symbols.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 5.4: Material Preparation

Unit Objectives



At the end of this unit, you will be able to:

- 1. Define material preparation;
- 2. Describe the different methods of cleaning and cutting metals.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant manual.
- PC with LCD Projector or Flip chart



Greet and welcome the participants to the next unit of the program.



- Before welding, the raw material is in the form of metal sheets or blocks and needs to undergo material preparation process.
- To make components of different sizes and shapes, material need to be cut and cleaned from the raw sheets or blocks. This process of cutting and cleaning is known as material preparation.
- There are different methods of cutting metal:
 - o Cold Cutting
 - Chisel
 - Hacksaw
 - Shearing
 - **Gas Cutting**
 - Pug Cutting
 - o Plasma Cutting
- Any material must be free of any foreign material like oil, paint, rust, moisture, scale etc before it

can be welded. If these impurities are not removed, the weld will have defects and the weld may be porous, brittle or weak. Material cleaning is done by different methods depending on the material and the type of impurity. Cleaning can be done by:

- o Wire Brushing
- o Grinding
- o Rubbing with Emery Paper
- o Flaming
- o Chemical Cleaning

Do



- Ask about their understanding about the raw material cutting and cleaning for welding.
- Explain material cutting and cleaning processes.
- Show them the material cutting and cleaning processes follow in industry.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 5.5: Edge Preparation

Unit Objectives



At the end of this unit, you will be able to:

- 1. Explain edge preparation;
- 2. State the methods of edge preparation;
- 3. List the types of edges.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant manual.
- PC with LCD Projector or Flip chart

Do



• Greet and welcome the participants to the next unit of the program.

Say



- Edges of the metal pieces have to be shaped and prepared for welding. This is known as edge preparation.
- There are many methods of edge preparation i.e. grinding, filing, milling, gas cutting etc.
- There are various types of possible edges i.e. square edge, bevel edge, double bevel edge etc. Type of edge is determined by the drawing of joint.

Elaborate



There are many methods of edge preparation. The method that is chosen will depend on:

- The shape of the edge to be prepared
- The thickness of the metal to be welded

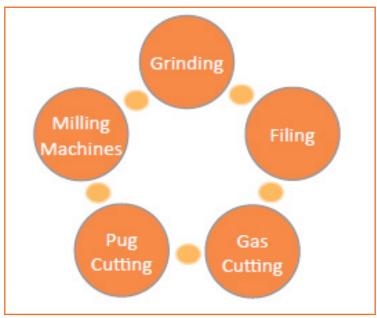


Fig. 5.5.1: Methods of Edge Preparation

Types of Edges

The choice of edge depends on:

- the thickness of the metal
- the type of joint and
- the type of weld
- requirement of welding strength

The most common types of edge preparation are:

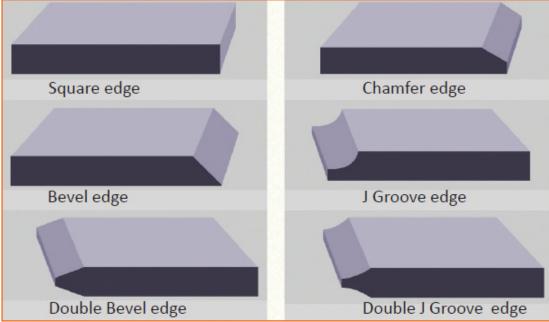


Fig. 5.5.2: Types of Edges

Do



- Ask about their understanding about the edge preparation and methods of edge preparation.
- Explain edge preparation methods.
- Show them samples of different types of edges.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 5.6: Fit Up

Unit Objectives



At the end of this unit, you will be able to:

- 1. Understand purpose and method of fit up;
- 2. To form the component as per the drawing.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant manual.
- PC with LCD Projector or Flip chart
- Workpiece, bend rod and welding setup



Greet and welcome the participants to the next unit of the program.



- A proper fit up is important if a good weld is to be made.
- Every fit up has edge preparation:
 - o The joint is brought to the required shape and dimension as per the drawing
 - Avoids disturbance of alignment of the joint during welding

Demonstrate



Steps for Actual Fit Up



Step 1: To arrange the components that we need.

Components are kept side by side on a levelled surface.

- With a try square the level of the surface is checked.
- The ends are checked to see if they are properly aligned.
- Step 3: Next, a bent rod is inserted at the side where the welding will end.
- Step 4: The alignment of the front and the back of the metals to be welded, are checked and adjusted accordingly.
- **Step 5:** The bridge plates are tacked.
- Step 6: The second bridge plate is also placed and tacked as done for the first bridge plate.
- **Step 7:** The rods are removed and the test coupon is made to stand on the bridge.
- Step 8: The runoff and run on pads are attached.

Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Skill Practice	Time	Resources
Making fitup	2 hours	Workpiece, bend rod, welding setup



- Divide the class into pairs.
- Go around and make sure they are doing it properly.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 5.7: Welding Demonstration

Unit Objectives



At the end of this unit, you will be able to:

1. Run a bead along a pre-defined path in different positions in different modes of transfer.

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Welding tools and equipment
- Personal Protective Equipment



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- In this session we are going to run welding beads on workpiece in different positions and metal transfer modes.
- We will learn about different parameters settings need to done during the welding of different size workpiece.



- Summarize the main points.
- Demonstrate them how to run a weld bead on wokpiece in different positions and in different transfer modes.
- Ask each participants to come and run a bead on the workpiece
- Encourage them to ask questions.
- Answer their queries satisfactorily.

5.7.1: Run a Bead in 1F Position (Short Circuit Mode of Transfer)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- **Bucket of water**
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Carbon dioxide (CO₂)
- Regulator
- Flow meter
- Personal Protective Equipment



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.





For short circuit mode of transfer parameters are:

Filler wire	0.8 mm
Gas	CO ₂
Current	160 amps
Wire feed speed	320 inches/min (8.13 meters)
Voltage	20 volts
Gas flow rate	16 litres /minute
Stick-out	12 to 15 mm
Welding /Travel speed	250 mm/min
Joint position	1F
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Base material	3 mm MS Plate

Demonstrate 🔄



Procedure to Run a Bead

- 1. Wear the PPE.
- 2. Set the machine for striking a GMAW arc.
- 3. Set up the parameters for laying a bead in 1F position.
- 4. Take a level plate and place it in down hand 1F position.
- 5. Draw a straight line using a chalk and a scale.
- 6. Strike an arc from one end of the straight line and start a running bead.
- 7. Complete the running bead till you reach the end of the straight line.
- 8. Release the torch switch to bring all functions to a stop.

Notes for Facilitation



Summarize the main points.

- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

5.7.2: Run a Bead in 1F position (Globular Transfer Mode)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Carbon dioxide (CO₂)
- Regulator
- Flow meter
- Personal Protective Equipment

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



For globular mode of transfer parameters are:

Filler wire	1.2 mm
Gas	CO ₂
Current	230 amps
Wire feed speed	230 inches/min (5.85 meters)
Voltage	25 volts
Gas flow rate	16 litres /minute

Stick-out	12 to 15 mm
Welding /Travel speed	250 - 300 mm/min
Joint position	1F
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Wire consumable	ER 70S6 diameter 1.2 mm
Base material	3 mm MS Plate

Demonstrate 🛱



Procedure to Run a Bead

- 1. Wear the PPE.
- 2. Set the machine for striking a GMAW arc.
- 3. Set up the parameters for laying a bead in 1F position.
- 4. Take a level plate and place it in down hand 1F position.
- 5. Draw a straight line using a chalk and a scale.
- 6. Strike an arc from one end of the straight line and start a running bead.
- 7. Complete the running bead till you reach the end of the straight line.
- 8. Release the torch switch to bring all functions to a stop.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

5.7.3: Run a Bead in 1F position (Spray Transfer Mode)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Argon CO₂ mixed gas
- Regulator
- Flow meter
- Personal Protective Equipment

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



For globular mode of transfer parameters are:

Filler wire	1.2 mm
Gas	80/20, Argon CO ₂ mixed gas
Current	260 amps
Wire feed speed	260 inches/min (6.6 meters)
Voltage	27 volts
Gas flow rate	16 litres /minute

Stick-out	15 to 18 mm
Welding /Travel speed	250 - 300 mm/min
Joint position	1F
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Wire consumable	ER 70S6 diameter 1.2 mm
Base material	8 mm – 10 mm MS Plate

Demonstrate



Procedure to Run a Bead

- 1. Wear the PPE.
- 2. Set the machine for striking a GMAW arc.
- 3. Set up the parameters for laying a bead in 1F position.
- 4. Take a level plate and place it in down hand 1F position.
- 5. Draw a straight line using a chalk and a scale.
- 6. Strike an arc from one end of the straight line and start a running bead.
- 7. Complete the running bead till you reach the end of the straight line.
- 8. Release the torch switch to bring all functions to a stop.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

5.7.4: Fillet Weld in 2F Position (Spray Transfer Mode)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plate
- MIG filler wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- · Earth cable with clamp
- Helmet with shaded glass
- Argon CO₂ mixed gas
- Regulator
- Flow meter
- Personal Protective Equipment

Do



 Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



For spray transfer mode parameters are:

Filler wire	1.2 mm
Gas	80/20, Argon CO ₂ mixed gas
Current	260 amps
Wire feed speed	260 inches/min (6.6 meters)
Voltage	27 volts

Gas flow rate	16 litres /minute
Stick-out	15 to 18 mm
Welding /Travel speed	250 - 300 mm/min
Joint position	2F
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Wire consumable	ER 70S6 diameter 1.2 mm
Base material	8 mm – 10 mm MS Plate

Demonstrate



Procedure to Run a Bead

- 1. Wear the PPE.
- 2. Set the machine for striking a GMAW arc.
- 3. Set the parameters for striking a GMAW arc in 2F position.
- 4. Using a chalk, draw a line parallel to the length of a plate at 25 mm from the sides.
- 5. Place another plate vertically on the line so drawn to form a 'T'. Hold the plate.
- 6. Tack the plate which is formed as a 'T' at one corner that is at the start and remove your hand.
- 7. Use a try square to ensure 90 degree position. Run the try square through the length of the joint to ensure the verticality.
- 8. Tack the plate which is formed as a 'T' at the end of the joint.
- 9. Now the fit up is ready to do the fillet weld in 2F position.
- 10. Place the fit up plate on a table in 2F position.
- 11. Orient the torch at 45 degrees focusing on the root. The aim is to do the welding by fusing the root using push technique.
- 12. Start the welding.
- 13. Complete the running bead till you reach the end of the plate.
- 14. Check penetration by macro section.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

5.7.5: Running a Parallel Bead in 1F Position (Short Circuit Mode of Transfer)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Carbon dioxide (CO₂)
- Regulator
- Flow meter
- Personal Protective Equipment

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



For spray transfer mode parameters are:

Filler wire	0.8 mm
Gas	CO ₂
Current	160 amps

Wire feed speed	320 inches/min (8.13 meters)
Voltage	20 volts
Gas flow rate	16 litres /minute
Stick-out	12 to 15 mm
Welding /Travel speed	250 mm/min
Joint position	1F
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Wire consumable	ER 70S6 diameter 1.2 mm
Base material	3 mm MS Plate



- The width of the running bead on both runs should be uniform from start to finish. This signifies that your hand is steady.
- The 2nd run should be absolutely parallel to the first run. This signifies that you are able to bring out the output exactly the way you visualised.
- The height or reinforcement of the bead should be uniform from start to finish. This signifies good hand-eye coordination and synchronisation of feeding of filler material.

Demonstrate 🗀



Procedure to run a parallel bead in 1F position

- 1. Wear the PPE.
- 2. Set the machine for striking a GMAW arc.
- 3. Set up the parameters for striking a GMAW arc.
- 4. Take a level plate and place it in down hand 1F position.
- 5. Draw a straight line using a chalk and a scale.
- 6. Strike an arc from one end of the straight line and start a running bead.
- 7. Complete the running bead till you reach the end of the straight line.

- 8. Release the torch switch to bring all functions to a stop.
- 9. Position the torch, say, 10 milli-meters from the start of the earlier bead. Use the earlier bead as a guide to run another bead parallel to the first.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

5.7.6: Merging a Bead in 1F Position (Short Circuit Mode of Transfer)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- · Helmet with shaded glass
- Carbon dioxide (CO₂)
- Regulator
- Flow meter
- Personal Protective Equipment

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Elaborate



Weld is classified into Fillet Weld and Groove Weld.

The various parts of weld are:

- **Face:** The face represents the insides of the weld. If the face is good, the weld can be expected to be sound.
- Toe: Toe of the weld takes the entire load of the weld. A well done toe doesn't have any undercuts.
- Throat: The throat, also called penetration, is normally defined by the leg length.

- **Reinforcement:** The height to which the bead is protruding from the surface of the plate is the reinforcement.
- Leg Length: The distance from the root to the toe of the fillet weld. Leg length determines the size of fillet weld. The leg length should be uniform.

Say



For short circuit mode of transfer parameters are:

Filler wire	0.8 mm
Gas	CO ₂
Current	160 amps
Wire feed speed	320 inches/min (8.13 meters)
Voltage	20 volts
Gas flow rate	16 litres /minute
Stick-out	12 to 15 mm
Welding /Travel speed	250 mm/min
Joint position	1F
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Wire consumable	ER 70S6 diameter 1.2 mm
Base material	3 mm MS Plate

Tips



- The merged pad should have a uniform height of deposit of weld metal.
- There should not be any deep grooves. To find this out, run a sharp tool on the beads. If the tool is stuck in the beads, it means the groove is deep, which is not preferable.
- Voids are under filled pockets. There should not be any voids.

Demonstrate



Procedure to merge a bead is

- 1. Wear the PPE.
- 2. Set the machine for striking a GMAW arc.
- 3. Set up the parameters for laying a bead in 1F position.
- 4. Take a level plate and place it in downhand 1F position.
- 5. Draw a straight line using a chalk and a scale.
- 6. Strike an arc from one end of the straight line and start a running bead.
- 7. Complete the running bead till you reach the end of the straight line.
- 8. Release the torch switch to bring all functions to a stop.
- 9. Start the second run. Focus the arc on the toe of the 1st run. Form a bead in such a way that 50% of it is over the 1st bead and rest 50% is on the base plate.
- 10. Continue in the same way till you complete the pad of defined size.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

5.7.7: Root Run in 1G Position (Short Circuit Mode of Transfer)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plates (2 numbers)
- MS rod
- Chipping hammer
- Work table connected to earth
- **Bucket of water**
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Carbon dioxide (CO₂)
- Regulator
- Flow meter
- Personal Protective Equipment



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



For short circuit mode of transfer parameters are:

Filler wire	0.8 mm
Gas	CO ₂
Current	160 amps
Wire feed speed	320 inches/min (8.13 meters)
Voltage	20 volts

Gas flow rate	16 litres /minute
Stick-out	12 to 15 mm
Welding /Travel speed	250 mm/min
Joint position	1G
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Wire consumable	ER 70S6 diameter 1.2 mm
Base material	3 mm MS Plate

Demonstrate



Procedure to run a bead is

- 1. Wear the PPE.
- 2. Set the machine for striking a GMAW arc.
- 3. Place both the plates on a levelled surface in the down hand 1G position.
- 4. Check the level of the plate using a try square.
- 5. Keep a gap of 2 mm at the start and 3.15 mm at the finish between the two plates. Ensure the same by inserting the correct size rods at the respective ends.
- 6. Tack weld at the start, middle and the end while maintaining a gap of 2 mm at start and 3.15 mm at the finishing end.
- 7. Remove the rods and start welding from the start point to the finish point using keyhole technique.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

5.7.8: Lap Joint in Inclined Position (Short Circuit Mode of Transfer)

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild Steel Plate
- MIG filler wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Gas cylinder
- Regulator
- Flow meter
- Personal Protective Equipment

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



For short circuit mode of transfer parameters are:

Filler wire	0.8 mm
Gas	CO ₂
Current	160 amps
Wire feed speed	320 inches/min (8.13 meters)
Base material	3 mm MS Plate

Voltage	20 volts
Gas flow rate	16 litres /minute
Stick-out	12 to 15 mm
Welding /Travel speed	250 mm/min
Joint position	Inclined
Torch (angle and technique)	Push or Pull technique
Torch weaving	Yes/No
Wire consumable	ER 70S6 diameter 1.2 mm
Base material	3 mm MS Plate

Demonstrate 🗓



Procedure to Lap Joint on 3 mm Plate in Inclined Position

- 1. The procedure for making this weld is similar to that used for making fillet welds in T joints.
- 2. The electrode should be held to form an angle approximately 30° from the vertical and tilted 15° in the direction of welding.
- 3. The position of the electrode in relation to the plates is shown in the given figure.
- 4. The aim is to do the welding by using push or pull technique.
- 5. Start the welding.
- 6. Complete the running bead till you reach the end of the plate.
- 7. Repeat the same exercise by keeping the plates in an inclined position.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 5.8: Welding Practice

Unit Objectives



At the end of this unit, you will be able to:

1. Practice running a bead in different positions in different modes of transfer.

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Welding tools and equipment
- Personal Protective Equipment



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- In this session we are going to do practice of running welding beads on workpiece in different positions and metal transfer modes.
- We will practice different parameters settings need to done during the welding of different size workpiece.



- Summarize the main points.
- Encourage them to run a weld bead on wokpiece in different positions and in different transfer modes.
- Ask each participants to come and run a bead on the workpiece
- Encourage them to ask questions.
- Answer their queries satisfactorily.

5.8.1: Practice I – Short Circuit Mode of Transfer in 1F Position

Resources to be Used



- Available objects such as pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Shielding gas
- Regulator
- Flow meter
- Personal Protective Equipment

Practical



- Group the participants for the activity.
- Explain the purpose and duration of the activity.
- Activities they have to perform are:
 - o Practice to run a bead on plate in 1F position in short circuit mode of transfer;
 - Practice to run a parallel bead on plate in 1F position in short circuit mode of transfer;
 - Practice to merge a bead on plate in 1F position in short circuit mode of transfer;
 - Practice to lay a root run on plate in 1F position in short circuit mode of transfer.

5.8.1.1: Practice to Run a Bead on Plate in 1F Position in Short Circuit Mode of Transfer

Say



- Today they are going to perform the practical.
- They have to run a bead on plate in 1F position in short circuit mode of transfer.
 - First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to move the torch from right to left i.e. they should use the leftward technique/forward technique/push technique along the chalk line to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple.
- They have to complete atleast 25 meters on workpiece.

Resources to be Used



- · Group the participants for the activity.
- Explain the purpose and duration of the activity.
- Activities they have to perform are:
 - o Practice to run a bead on plate in 1F position in short circuit mode of transfer;
 - o Practice to run a parallel bead on plate in 1F position in short circuit mode of transfer;
 - o Practice to merge a bead on plate in 1F position in short circuit mode of transfer;
 - o Practice to lay a root run on plate in 1F position in short circuit mode of transfer.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.

- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks per line	Marks obtained
Straightness of the bead for each line		
No deviation	2	
Deviation present	0	
Uniformity of width of the bead for each	ch line	
Uniform width (within - 2 mm in size)	2	
Not uniform	0	
Uniformity of height of the bead for ea	ch line	
Uniform height (within - 2 mm in size)	2	
Not uniform	0	
Stops and restart quality for each line		
0-1 stop and restart (smooth finish)	2	
2 or 3 stops and restart (smooth finish)	1	
More than 3 stops and restarts	0	
Defects: Undercut and overlap for each line		
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Total	10	

• Trainer has to give comments at the end of practical.

Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.1.2: Practice to Run a Parallel Bead on Plate in 1F Position in Short Circuit Mode of Transfer

Say



- Now they have to perform another welding activity.
- They have to run a parallel bead on plate in 1F position in short circuit mode of transfer.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to move the torch along the chalk line using the push technique to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple.
- The beads need to be laid keeping a spacing of 5 to 10 mm in such a way that the second bead shall run parallel to the first one.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained	
Follow the chalk line without any devia	Follow the chalk line without any deviation		
No deviation	2		
Deviation present	0		
Parallelism of the second run with respect to the first run			
More than 2 inconsistencies	0		
0-2 inconsistencies	1		
Missed 0 to 2 steps	2		

Uniformity of bead width		
Uniform width (within - 2 mm in size)	2	
Not uniform	0	
Uniformity of height of the bead		
Uniform height (within - 2 mm in size)	2	
Not uniform	0	
Defects: Undercut and overlap for each line		
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Total	10	

Trainer has to give comments at the end of practical.

– Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.1.3: Practice to Merge a Bead on Plate in 1F Position in Short Circuit Mode of Transfer

Say



- Now they have to perform another welding activity.
- They have to merge a bead on plate in 1F position in short circuit mode of transfer.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to use push technique along the chalk line to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple. They should focus on the toe of the first bead to have a smooth overlap/merging of bead.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Follow the chalk line without any deviation		
No deviation	2	
Deviation present	0	
Uniformity of the bead merging with the previous bead void of defects like undercut and under-fill.		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
Missed 0 to 2 steps	2	

Uniformity of height of the bead		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
Missed 0 to 2 steps	2	
Defects: Undercut and overlap for each	ı line	
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Start and stops for the weld pad		
More than 3 stops and restarts	0	
2-3 stops and restarts (smooth finish)	1	
0-1 stop and restart (smooth finish)	2	
Total	10	

• Trainer has to give comments at the end of practical.

- Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.1.4: Practice to Root Run in 1F Position in Short Circuit Mode of Transfer

Say

6

- Now they have to perform another welding activity.
- They have to root run a bead in 1F position in short circuit mode of transfer.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to make the fit-up which consists of the following procedure:
 - I. Take the two base plates.
 - II. Have a gap of 2.5 mm at the start and 3.15 mm at the end by inserting suitable inserts.
 - III. Make a bridge using the filler material at the start and at the end between the two individual plates to be joined.
 - IV. Place a bridge after every inch so that the plate remains in position for the activity to be performed.
- Follow keyhole technique to lay a running bead using filler material to have a full penetration weld.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Setting Up the Parameters		
1 or more mistakes	2	
No mistakes	0	

Fit-up		
1 and more inconsistencies	0	
No inconsistencies	2	
Uniform root bead ensuring full penet	ration. No visible edges of the i	ndividual plates to be sighted
from beneath after welding.		
2 and more inconsistencies	0	
1 inconsistency	1	
Full penetration	2	
Uniformity of the width and the height	of the bead along the run	
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
No inconsistencies	2	
Defects: Undercut and overlap for each line		
0 defects	2	
Up to 2 defects	1	
More than 2	0	
Total	10	

• Trainer has to give comments at the end of practical.

- Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.2: Practice II – Short Circuit Mode of Transfer in 1G Position

Resources to be Used



- Available objects such as pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Shielding gas
- Regulator
- Flow meter
- Personal Protective Equipment

Practical |



- Group the participants for the activity.
- Explain the purpose and duration of the activity.
- Activities they have to perform are:
 - Practice to run a bead on plate in 1G position in short circuit mode of transfer;
 - o Practice to run a parallel bead on plate in 1G position in short circuit mode of transfer;
 - o Practice to merge a bead on plate in 1G position in short circuit mode of transfer;
 - Practice to lay a root run on plate in 1G position in short circuit mode of transfer.

5.8.2.1: Practice to Run a Bead on Plate in 1G Position in Short Circuit Mode of Transfer

Say



- Today they are going to perform the practical.
- They have to run a bead on plate in 1G position in short circuit mode of transfer.
- First they have to make the notes in their notebook:
- o Material required
- o Procedure
- o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to move the torch from right to left i.e. they should use the leftward technique/forward technique/push technique along the chalk line to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks per line	Marks obtained	
Straightness of the bead for each line	Straightness of the bead for each line		
No deviation	2		
Deviation present	0		
Uniformity of width of the bead for each line			
Uniform width (within - 2 mm in size)	2		
Not uniform	0		
Uniformity of height of the bead for each line			
Uniform height (within - 2 mm in size)	2		

Not uniform	0	
Stops and restart quality for each line		
0-1 stop and restart (smooth finish)	2	
2 or 3 stops and restart (smooth finish)	1	
More than 3 stops and restarts	0	
Defects: Undercut and overlap for each line		
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Total	10	

• Trainer has to give comments at the end of practical.

– Summarize 🔎



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.2.2: Practice to Run a Parallel Bead on Plate in 1G Position in Short Circuit Mode of Transfer

Say



- Now they have to perform another welding activity.
- They have to run a parallel bead on plate in 1G position in short circuit mode of transfer.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to move the torch along the chalk line using the push technique to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple.
- The beads need to be laid keeping a spacing of 5 to 10 mm in such a way that the second bead shall run parallel to the first one.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Follow the chalk line without any deviation		
No deviation	2	
Deviation present	0	
Parallelism of the second run with respect to the first run		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
Missed 0 to 2 steps	2	

Uniformity of bead width			
Uniform width (within - 2 mm in size)	2		
Not uniform	0		
Uniformity of height of the bead			
Uniform height (within - 2 mm in size)	2		
Not uniform	1		
Defects: Undercut and overlap for each line			
Up to 2 defects	2		
3 or 4 defects	1		
More than 4	0		
Total	10		

• Trainer has to give comments at the end of practical.

- Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.2.3: Practice to Merge a Bead on Plate in 1G Position in Short Circuit Mode of Transfer

Say



- · Now they have to perform another welding activity.
- They have to merge a bead on plate in 1G position in short circuit mode of transfer.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to use push technique along the chalk line to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple. They should focus on the toe of the first bead to have a smooth overlap/merging of bead.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained	
Follow the chalk line in the first run without any deviation			
No deviation	2		
Deviation present	0		
Uniformity of the bead merging with the previous bead void of defects like undercut and under-fill.			
More than 2 inconsistencies	0		
0-2 inconsistencies	1		
Missed 0 to 2 steps	2		

Uniformity of height of the bead		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
Missed 0 to 2 steps	2	
Defects: Undercut and overlap for each	n line	
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Start and stops for the weld pad		
More than 3 stops and restarts	0	
2-3 stops and restarts (smooth finish)	1	
0-1 stop and restart (smooth finish)	2	
Total	10	

Trainer has to give comments at the end of practical.

– Summarize 🗵



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.2.4: Practice to Root Run in 1G Position in Short Circuit Mode of Transfer

Say



- Now they have to perform another welding activity.
- They have to root run a bead in 1G position in short circuit mode of transfer.
- First they have to make the notes in their notebook:
 - Material required
 - o Procedure
 - Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to make the fit-up which consists of the following procedure:
 - I. Take the two base plates.
 - II. Have a gap of 2.5 mm at the start and 3.15 mm at the end by inserting suitable inserts.
 - III. Make a bridge using the filler material at the start and at the end between the two individual plates to be joined.
 - IV. Place a bridge after every inch so that the plate remains in position for the activity to be performed.
- Follow keyhole technique to lay a running bead using filler material to have a full penetration weld.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Setting Up the Parameters		
1 or more mistakes	0	
No mistakes	2	

Fit-up		
1 and more inconsistencies	0	
No inconsistencies	2	
Uniform root bead ensuring full penet from beneath after welding.	ration. No visible edges of the i	ndividual plates to be sighted
2 and more inconsistencies	0	
1 inconsistency	1	
Full penetration	2	
Uniformity of the width and the height	of the bead along the run	
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
No inconsistencies	2	
Defects: Undercut and overlap for each line		
0 defects	2	
Up to 2 defects	1	
More than 2	0	
Total	10	

Trainer has to give comments at the end of practical.

- Summarize 🗵



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.3: Practice III – Lap Joint in Inclined Position (Short Circuit Mode of Transfer)

Resources to be Used



- Available objects such as pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- · Shielding gas
- Regulator
- Flow meter
- Personal Protective Equipment

Practical



- Group the participants for the activity.
- Explain the purpose and duration of the activity.
- Activities they have to perform are:
 - o Practice lap joint on 3 mm plate in inclined position using open arc, 0.8 mm wire and CO2.



Say



- Today they are going to perform the practical.
- They have to make lap joint on 3 mm plate in inclined position using open arc, 0.8 mm wire and CO₂.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to make the fit-up which consists of the following procedure:
 - I. Take the two base plates.
 - II. Have a gap of 2.5 mm at the start and 3.15 mm at the end by inserting suitable inserts.
 - III. Make a bridge using the filler material at the start and at the end between the two individual plates to be joined.
 - IV. Place a bridge after every inch so that the plate remains in position for the activity to be performed.
- Follow keyhole technique to lay a running bead using filler material to have a full penetration weld.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks per line	Marks obtained
Uniform leg length		
More than 2 inconsistencies	0	
1-2 inconsistencies	3	
No inconsistencies	6	
Defects		
2 or more defects	0	
Less than two defects	1	
No defects	2	

Smooth uniform bead with fine ripples		
More than 2 inconsistencies	0	
1-2 inconsistencies	1	
No inconsistencies	2	
Total	10	

Trainer has to give comments at the end of practical.

- Summarize 🗵



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.4: Practice IV – Spray Transfer Mode in 1G Position

Resources to be Used



- Available objects such as pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Shielding gas
- Regulator
- Flow meter
- Personal Protective Equipment

Practical



- Group the participants for the activity.
- Activities they have to perform are:
 - Practice to run a bead on plate in 1G position in spray transfer mode;
 - Practice to run a parallel bead on plate in 1G position in spray transfer mode;
 - Practice to merge a bead on plate in 1G position in spray transfer mode;
 - Practice to lay a root run on plate in 1G position in spray transfer mode.

5.8.4.1: Practice to Run a Bead on Plate in 1G Position in Spray Transfer Mode

Say



- Today they are going to perform the practical.
- They have to run a bead on plate in 1G position in spray transfer mode.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for spray transfer mode
- Now they have to start the welding procedure on workpiece.
- They have to move the torch from right to left i.e. they should use the leftward technique/forward technique/push technique along the chalk line to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks per line	Marks obtained
Straightness of the bead for each line		
No deviation	2	
Deviation present	0	
Uniformity of width of the bead for each line		
Uniform width (within - 2 mm in size)	2	
Not uniform	0	
Uniformity of height of the bead for each line		
Uniform height (within - 2 mm in size)	2	
Not uniform	0	

Stops and restart quality for each line		
0-1 stop and restart (smooth finish)	2	
2 or 3 stops and restart (smooth finish)	1	
More than 3 stops and restarts	0	
Defects: Undercut and overlap for each line		
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Total	10	

Trainer has to give comments at the end of practical.

- Summarize 🗵



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.4.2: Practice to Run a Parallel Bead on Plate in 1G Position in Spray Transfer Mode

Say



- Now they have to perform another welding activity.
- They have to run a parallel bead on plate in 1G position in spray transfer mode.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for spray transfer mode
- Now they have to start the welding procedure on workpiece.
- They have to move the torch along the chalk line using the push technique to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple.
- The beads need to be laid keeping a spacing of 5 to 10 mm in such a way that the second bead shall run parallel to the first one.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Follow the chalk line without any devia	ation	
No deviation	2	
Deviation present	0	
Parallelism of the second run with respect to the first run		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
Missed 0 to 2 steps	2	

Uniformity of bead width		
Uniform width (within - 2 mm in size)	2	
Not uniform	0	
Uniformity of height of the bead		
Uniform height (within - 2 mm in size)	2	
Not uniform	0	
Defects: Undercut and overlap for each line		
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Total	10	

Trainer has to give comments at the end of practical.

- Summarize 🔎



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.4.3: Practice to Merge a Bead on Plate in 1G Position Using **Spray Transfer Mode**

- Now they have to perform another welding activity.
- They have to merge a bead on plate in 1G position in spray transfer mode.
- First they have to make the notes in their notebook:
 - Material required
 - o Procedure
 - o Parameters for spray transfer mode
- Now they have to start the welding procedure on workpiece.
- They have to use push technique along the chalk line to form a continuous, smooth, reinforced, liquid bead of uniform height and width exhibiting a smooth ripple. They should focus on the toe of the first bead to have a smooth overlap/merging of bead.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Follow the chalk line in the first run wi	thout any deviation	
No deviation	2	
Deviation present	0	
Uniformity of the bead merging with the previous bead void of defects like undercut and under-fill.		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
Missed 0 to 2 steps	2	

Uniformity of height of the bead		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
Missed 0 to 2 steps	2	
Defects: Undercut and overlap for each	n line	
Up to 2 defects	2	
3 or 4 defects	1	
More than 4	0	
Start and stops for the weld pad		
More than 3 stops and restarts	0	
2-3 stops and restarts (smooth finish)	1	
0-1 stop and restart (smooth finish)	2	
Total	10	

• Trainer has to give comments at the end of practical.

- Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.4.4: Practice to Root Run in 1G Position in Spray Transfer Mode

Say



- Now they have to perform another welding activity.
- They have to root run a bead in 1G position in spray transfer mode.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for spray transfer mode
- Now they have to start the welding procedure on workpiece.
- They have to make the fit-up which consists of the following procedure:
 - I. Take the two base plates.
 - II. Have a gap of 2.5 mm at the start and 3.15 mm at the end by inserting suitable inserts.
 - III. Make a bridge using the filler material at the start and at the end between the two individual plates to be joined.
 - IV. Place a bridge after every inch so that the plate remains in position for the activity to be performed.
- Follow keyhole technique to lay a running bead using filler material to have a full penetration weld.
- They have to complete atleast 25 meters on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Setting Up the Parameters		
1 or more mistakes	0	
No mistakes	2	

Fit-up		
1 and more inconsistencies	0	
No inconsistencies	2	
Uniform root bead ensuring full penet	ration. No visible edges of the i	ndividual plates to be sighted
from beneath after welding.		
2 and more inconsistencies	0	
1 inconsistency	1	
Full penetration	2	
Uniformity of the width and the height of the bead along the run		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
No inconsistencies	2	
Defects: Undercut and overlap for each line		
0 defects	2	
Up to 2 defects	1	
More than 2	0	
Total	10	

• Trainer has to give comments at the end of practical.

- Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.5: Practice V – Spray Transfer Mode in 2F Position

Resources to be Used



- Available objects such as pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Shielding gas
- Regulator
- Flow meter
- Personal Protective Equipment

Practical



- Group the participants for the activity.
- Explain the purpose and duration of the activity.
- Activities they have to perform are:
 - o Practice fillet weld on 8 mm plate in 2F position using 1.2 mm wire using spray transfer mode.

Say



- Today they are going to perform the practical.
- They have to make fillet weld on 8 mm plate in 2F position using 1.2 mm wire using spray transfer mode.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for spray transfer mode
- Now they have to start the welding procedure on workpiece.
- They have to follow the following procedure:
 - 1. Striking the GMAW arc.
 - 2. Preparation of the fit up.
 - i. Take a base plate of size 8 mm and draw a line in the centre.
 - ii. Take the other base plate and place it vertically over the line ensuring the perpendicular position.
 - iii. Hold it in the above position and place a tack weld at the intersection at one end of the plate and run a tri-square to ensure the perpendicular position. Ensure no gap between the two plates.
 - iv. Place a tack weld on the other end of the plate intersection.
- 3. Place the plate in 2F position horizontal position.
- 4. Locate the torch so that it focuses the root of the T joint making an angle of 45 degrees either to the base plate or the vertical plate.
- 5. Orient the torch at 45 degrees focusing on the root. The aim is to do the welding by fusing the root using the leftward technique, forward technique or push technique. Alignment of the torch is complete.
- 6. Strike a GMAW arc and form weld bead so that it has equal leg length and progress the bead all through the length of the joint.
- 7. Check penetration by macro section.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.

- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks per line	Marks obtained
Uniform leg length		
More than 2 inconsistencies	0	
1-2 inconsistencies	3	
No inconsistencies	6	
Defects		
2 or more defects	0	
Less than two defects	1	
No defects	2	
Smooth uniform bead with fine ripples		
More than 2 inconsistencies	0	
1-2 inconsistencies	1	
No inconsistencies	2	
Total	10	

Trainer has to give comments at the end of practical.

Summarize 2



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.6: Practice VI – Test Plate Welding (Lap and Square Butt) 3 mm plate, 0.8 mm wire and CO_2 in Inclined Position Using Short Circuit Mode of Transfer

Resources to be Used



- · Available objects such as pen, notebook,
- Mild Steel Plate
- MIG wire
- · Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- · Complete MIG welding outfit
- · Earth cable with clamp
- Helmet with shaded glass
- Shielding gas
- Regulator
- Flow meter
- Personal Protective Equipment

Practical



- Group the participants for the activity.
- Explain the purpose and duration of the activity.
- Activities they have to perform are:
 - o Practice lap joints on 3 mm plate in inclined position using an open arc, 0.8 mm wire and CO₂ using short circuit mode of transfer;
 - o Prepare a square butt joint on 3 mm sheet using short circuit mode of transfer with 0.8 mm wire and ${\rm CO}_2$.

5.8.6.1: Test Plate Welding – Lap Joint in Inclined Position Using an Open Arc, 0.8 mm Wire and CO₂ Using Short Circuit Mode of Transfer

Say



- Today they are going to perform the practical.
- They have to make lap joints on 3 mm plate in inclined position using an open arc, 0.8 mm wire and CO₃ using short circuit mode of transfer.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.
- They have to follow the following procedure:
 - 1. Striking the GMAW arc.
 - 2. Preparation of the fit up.
 - 3. Place the plate in inclined position.
 - 4. Locate the torch so that it focuses the root of the joint making an angle of 30 degrees from the vertical and tilted 15 degrees in the direction of welding. The aim is to do the welding by fusing the root using the push or pull technique.
 - 5. Strike an arc and form weld bead so that it has equal leg length and progress the bead all through the length of the joint.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks per line	Marks obtained
Uniform leg length		
More than 2 inconsistencies	0	
1-2 inconsistencies	3	
No inconsistencies	6	
Defects		
2 or more defects	0	
Less than two defects	1	
No defects	2	
Smooth uniform bead with fine ripples		
More than 2 inconsistencies	0	
1-2 inconsistencies	1	
No inconsistencies	2	
Total	10	

Trainer has to give comments at the end of practical.

– Summarize 🗵



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.6.2: Test Plate Welding – Square Butt Joint on 3 mm Sheet Using Short Circuit Mode of Transfer with 0.8 mm Wire and CO₃

Say

6

- Today they are going to perform the practical.
- They have to make a square butt joint on 3 mm sheet using short circuit mode of transfer with 0.8 mm wire and CO₂.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for short circuit mode of transfer
- Now they have to start the welding procedure on workpiece.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.
- Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks/parameter	Marks obtained
Setting Up the Parameters		
1 or more mistakes	0	
No mistakes	2	
Fit-up		
1 and more inconsistencies	0	
No inconsistencies	2	
Uniform root bead ensuring full penetration. No visible edges of the individual plates to be sighted from beneath after welding.		
2 and more inconsistencies	0	
1 inconsistency	1	
Full penetration	2	

Uniformity of the width and the height of the bead along the run		
More than 2 inconsistencies	0	
0-2 inconsistencies	1	
No inconsistencies	2	
Defects: Undercut and overlap for each line		
0 defects	2	
Up to 2 defects	1	
More than 2	0	
Total	10	

• Trainer has to give comments at the end of practical.

- Summarize



- Summarize the main points.
- Ask participants if they have any doubts.

5.8.7: Practice VII – Test Plate Welding in 2F Position Using Spray Transfer Mode

Resources to be Used



- Available objects such as pen, notebook,
- Mild Steel Plate
- MIG wire
- Chipping hammer
- Work table connected to earth
- Bucket of water
- Ruler
- Complete MIG welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Shielding gas
- Regulator
- Flow meter
- Personal Protective Equipment

Practical



- Group the participants for the activity.
- Explain the purpose and duration of the activity.
- Activities they have to perform are:
 - o Practice fillet weld on 8 mm plate in 2F position using 1.2 mm wire with spray transfer mode.

Say



- Today they are going to perform the practical.
- They have to make fillet weld on 8 mm plate in 2F position using 1.2 mm wire using spray transfer mode.
- First they have to make the notes in their notebook:
 - o Material required
 - o Procedure
 - o Parameters for spray transfer mode
- Now they have to start the welding procedure on workpiece.
- They have to follow the following procedure:
 - 1. Striking the GMAW arc.
 - 2. Preparation of the fit up.
 - i. Take a base plate of size 8 mm and draw a line in the centre.
 - ii. Take the other base plate and place it vertically over the line ensuring the perpendicular position.
 - iii. Hold it in the above position and place a tack weld at the intersection at one end of the plate and run a tri-square to ensure the perpendicular position. Ensure no gap between the two plates.
 - iv. Place a tack weld on the other end of the plate intersection.
- 3. Place the plate in 2F position horizontal position.
- 4. Locate the torch so that it focuses the root of the T joint making an angle of 45 degrees either to the base plate or the vertical plate.
- 5. Orient the torch at 45 degrees focusing on the root. The aim is to do the welding by fusing the root using the leftward technique, forward technique or push technique. Alignment of the torch is complete.
- 6. Strike a GMAW arc and form weld bead so that it has equal leg length and progress the bead all through the length of the joint.
- 7. Check penetration by macro section.



- Explain the philosophy of making the weld bead on chalk line form path and tell trainees to follow the chalk line.
- Ensure that the participants are given every facility for performing the practical well. For example, the shaded glasses which are attached to their helmets should be checked and replaced time after time so that the stains do not obscure the participant's vision.
- The participant themselves should be conditioned to consider these minute details and make sure everything is in place.

Trainer has to evaluate the trainee work on following parameters and format:

Evaluation parameter	Marks per line	Marks obtained
Uniform leg length		
More than 2 inconsistencies	0	
1-2 inconsistencies	3	
No inconsistencies	6	
Defects		
2 or more defects	0	
Less than two defects	1	
No defects	2	
Smooth uniform bead with fine ripples		
More than 2 inconsistencies	0	
1-2 inconsistencies	1	
No inconsistencies	2	
Total	10	

Trainer has to give comments at the end of practical.

- Summarize



- Summarize the main points.
- Ask participants if they have any doubts.









6. Flux Cored Arc Welding (FCAW)

Unit 6.1 – Principles of Flux Cored Arc Welding (FCAW)



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- 1. Explain why FCAW;
- 2. List the materials required for FCAW;
- 3. Name the types of FCAW filler wire;
- 4. List the process parameters for FCAW.

UNIT 6.1: Principles of Flux Cored Arc Welding (FCAW)

Unit Objectives



At the end of this unit, you will be able to:

- 1. Explain why FCAW;
- 2. List the materials required for FCAW;
- 3. Name the types of FCAW filler wire;
- 4. List the process parameters for FCAW.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant manual.
- PC with LCD Projector or Flip Chart

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



- FCAW process is used for various reasons:
 - o For high strength requirement;
 - o High productivity;
 - o Better shielding shielding provided by gas as well as slag;
 - o Suitable for varieties of materials;
 - o Can tolerate abuses weld even on rusted plates;
 - o Hard surfacing applications.
- Material required for FCAW:
 - o Helmet with shaded glass;
 - Gas cylinder;

- o Power source;
- o Gas hoses;
- o Continuous filler wire flux cored wire;
- o Gas;
- o Interconnection cables;
- o Torch;
- o PPE;
- o Welding cables;
- o Wire feeder;
- o Accessories.
- Different types of FCAW filler wire are:
 - o Self shielding flux cored filler wire;
 - o Gas shielded flux cored filler wire;
 - o Hard surfacing flux cored filler wire either self shielding or gas shielding.
- Classification of filler wires: AWS classification E70T1, E70T2, E71T1 etc.
- Process parameters of FCAW: Similar to globular transfer mode

Ask



- You could ask about FCAW process.
- You could ask about materials required for FCAW process.
- You could ask about different types of filler wire used in FCAW process.
- Ask about parameters setting in FACW process.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 6.2: Welding Demonstration

Unit Objectives



At the end of this unit, you will be able to:

1. Run a bead along a pre-defined path in different positions in different modes of transfer.

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Welding tools and equipment
- Personal Protective Equipment



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- In this session we are going to run FCAW weld beads on workpiece in different positions and metal transfer modes.
- We will learn about different parameters settings need to done during the welding of different size workpiece.



- Summarize the main points.
- Demonstrate them how to run a weld bead on wokpiece in different positions and in different transfer modes.
- Ask each participants to come and run a bead on the workpiece
- Encourage them to ask questions.
- Answer their queries satisfactorily.

6.2.1: FCAW - Butt Weld on 8 mm Plate in 2G Position

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild steel plates of size 8 mm X 50 mm X 200 mm
- Flux cored filler wire of size 1.2 mm specification E 70 T1
- MS rod of size 2.5 and 3.15 mm
- Chipping hammer
- Tri-square
- Table connected to the ground
- **Bucket of water**
- Chalk piece
- Ruler
- FCAW welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Gas cylinder
- Regulator
- Flow meter
- Personal Protective Equipment



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



Required parameters are:

Filler wire	1.2 mm
Gas	CO ₂
Current	250-260 amps

Wire feed speed	320 - 340 inches/min (8.12 - 8.64 meters)
Voltage	28 - 30 volts
Gas flow rate	16 – 18 litres /minute
Stick-out	22 to 25 mm
Welding /Travel speed	280 - 300 mm/min
Joint position	2G
Torch (angle and technique)	Push or Pull technique
Torch weaving	No
Wire consumable	E 70 T-1 diameter 1.2 mm
Base material	8 mm MS Plate

Demonstrate 🔄



Procedure to do butt weld on 8 mm plate in 2G position

- 1. Wear the PPE.
- 2. Set the machine for striking a FCAW arc.
- 3. Set the parameters for striking a FCAW arc in 2G position.
- 4. Do a fit up in 2G position.
- 5. Maintain a gap of 2 mm at the start and 3.15 mm at the finish between the two plates, by inserting the appropriate rods.
- 6. Tack weld at the start, middle and the end. Ensure that the gaps at the start and finishing end are maintained.
- 7. Remove the rods and place the plate in the 2G position.
- 8. Start welding from the start point to the finish point using keyhole technique.
- 9. Check for full penetration.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

6.2.2: FCAW - Fillet Weld on 8 mm Plate in 2F Position

Resources to be Used



- Available objects such as a duster, pen, notebook,
- Mild steel plates of size 8 mm X 50 mm X 200 mm
- Flux cored filler wire of size 1.2 mm specification E 70 T1
- MS rod of size 2.5 and 3.15 mm
- Chipping hammer
- Tri-square
- Table connected to the ground
- **Bucket of water**
- Chalk piece
- Ruler
- FCAW welding outfit
- Earth cable with clamp
- Helmet with shaded glass
- Gas cylinder
- Regulator
- Flow meter
- Personal Protective Equipment



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.





Required parameters are:

Filler wire	1.2 mm
Gas	CO ₂
Current	250-260 amps
Wire feed speed	320 - 340 inches/min (8.12 - 8.64 meters)
Voltage	28 - 30 volts
Gas flow rate	16 – 18 litres /minute
Stick-out	22 to 25 mm
Welding /Travel speed	280 - 300 mm/min
Joint position	2F
Torch (angle and technique)	Push or Pull technique
Torch weaving	No
Wire consumable	E 70 T-1 diameter 1.2 mm
Base material	8 mm MS Plate

Demonstrate



Procedure to do fillet weld on 8 mm plate in 2F position

- 1. Wear the PPE.
- 2. Set the machine for striking a FCAW arc.
- 3. Set the parameters for striking a FCAW arc in 2F position.
- 4. Using a chalk, draw a line parallel to the length of a plate at 25 mm from the sides.
- 5. Place another plate vertically on the line so drawn to form a 'T'. Hold the plate.
- 6. Tack the plate which is formed as a 'T' at one corner that is at the start and remove your hand.
- 7. Use a try square to ensure 90 degree position. Run the try square through the length of the joint to ensure the verticality.
- 8. Tack the plate which is formed as a 'T' at the end of the joint.
- 9. Now the fit up is ready to do the fillet weld in 2F position.
- 10. Place the fit up plate on a table in 2F position.
- 11. Orient the torch at 45 degrees focusing on the root. The aim is to do the welding by fusing the root using push technique.
- 12. Start the welding.
- 13. Complete the running bead till you reach the end of the plate.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.









7. Gas Metal Arc Welding (GMAW) – After Welding

Unit 7.1 – Defects: Definition, Causes and Remedy

Unit 7.2 - Methods of Inspection



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- 1. List the common defects that occur during welding and their causes;
- 2. State the ways to prevent defects;
- 3. Know the classification of inspection methods;
- 4. Learn about the methods of Non Destructive Examination (NDE).

UNIT 7.1: Defects: Definition, Causes and Remedy

Unit Objectives



At the end of this unit, you will be able to:

- 1. List the common defects that occur during welding and their causes;
- 2. State the ways to prevent defects.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant manual.
- PC with LCD Projector or Flip Chart
- Welding defects samples



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- A welding defect is a discontinuity which does not allow the finished joint to withstand or carry the required load.
- All defects are discontinuities but all discontinuities shall not be defects.
- Common defects found in welding are undercut, overlap, slag inclusion, porosity etc.

Flaborate



A defective welded joint will have the following common defects

1. Undercut: A groove at the toe or at the root of the weld on the weld face is called an undercut.

The causes of undercut are:

Excessive amperage - meaning too high current

- Arc length too long
- · Too much weaving of electrode
- Travel speed too high or
- Electrode angle either too big or too small

Ways to repair defect

- The resultant groove with a smaller size electrode can be welded up to fix undercut.
- **2. Overlap:** When metal overflows on to the base metal at the toe or at the root of the weld, it is called overlap.

The causes of overlap are:

- · Current too low
- Incorrect travel speed of the electrode
- Electrode size, that is electrode diameter too large or
- 'Angle of approach' not correct

Ways to prevent defect

- The overlap can be repaired by grinding off excess weld metal and surface grinding the base metal to smoothen it.
- **3. Slag Inclusion:** When any non-metallic material such as slag or other impurities is left behind in a weld, it is called an inclusion.

The causes of inclusion are:

- Slag from previous run not removed
- Low current
- Wrong electrode angle
- Wrong electrode size or T
- Material not prepared properly

Ways to repair the defect

- Grinding down and re-welding.
- **4. Porosity:** When small cavities or holes are formed from gas pockets in the weld metal, either externally or internally, the defect is called porosity.

The causes of porosity are:

- Wet electrodes
- Electrode flux breaking down leading to atmospheric contamination

• Impurities on the surface of the base metal or too high travel speed.

Ways to prevent defect

- Dry the electrodes; reduce the arc length and remove all grease, dirt etc.
- Weld at slower speed to allow gases to escape
- · Grinding down and re-welding.
- **5.** Lack of Fusion: When the weld metal fails to blend completely with the base metal or a weld bead before it, the defect is called lack of fusion or incomplete fusion.

The causes of lack of fusion are:

- Small electrodes used on thick and cold steel
- Not enough heat and so base metal does not melt properly
- Wrong electrode angle and weaving
- Travel speed is too high and there is no enough time for fusion
- Surface of metal not clean

Ways to prevent defect

- Use larger size electrodes, increase amperage, and follow correct welding techniques.
- **6. Incomplete Penetration:** When the weld metal does not penetrate to the root of the joint it is called incomplete penetration.

Causes of incomplete penetration are:

- · Current being too low
- Not enough root gap
- Electrode size is too big
- Improper technique, keyhole technique not followed completely

Ways to prevent defect

- The joint preparation and design must be such that the groove can be reached. Increase the current and select proper electrode size.
- **7. Excessive Penetration:** When the weld metal melts through the base metal and hangs underneath the weld, it is a defect and it is called excessive penetration.

The possible causes of excessive penetration are:

- · Current being too high
- Electrode very big
- Incorrect travel speed

Ways to prevent defect

- The defect can be avoided by keeping the current low, using a smaller electrode and by adjusting the travel speed.
- **8. Burn Through:** When the weld metal melts completely through the base metal and causes holes such that no metal remains, the defect is known as burn through.

Cause of burn through are:

- Low travel speed
- Too much of heat higher current

Ways to prevent defect

- To avoid burn through, the heat must be kept low. Thus a lower current setting should be chosen. The electrode should be smaller and travel speed should be increased.
- **9. Weld Cracking:** Cracks are fractures or breaks that appear in the weld. Cracks will occur in the weld metal when the stresses are more than the ultimate strength of the metal.

Some of the causes are:

- Improper weld termination techniques
- The centre of the weld pool becoming solid before the outside of the weld pool and
- Electrodes may be wet or damp
- Incorrect welding technique and travel speed

Ways to prevent defect

- The crack should be opened till its depth and filled up
- A crack can be stopped from propagating by drilling on start and end of crack and filling the drilled holes.
- **10. Misalignment:** When the parts being welded are not aligned according to specifications, it is a defect and, is called misalignment.

Causes of misalignment can be:

- The parts to be welded have been assembled badly
- Tack welds inadequate or
- · Insufficient damping that results in movement
- Low travel speed
- Too much heat higher current

Ways to prevent defect

• Ensure that all parts are aligned in the correct position before welding begins.

11. Distortion: Distortion cannot be eliminated in any form of welding, though it can be controlled. If the weld metal contracts during welding forcing the base metal to move, it is a defect called distortion.

Possible causes of distortion can be:

- · Non uniform heating and cooling of the joint or
- Excessive heat input
- Incorrect welding technique and travel speed

Ways to prevent defect

- Avoid over welding The bigger the weld, the greater the shrinkage.
- Use a clamp to hold base metal in position.
- Weld in small segments to distribute the heat uniformly over the plates.
- **12. Excessive Spatter:** When there is a lot of scattering of molten metal particles that cool to solid form, near the weld bead it is called excessive spatter.

Causes of excess spatter are:

- The amperage or current is too high for the electrode
- Arc length is too long or voltage is too high
- Low travel speed
- Too much heat higher current

Ways to prevent defect

- Decrease amperage or select larger electrode and
- Reduce arc length or voltage.
- 13. Arc Strike: If the electrode joins the base metal off from the weld accidentally it is called arc striking.

Cause of arc strike:

Due to operator error

Ways to prevent defect

- The operator has to be careful and not touch the electrode on the metal plate at unintended places when the machine is on.
- **14. Tungsten Inclusion:** Tungsten inclusion is a defect which is due to tungsten melting and contaminating the base metal.

This occurs due to:

- Polarity change which leads to melting of the tungsten electrode
- Excessive current for the given diameter of the electrode

Do



- Ask the causes and its remedies of the welding defects.
- Ask what defects are usually found along the toe of a weld?
- Show the welding defects samples



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.

UNIT 7.2: Methods of Inspection

Unit Objectives



At the end of this unit, you will be able to:

- 1. Know the classification of inspection methods;
- 2. Learn about the methods of Non Destructive Examination (NDE).

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, Participant manual.
- PC with LCD Projector or Flip Chart



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- Methods of inspection can be classified into destructive and non destructive examination.
- Destructive testing is carried out on test specimens or on a specimen taken as a representative of several similar ones.
- Destructive tests are costlier because they damage or break the weld.
- Non destructive examination can be done by different methods depending on the requirement.
- In non-destructive testing the weld is not broken or damaged and is therefore a cheaper method of testing.
- Non destructive examination methods are visual examination, dye penetrant test, ultrasonic test and X-Ray test.

Elaborate



Methods of non-destructive examination

- **1. Visual Inspection:** In visual inspection the finished weld should be examined for defects such as undercut, overlap, surface irregularities, cracks, porosity and spatter.
- **2. Dye Penetrant Test:** In dye penetrant test the weld is inspected for cracks, porosity or any other surface defect.
- **3. Ultrasonic Test:** Ultrasonic inspection is used to detect and locate internal defects such as cracks, porosity, inclusions, lack of fusion and incomplete penetration. Wall thickness can be measured in close vessels or in cases where such measurement cannot otherwise be made.
- **4. X-ray Test:** X-rays are used to view a cross sectional area of a weld and locate defects. This process is called radiography. Radiographs are used to assess the quality of welded joints

Do



- Ask the defects inspection process.
- Ask methods of defects inspection.
- Demonstrate the non-destructive examination methods



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- · Answer their queries satisfactorily.
- Tell participants to complete the questions at the end of the unit.
- Ensure that every participant answer all the questions.









8. Inspect and Maintain Product Quality

Unit 8.1 – Introduction to Quality Control

Unit 8.2 - Inspections

Unit 8.3 – Inspections of the final product

Unit 8.4 - CAPA and its implementation

Unit 8.5 - PPAP - PSW

Unit 8.6 - ISO/TS 16949

Unit 8.7 – 8ds

Unit 8.8 - FMEA

Unit 8.9 - The 5 Whys



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- 1. Understand Quality Control & Pre-delivery (PDI)
- 2. Understand the importance of Pre-delivery (PDI)
- 3. Explain objectives & purpose of inspection.
- 4. Carry out inspection of final product.
- 5. Understand different types of Inspection methods (Dimensional / Layout Inspection) & Inspection Tools (Micrometer, Vernier Calipers & Height Gauge).
- 6. Understand CAPA.
- 7. Coordinate with R&D / Quality Manager CAPA C1.
- 8. Understand the objectives of PPAP-PSW
- 9. Understand the importance of ISO/TS 16949
- 10. Understand the discipline 8ds.
- 11. Explain what is FMEA.
- 12. Understand the relation between 8D & FMEA.
- 13. Explain what is 5 Whys.

UNIT 8.1: Introduction to Quality Control

Unit Objectives



At the end of this unit, Students will be able to:

- 1. Understand Quality Control & Pre-delivery (PDI)
- 2. Understand the importance of Pre-delivery (PDI)

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster.
- PC with LCD Projector or Flip Chart
- Participant Manual

Do



 Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts

Say



- The term "inspection" generally refers to the activity of checking products, whereas "audit" applies
 to analyzing a manufacturing organization.
- The ISO 2859 standard defines an inspection as an "activity such as measuring, examining, testing or gauging one or more characteristics of a product or service, and comparing the results with specified requirements".
- The inspected products can be the components used for production, work -in-process inventory, or finished goods.
- Quality control in the automobile industry forms an important aspect of the production process, because of the complexity of the mechanical parts involved and the necessity of their lending themselves to proper assembly with other portions of the engine.
- Combinations of tools and techniques work together in the quality control process within the automobile industry.
- A pre-delivery inspection is a standard procedure carried out or a finished component/subassebly/ aggregate by quality team. A pre-delivery inspection ensures that any remark that has to be done is carried out prior to the product reaching the customer. The product should then be conferming to the product drawing specifications.

 The pre-delivery inspection will give you one last chance to make sure the finished components/ subassembly/aggregate have been manufactured as specified, and will provide the opportunity to do a final quality control check before the goods are shipped.

Elaborate



Pre-delivery inspection (PDI)

Example of a finished vehicle-In a pre-delivery inspection, the vehicle is checked over to ensure that everything is working properly and safely. Often a checklist is worked through. The items on the checklist include such things as the exterior of the vehicle which is inspected for its condition and the installation of panels and attachments. Any defects identified have to be noted.

The interior of the vehicle is also inspected in a pre delivery inspection. This includes the interior condition and installation of any of the panels and items. Defects are identified and noted on the check list. Simple repairs are done on the spot.

In the next part of a pre delivery inspection, the engine is checked over for tightness and leakages. Any simple adjustments can be made, and any simple defects can be rectified. Fluid levels under the bonnet are checked with the engine off.

The engine is also started and brought up to normal operating temperature, and again checks are carried out on fluid levels, leaks and tightness of the engine components. Simple adjustments can be made according to vehicle manufacturer's specifications. During a pre-delivery inspection, the vehicle will be taken for a run and operated in compliance with the Road Code to test its operation.

Pre- delivery inspections are important for the below reasons

- a) It is likely that your goods will be travelling a long distance, and shipping can be both slow and expensive. By making sure that items are right before they are put in their shipping containers could save the time, hassle and expense of returning products that turn out to be unsuitable. This will also help to prevent any gaps in your supply chain.
- b) To make sure the goods have been packed properly for transport. This is particularly true for fragile items or products that could go off if inadequately packaged. Pre-delivery inspector can do a number of checks and tests to ensure the shipping conditions are suitable for the goods in question, reducing the chance of breakage or spoilage during shipment.
- c) To check that all paperwork and documentations are complete and correct

Ask



- Ask about importance of inspection and quality control.
- Ask about pre-delivery inspection (PDI).
- Ask about things have to check in PDI.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 8.2: Inspections

Unit Objectives



At the end of this unit, Students will be able to:

- 1. Explain objectives & purpose of inspection.
- 2. Carry out inspection of final product.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



- Inspection is the most common method of attaining standardisation, uniformity and quality of workmanship. It is the cost of controlling the product quality after comparison with the established standards and specifications. It is the function of quality control.
- Inspection is an indispensable tool of modern manufacturing process. It helps to control quality, reduces manufacturing costs, eliminate scrap losses and assignable causes of defective work.
- Purpose of Inspection
 - o To distinguish good lots from bad lots
 - o To distinguish good pieces from bad pieces.
 - o To determine if the process is changing.
 - o To determine if the process is approaching the specification limits.
 - o To rate quality of product.
 - o To rate accuracy of inspectors.
 - o To measure the precision of the measuring instrument.

- o To secure products design information.
- o To measure process capability.

Elaborate



Objectives of Inspection

- 1. To collect information regarding the performance of the product with established standards for the use of engineering production, purchasing and quality control etc.
- 2. To sort out poor quality of manufactured product and thus to maintain standards.
- 3. To establish and increase the reputation by protecting customers from receiving poor quality products.
- 4. Detect source of weakness and failure in the finished products and thus check the work of designer.

Stages of Inspection

- 1. Inspection of incoming material
- 2. Inspection of production process
- 3. Inspection of finished goods.

Inspection Procedures

1. Inprocess/Inspection: It suggests the checking of materials in process at the machine or in the production time by patrolling inspectors. This method of inspection minimise the material handling, does not disrupt the line layout of machinery and quickly locate the defect and readily offers field and correction.

Advantages of floor inspection

- (1) Encourage co-operation of inspector and foreman.
- (2) Random checking may be more successful than batch checking.
- (3) Does not delay in production.
- (4) Saves time and expense of having to more batches of work for inspection.
- (5) Inspectors may see and be able to report on reason of faulty work.

Disadvantages of floor inspection

(1) Difficult in inspection due to vibration.

- (2) Possibility of biased inspection because of worker.
- (3) Pressure on inspector.
- (4) High cost of inspection because of numerous sets of inspections and skilled inspectors.

Suitability of floor inspection

- (1) Heavy products are produced.
- (2) Different work centres are integrated in continuous line layout.
- **2. Centralised Inspection:** Materials in process may be inspected and checked at centralise d inspection centre which are located at one or more places in the manufacturing industry.

Advantages

- (1) Quality check up in detail.
- (2) Close supervision.
- (3) Absence of workers pressure.
- (4) Orderly production flow and low inspection cost.

Disadvantages

- (1) More material handling.
- (2) Delays of inspection room cause wastage of time.
- (3) Work of production control increases.
- (4) Due to non-detection of machining errors in time, there may be more spoilage of work.

Suitability

- (1) Incoming materials inspection.
- (2) Finished product inspection.
- (3) Departmental inspection.
- (4) High precision products of delicate products.
- (5) Small and less expensive products.
- **3. Combined Inspection:** Combination of two methods whatever may be the method of inspection, whether floor or central. The main objective is to locate and prevent defect which may not repeat itself in subsequent operation.

Methods of Inspection

1. 100% Inspection: This type will involve careful inspection in detail of quality at each strategic point or stage of manufacture where the test involved is non-destructive and every piece is separately inspected. It requires more number of inspectors and hence it is a costly method.

There is no sampling error. This is subjected to inspection error arising out of fatigue, negligence, difficulty of supervision etc. It is suitable only when a small number of pieces are there or a very high degree of quality is required. Example: Jet engines, Aircraft, Medical and Scientific equipment.

2. Sampling Inspection: In this method randomly selected samples are inspected as per the aplicable IS standards. Samples taken from different batches of products are representatives. If the sample proved defective, the entire lot is to be rejected or revoked. Sampling inspection is cheaper and quicker. It requires less number of Inspectors. It is subjected to sampling errors but the magnitude of sampling error can be estimated. In the case of destructive test, random or sampling inspection is desirable. It is suitable for inspection of products which have less precision importance and are less costly. Example: Electrical bulbs, radio bulbs, washing machine etc.

Drawbacks of Inspection

- 1. Inspection adds to the cost of the product but not for its value.
- 2. It is partially subjective, often the inspector has to judge whether a product passes or not.
- 3. Fatigue and Monotony may affect any inspection judgement.
- 4. Inspection merely separates good and bad items. It is no way to prevent the production of bad

Ask



- Ask about inspection process.
- Ask about stages and methods of inspection.
- Ask about inspection procedure.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- · Answer their queries satisfactorily.

UNIT 8.3: Inspections of the final product

Unit Objectives



At the end of this unit, Students will be able to:

1. Understand different types of Inspection methods (Dimensional / Layout Inspection) & Inspection Tools (Micrometer, Vernier Calipers & Height Gauge).

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart
- Inspection Tools: Micrometer, Vernier Caliper & Height Gauge.

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



- Dimensional Inspection is performed to compare the actual condition of a manufactured part or component to the nominal condition as defined by engineering drawings and blueprints, metal or film templates (decreasingly), digital files and 3D CAD models (increasingly), or even a master tool or part.
- Layout Inspection is the complete measurement of all part dimensions show n on the design record.
 A layout inspection may be required by some customers for all products annually unless another frequency is established in a customer approved control plan.
- Inspection tools like micrometer, vernier caliper & height Gauge are utilized for these inspections.
- The **Vernier Caliper** is a precision instrument that can be used to measure internal and external distances extremely accurately. Measurements are interpreted from the scale by the user. This is more difficult than using a digital vernier caliper which has an LCD digital display on which the reading appears. The manual version has both an imperial and metric scale.
- The micrometer is a precision measuring instrument used by engineers. The object to be measured
 is placed between the anvil face and the spindle face. The ratchet is turned clockwise until the object
 is 'trapped' between these two surfaces and the ratchet makes a 'clicking' noise. This means that the

ratchet cannot be tightened anymore and the measurement can be read.

• A **height gauge** is a measuring device used either for determining the height of objects, or for marking of items to be worked on. These measuring tools are used in metalworking or metrology to either set or measure vertical distances; the pointer is sharpened to allow it to act as a scriber and assist in marking out work pieces. Height gauges may also be used to measure the height of an object by using the underside of the scriber as the datum.

Demonstrate



Reading the measurement on a Vernier Calipers



Mathematical method:

Step1: The main metric scale is read first and this shows that there are 13 whole divisions before the 0 on the hundredths scale. Therefore, the first number is 13.

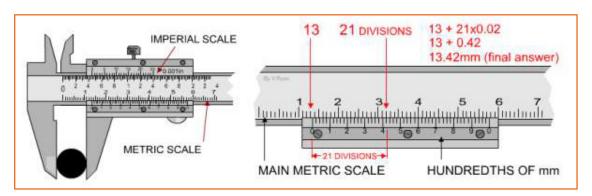
Step2: The' hundredths of mm' scale is then read. The best way to do this is to count the number of divisions until you get to the division that lines up with the main metric scale. This is 21 divisions on the hundredths scale.

Step3: This 21 is multiplied by 0.02 giving 0.42 as the answer (each division on the hundredths scale is equivalent to 0.02mm).

Step4: The 13 and the 0.42 are added together to give the final measurement of 13.42mm (the diameter of the piece of round section steel)

Common Method:

• Alternatively, it is just as easy to read the 13 on the main scale and 42 on the hundredths scale. The correct measurement being 13.42mm.



Reading measurements on the micrometer

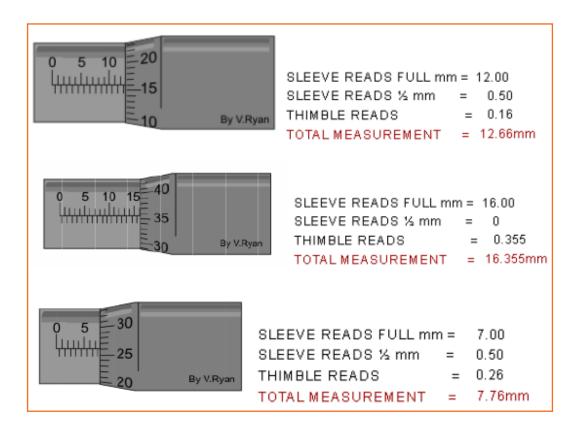


Step1: Read the scale on the sleeve. The example clearly shows 12 mm divisions.

Step1: Still reading the scale on the sleeve, a further ½ mm (0.5) measurement can be seen on the bottom half of the scale. The measurement now reads 12.5mm.

Step1: Finally, the thimble scale shows 16 full divisions (these are hundredths of a mm).

The final measurement is 12.5mm + 0.16mm = 12.66



Activity



- · Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- Do the measurement of given object by using micrometer

Skill Practice	Time	Resources
Using micrometer and Vernier caliper	2 hours	Micrometer and Vernier caliper
		Micrometer and Vernier caliper Any object for measurement

Do



- Ask them to get practice the activity alone.
- Go around and make sure they are doing it properly.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 8.4: CAPA and its implementation

Unit Objectives



At the end of this unit, students will be able to:

- 1. Understand CAPA.
- 2. Coordinate with R&D / Quality Manager CAPA C1.

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- Corrective and preventive actions (CAPA) are improvements to an organization's processes taken to eliminate causes of non-conformities or other undesirable situations.
- CAPA is a concept within good manufacturing practice (GMP), and numerous ISO business standards. It focuses on the systematic investigation of the root causes of identified problems or identified risks in an attempt to prevent their recurrence (for corrective action) or to prevent occurrence (for preventive action).
- Corrective actions are implemented in response to customer complaints, unacceptable levels of product non-conformance, issues identified during an internal audit, or adverse or unstable trends in product and process monitoring such as would be identified by statistical process control (SPC).
- Preventive actions are implemented in response to the identification of potential sources of noncon-
- CAPA is part of the overall quality management system (QMS).

Elaborate



CAPA Inputs

Inputs such as Complaints, Quality Records, Servicing, Nonconforming Product Supply Chain, Process Monitoring, Audits and Concessions (Deviations) give specific information to design and deploy CAPA actions.

- **Risk assessment and prioritization** Risks associated with the above identified inputs are analysed and prioritized as per the SOP/requirement of the organization.
- **Investigation disciplines** A detailed investigation of the risks are then conducted through various inspection methods.
- **Verification / validation** The results of the above investigations are validated against desired outcomes and verified for conformity of standards.
- **Well defined action plan** A CAPA action plan is prepared where all the action items and modifications are defined to the last element.
- **Disseminate information** Information is then disseminated to the various departments which come under the scope of the CAPA.
- **Documentation rules** All the standard rules of documenting the CAPA process is carried out as an ongoing activity and checked for conformity.
- **Effectiveness checks** The CAPA which is set in motion will be checked for its completeness, effectiveness and confirmation to the set timelines.
- Management escalation The problems identified, if any, after determining their severity, are escalated to the management for review

Ask



- Ask about CAPA.
- Ask about CAPA Inputs.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 8.5: PPAP - PSW

Unit Objectives



At the end of this unit, students will be able to:

1. Understand the objectives of PPAP-PSW.

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



• The Part Submission Warrant or PSW is a document that summaries the whole 'PPAP Package'.

Elaborate



PSW document include following details:

1) Part Information

- Part Name The part name is the parts official name for example Pedal Box or Bonnet Locking Platform. This benefits the manufacturer by giving the part a more human name and decreasing the chance of errors for example calling the part QNCA0001450002N could easily be mixed up if multiple PPAPs were being discussed.
- Part Name on Drawing The part name on the drawing is the part ID written or stamped onto the drawing for example QNCA0001450002N.
- **Engineering Change Level** Will be specified by the manufacturer and could include any manufacturing change such as tool modifications.

- **Engineering Change Date** The date of these changes.
- Additional Engineering Changes Will be specified by the manufacturer and could include any
 manufacturing change such as tool modifications.
- Additional Engineering Changes Date The date of these changes.
- Safety and/or Government Regulation Are there any safety and/or government regulation that the manufacturer need to be aware of. These should be listed and relevant documents included or referred to.
- Checking Aid Number ID of any special tools used while completing the PPAP.
- Checking Aid Engineering Change Level What is the level of the checking equipment you use to check this part are there any special tools used?
- Checking Aid Engineering Change Date Date of the Checking Aid.
- **Customer Part Number** The number the customer uses on their system to identify the part. This is very helpful to know when speaking to different department in the manufacturers company as not everyone will know the suppliers part number.
- **Organization Part Number -** The number the organization uses on their system to identify the part.
- Purchase Order Number The ID of the manufacturers purchase order.
- Weight Weight of the material ordered.

2) Suppliers Contact Information

- Name of Supplier and/or Vendor Code
- Suppliers Address

3) The Customers Contact Information

- Customers Name and Division
- Any buyer code

4) Materials Reporting

- May need to be submitted, Could be COSH data sheets IMDS format.
- In what format will you submit IMDS or IMDS like information? IMDS ID.
- What is the module or IMDS number?

5) Reason for Submission

There can be many reasons why it is necessary to conduct a PPAP:

- I. Initial Submission
- II. Engineering Changes

- III. Tooling: Transfer, Replacement, Refurbishment, or Additional
- IV. Correction of Discrepancy
- V. Tool Inactive > 1 Year
- VI. Change to Optional Construction or Material
- VII. Supplier or Material Source Change
- VIII.Change in Part Processing
- IX. Parts Produced at Additional Location
- X. Other (Specify)

6) Requested Submission Level

There are different levels of PPAP submission

- 1. Level 1 Warrant only submitted to customer
- 2. Level 2 Warrant with product samples and limited supporting data
- 3. Level 3 Warrant with product samples and complete supporting data
- 4. Level 4 Warrant and other requirements as defined by customer
- 5. **Level 5** Warrant with product samples and complete and complete supporting data reviewed at suppliers manufacturing location.

7) Submission Results

- i. Dimensional measurements
- ii. Material and function tests
- iii. Appearance Criteria
- iv. Statistical process package

Do all the results meet all the design requirements with any concerns noted Mold / Cavity /Production Process ID

8) Declaration

9) Explanations or Comments

- Comments / Explanations
- Customer tool tags
- Signature and Date
- Printed name
- Phone Number/Fax Number

- Job Title
- Email

10) Status

Sign off by customer

Ask



- Ask about PSW.
- Ask about details required in a PSW.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 8.6: ISO/TS 16949

Unit Objectives



At the end of this unit, Students will be able to:

1. Understand the importance of ISO/TS 16949

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- ISO/TS 16949 was prepared by the International Automotive Task Force (IATF), with support from ISO/TC 176, Quality management and quality assurance.
- ISO/TS 16949 specifies the requirements of ISO 9001 for automotive production.
- This technical specification combines all previous and published national automotive quality standards such as QS-9000, VDA 6.1, EAQF 94, and AVSQ.

Elaborate



Why is ISO/TS 16949 important?

ISO/TS 16949 certification demonstrates that your company has met the quality management system requirements to create a process of continuous improvement with an emphasis on defect prevention and reduction of variation and waste in the supply chain. The technical specification is implemented for all branches of manufacturers and suppliers of products or production materials, services such as heat treatment or galvanizing, and other products specified by automotive customers such as the constituent parts of vehicles.

Certification to this technical specification is recognized by leading automotive manufacturers and OEMs. Most leading manufacturers will only work with companies that hold ISO/TS 16949 certification.

What are the key benefits?

- A commercial advantage during contract negotiations.
- A clear focus on continual improvement, emphasizing defect prevention and reduction of variation and waste.
- Time and cost savings, by avoiding multiple customer specific certification audits.

Ask



- Ask about ISO/TS 16949 certification.
- Ask about benefits of ISO/TS 16949 certification.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 8.7: 8ds

Unit Objectives



At the end of this unit, Students will be able to:

1. Understand the discipline 8ds.

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- Eight Disciplines (8Ds) is a problem solving method developed at Ford Motor Company used to approach and resolve problems, typically employed by engineers or other professionals.
- Focused on product and process improvement, its purpose is to identify, correct, and eliminate recurring problems.
- It establishes a permanent corrective action based on statistical analysis of the problem and on the origin of the problem by determining the root causes.
- 8D follows the logic of the PDCA cycle.
- 8Ds has become a standard in the automotive, assembly and other industries that require a thorough structured problem solving process using a team approach.

Elaborate



8D are:

D0: Plan: Plan for solving the problem and determine the prerequisites.

- **D1**: Use a Team: Establish a team of people with product/process knowledge.
- **D2**: Describe the Problem: Specify the problem by identifying in quantifiable terms the who, what, where, when, why, how, and how many (5W2H) for the problem.
- **D3**: Develop Interim Containment Plan: Define and implement containment actions to isolate the problem from any customer.
- **D4**: Determine, and Verify Root Causes and Escape Points: Identify all applicable causes that could explain why the problem has occurred. Also identify why the problem was not noticed at the time it occurred. All causes shall be verified or proved. One can use five whys or Ishikawa diagrams to map causes against the effect or problem identified.
- **D5**: Verify Permanent Corrections (PCs) for Problem will resolve problem for the customer: Using pre-production programs, quantitatively confirm that the selected correction will resolve the problem. (Verify that the correction will actually solve the problem.)
- **D6**: Define and Implement Corrective Actions: Define and Implement the best corrective actions.
- **D7**: Prevent Recurrence: Modify the management systems, operation systems, practices, and procedures to prevent recurrence of this and all similar problems.
- **D8**: Congratulate Your Team: Recognize the collective efforts of the team. The team ne eds to be formally thanked by the organization.

Ask



- Ask about what is 8D?
- Ask about 8D's.



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 8.8: FMEA

Unit Objectives



At the end of this unit, Students will be able to:

- 1. Explain what is FMEA.
- 2. Understand the relation between 8D & FMEA.

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- FMEA is called failure modes and effects analysis.
- Failure modes and effects analysis (FMEA) is a step -by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service.
- "Failure modes" means the ways, or modes, in which something might fail. Failures are any errors or defects, especially ones that affect the customer, and can be potential or actual. "Effects analysis" refers to studying the consequences of those failures.
- The purpose of the FMEA is to take actions to eliminate or reduce failures, starting with the highestpriority ones.

When to Use FMEA

- When a process, product or service is being designed or redesigned, after quality function deployment.
- o When an existing process, product or service is being applied in a new way.
- Before developing control plans for a new or modified process.
- When improvement goals are planned for an existing process, product or service.

- o When analyzing failures of an existing process, product or service.
- o Periodically throughout the life of the process, product or service.
- FMEA is a tool used in the planning of product or process design. The Failure Modes in a FMEA are equivalent to the problem statement or description in an 8D. Causes in a FMEA are equivalent to potential causes in an 8D. Effects of failure in a FMEA are problem symptoms in an 8D.

Elaborate



FMEA Procedure

- Assemble a cross-functional team of people with diverse knowledge about the process, product
 or service and customer needs. Functions often included are: design, manufacturing, quality,
 testing, reliability, maintenance, purchasing (and suppliers), sales, marketing (and customers)
 and customer service.
- Identify the scope of the FMEA. Is it for concept, system, design, process or service? What are the boundaries? How detailed should we be?
- Fill in the identifying information at the top of FMEA form.
- Identify the functions of scope. Ask, "What is the purpose of this system, design, process or service? What do our customers expect it to do?"
- For each function, identify all the ways failure could happen.
- For each failure mode, identify all the consequences on the system, related systems, process, related processes, product, service, customer or regulations. These are potential effects of failure.
- Determine how serious each effect is. This is the severity rating or S and it is usually rated on a scale from 1 to 10, where 1 is insignificant and 10 is catastrophic. If a failure mode has more than one effect, write on the FMEA table only the highest severity rating for that failure mode.
- For each failure mode, determine all the potential root causes. Use tools classified as cause analysis tool, as well as the best knowledge and experience of the team. List all possible causes for each failure mode on the FMEA form.
- For each cause, determine the occurrence rating, or O. This rating estimates the probability of failure occurring for that reason during the lifetime of your scope. Occurrence is usually rated on a scale from 1 to 10, where 1 is extremely unlikely and 10 is inevitable.
- For each cause, identify current process controls. These are tests, procedures or mechanisms that you now have in place to keep failures from reaching the customer.
- For each control, determine the detection rating, or D. This rating estimates how well the controls can detect either the cause or its failure mode after they have happened but before

the customer is affected. Detection is usually rated on a scale from 1 to 10, where 1 means the control is absolutely certain to detect the problem and 10 means the control is certain not to detect the problem (or no control exists).

- (Optional for most industries) Is this failure mode associated with a critical characteristic? (Critical characteristics are measurements or indicators that reflect safety or compliance with government regulations and need special controls.) If so, a column labelled "Classification" receives a Y or N to show whether special controls are needed. Usually, critical characteristics have a severity of 9 or 10 and occurrence and detection ratings above 3.
- Calculate the risk priority number, or RPN, which equals S × O × D. Also calculate Criticality by multiplying severity by occurrence, S × O. These numbers provide guidance for ranking potential failures in the order they should be addressed.
- Identify recommended actions. These actions may be design or process changes to lower severity or occurrence.
- As actions are completed, note results and the date on the FMEA form. Also, note new S, O or D ratings and new RPNs.

Relationship between 8D and FMEA

- The problem statements and descriptions can be linked between both documents. An 8D can be completed faster by utilizing easy to locate, pre-brainstormed information from a FMEA to solve problems.
- Possible causes in a FMEA can immediately be used to jump start 8D Fishbone or Ishikawa diagrams. Brainstorming information that is already known is not a good use of time or resources.
- Data and brainstorming collected during an 8D can be placed into a FMEA for future planning
 of new product or process quality. This allows a FMEA to consider actual failures, occurring as
 failure modes and causes, becoming more effective and complete.
- The design or process controls in a FMEA can be used in verifying the root cause and permanent Corrective Action in an 8D.
- The FMEA and 8D should reconcile each failure and cause by cross documenting failure modes, problem statements and possible causes. Each FMEA can be used as a database of possible causes of failure as an 8D is developed.

Ask



- Ask about what is FMEA?
- Ask about FMEA procedure.
- Ask about relationship between FMEA and 8D.

Notes for Facilitation



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 8.9: The 5 Whys

Unit Objectives



At the end of this unit, Students will be able to:

1. Explain what is 5 Whys.

Resources to be Used



- Available objects such as white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart



Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.



- A discussion of the unexpected event or challenge that follows one train of thought to its logical conclusion by asking "Why?" five times to get to the root of what happened.
- The 5 Whys technique was developed and fine-tuned within the Toyota Motor Corporation as a critical component of its problem-solving training.

Elaborate



5 Why process

- Invite anyone affected by the issue: As soon as the problem or situation is identified (and all immediate concerns are dealt with), invite anyone at all on the team who was affected or noticed the issue to be involved in a 5 whys meeting.
- Select a 5 Whys master for the meeting: The 5 Whys master will lead the discussion, ask the 5 whys and assign responsibility for the solutions the group comes up with. The rest of those involved will answer those questions and discuss.

- Ask "why" 5 times: Dig at least 5 levels deep into the issue with 5 levels of "whys." This seems like the simplest part, but can in fact get a bit difficult in getting the right question to start with, the first why, seems to be the key.
- Assign responsibility for solutions: At the end of the exercise, go through each why question and- answer pairing and come up with 5 related "corrective actions" that everyone agree on. The master assigns responsibility for the solutions to various participants in the discussion.
- Share the results: After each 5 Whys process, someone involved in the meeting will write down what was discussed in the clearest, plainest language as possible and shares the result with all concerned.

Ask



- Ask about what is 5 Whys?
- Ask about 5 Whys procedure.
- Ask about need of 5 Whys.

Notes for Facilitation



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

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Maintaining a safe, Clean and secure working environment

Unit 9.1 - Health and Safety

Unit 9.2 - Personal Protective Equipment of Workers

Unit 9.3 - Hazards



Key Learning Outcomes 👸



At the end of this module, students will be able to:

- 1. Understand health, safety and security procedure
- 2. Identify the Safety Equipment required
- 3. Identify activities causing potential hazards.
- 4. Explain safe practises for avoiding hazards.

UNIT 9.1: Health and Safety

Unit Objectives



At the end of this unit, you will be able to:

1. Understand health, safety and security procedure

Resources to be Used



- Available objects such as white Board, white board marker pens, duster.
- PC with LCD Projector or Flip Chart
- Participant Manual

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



- Health, safety and security procedures refer to the guidelines and rules that make sure that people in the workplace, whether they are employers, employees or other visitors are safe and secure.
- These procedures tell employees or employers how they should carry out their tasks around the workplace in a way that ensures a minimization in accidents, incidents, contraction of diseases and security breaches.

Elaborate



Preventative procedures may include:

- · Educating staff on manual handling, i.e.: how to lift and move objects properly to avoid an injury
- Educating staff on how to minimize back and neck pain by using ergonomic furniture in an appropriate fashion
- Giving detailed instructions on how to use equipment

- Educating staff on the importance of wearing appropriate protective gear to handle certain pieces of equipment
- Instructing staff on how to keep the workplace secure, by teaching them about the security systems in place and how to use them so that cash, equipment and people are safe and secure
- Educating staff on potential hazards in the workplace.
- Health, safety and security procedures also refer to what you should do when accidents or incidents do occur.

Ask



- Ask about organization safe operating procedures
- Ask about need of safe operating procedures

Notes for Facilitation



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 9.2: Personal Protective Equipment of Workers

Unit Objectives



At the end of this unit, you will be able to:

1. Identify the Safety Equipment required

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart.
- PPE

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



- PPE refers to the equipment worn by staff to reduce the exposure to hazards.
- PPE include such items as: gloves, safety boots, earplugs, safety hat, face mask, welding shield etc.
- There are two things to consider in regards to PPE:
 - o PPE protects only the wearer, whereas measures controlling the risk at source can protect everyone in the workplace.
 - o The specified level of protection in reality may not be achieved with PPE and the actual level of protection provided is difficult to assess

Elaborate



PPE items may include:

- **Gloves** Always wear gloves when you are working with any sharp tools, knives or materials. You should also wear gloves when working with some cleaning agents, glues, etc.
- Foot protection (safety boots) Safety boots are necessary if you are working in a building site or in an area where heavy objects can fall on you.
- **Body protection** aprons, gowns Additional protective clothing may be necessary when cleaning duties require the use of various chemicals and/or disinfectants.
- **Hearing protection** ear muffs, ear plugs Ear muffs should be used when working in an environment to protect your ears if there is regular noise or occasional sounds that are louder.
- Face masks Use face masks to get the protection from gases, poisonous fumes, dust, vapours etc. Face mask protect our self from flying particles and harmful radiation.
- **Head protection** hard hats If you are working in an area where tradesmen are working above you, you should wear a hard hat.
- **Eye protection** goggles, glasses When working outside you should wear protection glasses to protect you from the sun ultra -violet rays.

Ask



- Ask about PPE
- Ask about need of PPE

Do



- Show the PPE to trainees.
- Demonstrate them how to wear the PPE properly.
- Explain the functioning of every item of PPE.

Notes for Facilitation



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

UNIT 9.3: Hazards

Unit Objectives



At the end of this unit, you will be able to:

- 1. Identify activities causing potential hazards.
- 2. Explain safe practises for avoiding hazards.

Resources to be Used



- Available objects such as whiteboard, white board marker pens, duster, participant manual.
- PC with LCD Projector or Flip Chart.

Do



• Welcome and greet the participants. Revise the learnings of the previous sessions and ask them if they have any doubts.

Say



- A hazard is a situation that poses a level of threat to life, health, property, or environment.
- The main hazards can happen during work are:
 - o Fire caused by heat, sparks, molten metal or direct contact with the flame.
 - o Explosion when cutting up or repairing tanks or drums which contain or may have contained flammable materials.
 - o Fire/explosion caused by gas leaks, backfires and Flashbacks.
 - o Fumes created during flame cutting.
 - o Fire/burns resulting from misuse of oxygen.
 - o Burns from contact with the flame or hot metal.
 - o Crushing or impact injuries when handling and transporting cylinders.
- To assure a high degree of safety, no machine-tool is to be used unless the risk management process applied on it.

- While working in workplace you have to follow personal safety procedures when dealing with tools
 and equipments. You have to follow Standard Operating Procedures (SOP's) must be maintained for
 each piece of machinery in the shop.
- The Hazardous Material can be: Flammable, Reactive, Toxic and Corrosive.

- Elaborate



Risk management process

- 1. Identify the potential hazard(s) that the machine tool can generate.
- 2. Assess the probability and severity of the hazard(s) by utilizing the Risk Assessment Matrix. Risk acceptance decision authority for the risk levels is as follows:
 - a. Extremely high Loss o f ability to accomplish mission.
 - b. High Significantly degrades mission capabilities in terms of required mission standards.
 - c. Moderate Degrades mission capabilities in terms of required mission's standards.
 - d. Low Little or no impact on accomplishment of mission.
- 3. Determine the risk control measures that will eliminate the hazard(s) or reduce the risk.
- 4. Supervise and evaluate the process. Enforce the established standards and risk control measures.

Probability of hazard

- Frequent Occurs often in the career/equipment service life. Continuously experienced during operation.
- **Likely** Occurs several times in career/equipment service life. Occurs frequently during operation.
- Occasional Occurs sometimes in career/equipment service life. Occurs periodically or several times in inventory service or operations.
- **Remote** Possible to occur in career/equipment service life. Expected to occur sometime in inventory service life or operation.
- Unlikely Can assume will not occur in career/ equipment/ service life. Possible, but improbable;
 occurs only very rarely during operation.

Severity of hazard

Catastrophic - Death or permanent total disability, system loss or major property damage.

- Critical Permanent partial disability, temporary total disability in excess of 3 months, major system damage or significant property damage.
- Marginal Minor injury, lost workday accident with compensable injury/illness, mirror system damage or minor property damage.
- **Negligible** First aid or minor treatment or minor system impairment.

Remedial action procedure:

- 1. If you find any problem or hazard situation, remedial action should be completed as soon as possible.
- 2. Give remedial action priority to hazards with more severe loss potential.
- 3. Obtain target dates for correction. Use hazard classification to motivate correction.
- 4. Write a detailed explanation of the hazard and its potential loss severity as justification for any action requiring a major expenditure and forward it to the person most responsible for corrective action.
- 5. Encourage responsible persons to take permanent corrective action (repetitive remedy is costly).
- 6. Make sure intermediate (temporary) safety measures are taken whenever permanent or complete remedy will require additional time.
- 7. At a reasonable time after the inspection is conducted and necessary action is submitted, do a follow-up walk through to ensure that the corrective action has been completed.
- 8. Make sure all reports are properly filed and maintained for record purposes.

Hazardous work practices:

- **Hot Work:** Hot work is defined as any work producing an arc, flame, or spark. The only exception to this are those areas specifically designed and or built for welding, cutting or brazing.
- Confined Space Entry: Entry to confined spaces is very dangerous and requires special precautions
 in addition to a permit issued by a supervisor. Confined spaces are defined as tanks, vessels,
 sewers, pits, boilers, manholes, etc.
- Lockout: Everyone who works on or is endangered by equipment that is powered by an energizing source, such as electricity, steam, hydraulics, or pneumatic power shall shut it off and lock it out prior to performing any maintenance work.
- **High Voltage Electricity:** Only specially trained maintenance employees/electricians are permitted to work with high voltage equipment.

The main hazards in machining works are:

- Fire caused by heat, sparks, molten metal or direct contact with the flame.
- Explosion when cutting up or repairing tanks or drums which contain or may have contained flammable materials
- Fire/explosion caused by gas leaks, backfires and flashbacks
- Fume s created during flame cutting
- Fire/burns resulting from misuse of oxygen
- Burns from contact with the flame or hot metal

Safe practices for avoiding general shop hazards:

- 1. Never use compressed air to blow chips away from a machine
- 2. Keep the floor clear of stock and tools, and clean spilled oils or coolants
- 3. Know where the fire extinguisher is kept and how to use it
- 4. Always keep machines turned off when making adjustments to them

Safe practices for avoiding machine hazards

- 1. Am I familiar with the operation of this machine?
- 2. What are the potential hazards involved with using this machine?
- 3. Are all safety guards in place?
- 4. Are my procedures safe?
- 5. Am I doing something that I probably should not do?
- 6. Have I made all the proper adjustments and tightened all locking mechanisms?
- 7. Is the workpiece secured properly?
- 8. Do I have proper safety equipment?
- 9. Do I know how to turn off the machine quickly if necessary?
- 10. Do I think about safety in everything I do?



- You can ask the different ideas to control the hazard.
- You could ask the common causes of hazard.
- You can pick the students and ask the safe practices for avoiding general shop hazards.

Team Activity



- Conduct a skill practice activity.
- Ask the students to assemble together.
- Explain the purpose and duration of the activity.
- Make the 5 teams.
- Divide the complete training center area into five different areas like cafeteria, workshop, classroom, training center admin block, washrooms etc.
- Assign one area to each team.
- Tell them to go their area and identify the reasons of hazards in that area.
- Once they back, they have to present what type of hazards they identified and what precautions have to be taken to control those hazards.
- Go around and make sure they are doing it properly.
- Wrap the unit up after summarizing the key points and answering questions.

Notes for Facilitation



- Summarize the main points.
- Ask participants if they have any doubts.
- Encourage them to ask questions.
- Answer their queries satisfactorily.

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10. Employability & Entrepreneurship Skills

Unit 10.1 – Personal Strengths & Value Systems

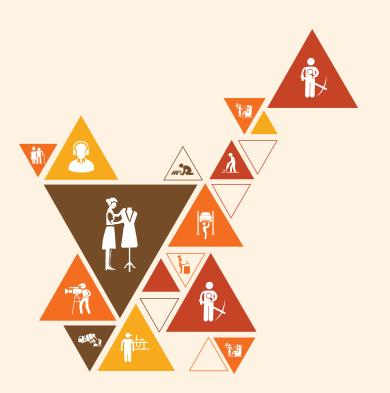
Unit 10.2 - Digital Literacy: A Recap

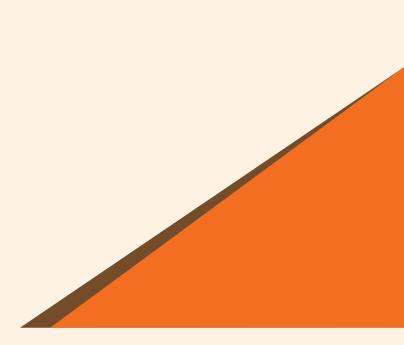
Unit 10.3 – Money Matters

Unit 10.4 – Preparing for Employment & Self Employment

Unit 10.5 – Understanding Entrepreneurship

Unit 10.6 – Preparing to be an Entrepreneur





Introduction: Employability and Entrepreneurship Skills

This Facilitator's guide includes various activities which will help you as a facilitator to make the sessions participative and interactive.

Ice breaker

• You can begin the module with the following ice breaker:

Five of Anything Ice Breaker Steps:

- Divide the participants into groups of four or five by having them number off. (You do this because people generally begin a meeting by sitting with the people they already know best.)
- Tell the newly formed groups that their assignment is to share their five favourite movies of all time, their five favourite novels or their five least liked films. The topic can be five of anything most liked or disliked.
- This ice breaker helps the group explore shared interests more broadly and sparks lots of discussion about why each person likes or dislikes their selected five.
- Tell the groups that one person must take notes and be ready to share the highlights of their group discussion with the class upon completion of the assignment.

Expectation Mapping

- 1. During the first session and after ice breaker session, ask the participants to answer the following question: "What do I expect to learn from this training?"
- 2. Have one of the participants write their contributions on a flip chart sheet.
- 3. Write down your own list of covered material in the training on another flip chart sheet.
- 4. Compare the two sheets, commenting on what will and what will not be covered during the training.
- 5. Set some ground rules for the training sessions. Ask the participants to put these rules on a flipchart and display it in the class.
- 6. You may get back to those sheets once again at the end of the last session of the training.
- 7. Benefits of doing this activity:
 - Participants feel better as their opinions are heard.
 - Participants get to know what they should expect from the training.
 - The facilitator gets to know which points to emphasize, which to leave out, and which to add during the training.
- 8. Expectations from the participants:
 - Must sign the attendance sheet when they arrive for class.
 - Conduct themselves in a positive manner
 - Be punctual, attentive, and participative
- 9. Explain the contents that are going to get covered one by one and connect it with the expectation mapping done earlier.
- 10. By the end of this exercise, the participants should have a clear understanding of what to expect from the session and what are the areas that will not get covered.

Defining Objectives

- 1. Defining the objectives in the beginning of the units sets the mood for the unit.
- 2. To begin with the end in mind sets the expectations of the participants as what could be the important takeaways from the session.
- 3. It is also a way of making participants take responsibility of their own learning process.
- 4. For the facilitator, the objectives decide a designed path to progress on so that the learning stays aligned and on track.

- 5. Read the objectives slowly, one by one, and ask the participants to explain what they think it means.
- 6. At the end of the session, you could again revisit the objectives to find out from the participants about how many objectives have been achieved.

In order to effectively facilitate this workshop:

- 1. You must have thorough knowledge of the material in the Participant Handbook, and be prepared to answer questions about it.
- 2. You may also wish to read other material to enhance your knowledge of the subject.
- 3. There may be issues raised with which you are not able to deal, either because of lack of time or knowledge. You can either state that you will obtain answers and get back to the participants with the information. Incase the query can be turned to an assignment to the class, do so. You can work with the the participants on the assignement.
- 4. You must have a very clear understanding of what the participants want to accomplish by the end of the workshop and the means to guide the participants.
- 5. As the facilitator, it is your responsibility to make sure that all logistical arrangements are made for the workshop. This may involve doing it yourself or confirming that someone else has made all necessary arrangements associated with the workshop. Assume nothing and check everything before the workshop begins.
- 6. To break the monotony and boredom during sessions, introduce mini breaks in the form of stretching exercises, jokes, some group songs or games.
- 7. Invite discussion from the participants.
- 8. Probe the participants further and lead them to come to affirmative conclusions.
- 9. Let the participants answer. No answer is incorrect.
- 10. Ask one participant to write all the points on the whiteboard.
- 11. Build the sessions from the answers provided by the class.
- 12. Prepare for the sessions in advance so that the resources like flipcharts, handouts, blank sheets of paper, marker pens, etc. can be kept ready.
- 13. Ensure that resources like board, markers, duster etc. is available before your session starts.

General instructions for role playing:

- 1. You are not being asked to be an actor or to entertain. The purpose of the role play is to provide a situation in which you can practice certain skills.
- 2. When you read the brief, try to imagine yourself in the situation described and behave in a way you feel to be natural but be conscious of the fact that your role may require a different approach from that which you might normally use.
- 3. You (and others) may benefit from the change in approach and behaviour. Therefore, try to use the approach you feel to be most appropriate for the circumstances described in your brief.
- 4. The brief is just the starting point. It simply sets the scene and the tone of session or activity. Try not to keep referring to the brief as this will affect the spontaneity of the meeting. Allow the role play to develop as you think it might in real life and change your reactions in line with the behaviour and responses of others involved.
- 5. If you find that you have too little information to answer questions or to describe what has happened in the situation, do feel free to add your own thoughts and ideas. Try to keep these within the framework of the role you are taking and try to make your improvisations as realistic as possible.

UNIT 10.1: Personal Strengths & Value Systems

Key Learning Outcomes



At the end of this unit, participants will be able to:

- 1. Explain the meaning of health
- 2. List common health issues
- 3. Discuss tips to prevent common health issues
- 4. Explain the meaning of hygiene
- 5. Discuss the purpose of Swacch Bharat Abhiyan
- 6. Explain the meaning of habit
- 7. Discuss ways to set up a safe work environment
- 8. Discuss critical safety habits to be followed by employees
- 9. Explain the importance of self-analysis
- 10. Discuss motivation with the help of Maslow's Hierarchy of Needs
- 11. Discuss the meaning of achievement motivation
- 12. List the characteristics of entrepreneurs with achievement motivation
- 13. List the different factors that motivate you
- 14. Discuss the role of attitude in self-analysis
- 15. Discuss how to maintain a positive attitude
- 16. List your strengths and weaknesses
- 17. Discuss the qualities of honest people
- 18. Describe the importance of honesty in entrepreneurs
- 19. Discuss the elements of a strong work ethic
- 20. Discuss how to foster a good work ethic
- 21. List the characteristics of highly creative people
- 22. List the characteristics of highly innovative people
- 23. Discuss the benefits of time management
- 24. List the traits of effective time managers
- 25. Describe effective time management technique
- 26. Discuss the importance of anger management
- 27. Describe anger management strategies
- 28. Discuss tips for anger management
- 29. Discuss the causes of stress
- 30. Discuss the symptoms of stress
- 31. Discuss tips for stress management

UNIT 10.1.1: Health, Habits, Hygiene: What is Health?

Unit Objectives | @



At the end of this unit, participants will be able to:

- Explain the meaning of health
- List common health issues
- Discuss tips to prevent common health issues
- Explain the meaning of hygiene
- Discuss the purpose of Swachh Bharat Abhiyan
- Explain the meaning of habit

Resources to be Used



Participant Handbook

Ask



- What do you understand by the term "Health?"
- According to you, who is a healthy person?

Say



Discuss the meaning of health and a healthy person as given in the Participant Handbook.

Ask



When did you visit the doctor last? Was it for you or for a family member?



- Discuss the common health issues like common cold, allergies etc. Refer to the Participant Handbook.
- Let us do a small activity. I will need some volunteers.

-Role Play



- Conduct a small skit with volunteers from the class. Consider one of the villagers has been appointed as a health representative of the village, what measures will you as a health representative suggest to the common villagers to prevent common health issues discussed.
- You will need at least 4 volunteers (Narrator, Health Representative, Head of the Village, Doctor).
- Explain the health concerns of the village to the Narrator. The Narrator will brief the class about the skit.
- Give the group of volunteers, 5 minutes to do discuss.
- At the end of 5 minutes, ask the group to present the skit to the class assuming them as the villagers.
- The class can ask questions to the group as a common villager.

Summarize | **/**



Through this activity we got some tips on how can we prevent these common health issues.



Let us now see how many of these health standards we follow in our daily life.

- Activity



Health Standard Checklist from the Participant Handbook.

Ask



How many of you think that you are healthy? How many of you follow healthy habits?

Say



- Let's do an exercise to find out how healthy you are.
- Open your Participant Handbook section 'Health, Habits, Hygiene: What is Health?', and read through the health standards given.
- Tick the points which you think are true for you.
- Try to be as honest as possible as this test is for your own learning.

Do



- Ensure that all the participants have opened the right page in the Participant Handbook.
- Read aloud the points for the participants and explain if required.
- Give them 5 minutes to do the exercise.
- At the end of 5 minutes, ask the participants to check how many ticks have they got.

Summarize |



Tell them that they need to follow all the tips given in this checklist regularly in order to remain healthy and fit.

Ask



Discuss:

- Is it necessary to practice personal hygiene every day? Why?
- How does a person feel when they do not practice good personal hygiene? Why?
- Can good personal hygiene help a person feel good about his/her self? How?

Say



Discuss the meaning of hygiene as given in the Participant Handbook.

Activity 2



Health Standard Checklist: Hygiene

Say



- Let's do an exercise to find out if we maintain good hygiene habits or not.
- Open the Participant Handbook and read through the Health Standard checklist given.
- Tick the points which you think are true for you.
- Try to be as honest as possible as this test is for your own learning.

Do



- Ensure that all the participants have opened the right page in the Participant Handbook.
- Read aloud the points for the participants and explain if required.
- Give them 5 minutes to do the exercise...
- At the end of 5 minutes, ask the participants to check how many ticks have they got.
- Ask them to calculate their score.
- Tell them what each score indicates by reading aloud what has been mentioned in the Participant Handbook.

Ask



- · How many of you have heard about "Swachh Bharat Abhiyan"?
- Can you tell the class what it is about?

Summarize \



• Tell them about Swachh Bharat Abhiyan as given in the Participant Handbook and request them to take a pledge to keep our country clean.

Ask



· What is a habit?

Say



• Discuss some good habits which can become a way of life.

Summarize 2



• Tell them about good and bad habits and the reasons to make good habits a way of life.

UNIT 10.1.2: Safety

Unit Objectives | @



At the end of this unit, participants will be able to:

- Discuss ways to set up a safe work environment
- Discuss critical safety habits to be followed by employees

Resources to be Used



- Participant Handbook
- Safety signs and symbols
- Safety equipments
- Blank papers
- Pens



- There are many common safety hazards present in most workplaces at one time or another. They include unsafe conditions that can cause injury, illness and death.
- Safety Hazards include:
 - Spills on floors or tripping hazards, such as blocked aisles or cords running across the floor.
 - Working from heights, including ladders, scaffolds, roofs, or any raised work area.
 - Unguarded machinery and moving machinery parts; guards removed or moving parts that a worker can accidentally touch.
 - Electrical hazards like cords, missing ground pins, improper wiring.
 - Machinery-related hazards (lockout/tag out, boiler safety, forklifts, etc.)

Team Activity



Safety Hazards

- There are two parts to this activity.
- First part will cover the potential safety hazards at work place.
- Second part will cover a few safety signs, symbols and equipments at work place.
- Use this format for the first part of the activity.

PART 1			
Hazard	What could happen?	How could it be corrected?	

Ask



How could you or your employees get hurt at work?

Say



• Let's understand it better with the help of an activity. You will be given a handout within your groups. You have to think about the possible hazards of your workplace, what damage these hazards could cause and about the corrective action.

Do



- Divide the class into five to six groups of four participants each.
- Put the format on the board for the activity.
- Give blank papers and pens to each group.
- The group is expected to think and discuss the potential safety hazards in the workplace.
- Ask the group to discuss and fill the format using the blank sheet.
- Give the groups 5 minutes for the activity.
- For the second part of the activity, show the class some pictures of safety signs, symbols and equipments.
- Now they will put down a few safety symbols, signs or equipment against the safety hazards identified.
- Give them 5 to 10 minutes to discuss and draw/note it.
- At the end of 10 minutes the groups will present their answers to the class.

Say



- Now, let's discuss the answers with the class.
- All the groups will briefly present their answers.

Do



- Ask the audience to applaud for the group presentation.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time.
- Tell the group to wind up the discussion quickly if they go beyond the given time limit.

Ask



De-briefing

- What did you learn from the exercise?
- As an entrepreneur, is it important to ensure the safety of your employees from possible hazards? Why?

Summarize 🔎



- Ask the participants what they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the tips to design a safe workplace and non-negotiable employee safety habits.

UNIT 10.1.3: Self Analysis- Attitude, Achievement Motivation: What is Self Analysis?

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- Explain the importance of self- analysis
- · Discuss motivation with the help of Maslow's Hierarchy of Needs
- Discuss the meaning of achievement motivation
- List the characteristics of entrepreneurs with achievement motivation
- List the different factors that motivate you
- Discuss the role of attitude in self- analysis
- Discuss how to maintain a positive attitude
- List your strengths and weaknesses

Resources to be Used



- Participant Handbook
- Old newspapers
- Blank papers
- Pencils/ pens

Activity



This is a paper pencil activity.

What are the three sentences that describe you the best?

What do you need to live happily?

What are your strengths and weaknesses?

Do



- Write the three questions on the board/flipchart before the session begins.
- Give plain papers and pencils/pens to each participant.
- Tell participants to write the answer for the three questions on the paper.
- Tell them the purpose of this activity is not to judge anyone but to understand more about self.

Say



Discuss the concept of Self Analysis and motivation with reference to Maslow's Hierarchy of Needs as discussed in the Participant Handbook.

Team Activity



Tower building

Each group which will create tower using the old newspapers.

Do



- Divide the class into groups.
- Give them some old newspapers.
- The task is to create a tower out of the newspapers.
- The group which will create the highest tower standing on its own will be considered the winning group.
- Groups can use as many newspapers as they want to and in any way they want.

Ask



- · What did the winning group do differently?
- If you were given a chance, how would you have made the tower differently?
- How did you feel while making the tower?
- Did you feel motivated?

Say



• Discuss the concept of achievement motivation and characteristics of entrepreneurs with achievement motivation as discussed in the Participant Handbook.

Ask



· Is your attitude positive or negative?

Say



• Let me tell you a story:

It's Little Things that Make a Big Difference.

There was a man taking a morning walk at the beach. He saw that along with the morning tide came hundreds of starfish and when the tide receded, they were left behind and with the morning sun rays, they would die. The tide was fresh and the starfish were alive. The man took a few steps, picked one and threw it into the water. He did that repeatedly. Right behind him there was another person who couldn't understand what this man was doing. He caught up with him and asked, "What are you doing? There are hundreds of starfish. How many can you help? What difference does it make?" This man did not reply, took two more steps, picked up another one, threw it into the water, and said, "It makes a difference to this one." What difference are we making? Big or small, it does not matter. If everyone made a small difference, we'd end up with a big difference, wouldn't we?

Ask



• What did you learn from this story?

Activity



What Motivates You?

- This is an individual activity.
- It is an exercise given in the Participant Handbook.

Do



- Ask the class to open their Participant Handbook and complete the exercise given in the section What Motivates You?
- Ensure that the participants have opened the correct page for the activity.
- Give the class 5 minutes to complete the activity.



Discuss the concept of attitude and how to cultivate a positive attitude as discussed in the Participant Handbook.

Summarize \ \(\begin{align*} \equiv \equiv



• Close the discussion by summarizing how self-analysis, knowledge about what motivates you and your positive attitude can help in your business as well in life.

UNIT 10.1.4: Honesty & Work Ethics

Unit Objectives | @



At the end of this unit, participants will be able to:

- Discuss the qualities of honest people
- Describe the importance of honesty in entrepreneurs
- Discuss the elements of a strong work ethic
- Discuss how to foster a good work ethic

Resources to be Used



Participant Handbook

Ask



- What do you understand by honesty?
- Why is it important for entrepreneurs to be honest?
- Do you remember any incident where your honesty helped you in gaining confidence?
- Do you remember any incident where someone lost business due to dishonesty?

Say



- Talk about honesty, qualities of an honest person, and the importance of honesty in entrepreneurs as discussed in the Participant Handbook.
- "Let's understand it better with the help of some case scenarios. You will be given some cases within your groups. You have to analyse the case scenario that has been given to you and then find an appropriate solution to the problem.
- Keep your discussion focussed around the following:
 - What went wrong?
 - · Who was at fault?
 - Whom did it impact- the customer or the businessman?
 - How would it impact the business immediately? What would be the long term impact?
 - What could be done?
 - What did you learn from the exercise?

Do



- Divide the class into four groups of maximum six participants depending on the batch size.
- Give one case study to each group.
- Instruct them to read the case carefully.
- Put down the de-brief questions on the board and ask the groups to focus their discussion around these questions.
- The group is expected to analyse and discuss the case amongst them and find a solution to the given problem. Give the class 5-10 minutes to discuss the case and note down their solutions.
- At the end of 10 minutes the team should present their case solution to the class. The presentation can be a
- Ask the group to select a group leader for their group. The group leader to discuss and assign roles to the group members for the presentation.

Team Activity 🚉



Case Study Analysis

Scenario 1

Aakash has a small mobile retail sales and repair shop in Allahabad. He has one of the most popular outlets and has great rapport with his customers.

It's around 11 AM when a customer barges in to the shop and starts shouting at Aakash for giving her a faulty instrument. The screen of her mobile is cracked from one side. Aakash remembered thoroughly checking the handset before handing it over to the customer. The customer threatens to sue him and to go to Consumer Court for cheating her. Now, the problem occurred somewhere outside the shop but as other customers were listening to the conversation, it might impact his business. The situation needs to be managed very sensitively. What would you do if you were in Aakash's place?

Scenario 2

Rajni does beautiful Phulkari embroidery on suits and sarees. She has a small home-based business. She has a huge list of customers on Facebook and WhatsApp who give her orders regularly. Smita is one of her old and regular customers. As her sister-in-law's weddingwas around the corner, Smita wanted to buy few handcrafted Phulkari duppatta. She placed an order for three duppattas via WhatsApp and requested Rajni to send them as soon as possible. When the parcel reached Smita through courier she found that out of the three duppatas, only one was hand embroidered and the other two had machine embroidery on them. Even the length and the quality of the material was not as desired. Smita was heartbroken. It was a complete waste of money and moreover she couldn't wear what she had planned to during the wedding functions. She sent a message to Rajni on WhatsApp, expressing her anger and disappointment.

Smita has also sent a feedback and expressed her disappointment on the social media... this will directly affect Rajni's business. What would you do if you were in Rajni's place?

Scenario 3

Shankar is a tattoo artist who has a small tattoo showroom in a big, reputed mall in New Delhi. Mr Saksham had an appointment for today, at 11:00 am but he reached at 11:50 am. Meanwhile, Shankar had to reschedule his next appointment. After availing Shankar's services, Mr Saksham started yelling in an abusive language, refusing to pay the requisite amount, and finding faults in the services provided by him. Who was at fault in this case? What should Shankar do? Should he confront Saksham or give in to the demands of the client?

Scenario 4

Shailender is an online cloth reseller who does business through social networking sites such as Facebook and WhatsApp. Priyanka made online payment for a dress to Shailander. But she did not receive the dress for a month. When she asked for a cancellation, Shailander started misleading her. For almost 45 days, he kept promising her that he will pay the amount today, tomorrow, day after etc. Even after repeated calls and messages when she did not receive the payment or the dress, she decided to write a post against him on a popular social media platform. As a result, Shailender lost lots of customers and his flourishing business faced a major crisis. How could this situation have been managed?



- Now, let's discuss the problem and solution with the larger group.
- The group will first briefly describe the case to the class.
- Then discuss the issue identified and the proposed solution.
- Once the presentation is over, the class can ask their questions.

- Congratulate each group for the group presentation.
- Ask the audience to applaud for them.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time. Tell the group to wind up the discussion quickly if they go beyond the given time limit.

Summarize \(\beta \)



- Ask the participants what they have learnt from the exercise/activity.
- Ask if they have any questions related to what they have talked about so far.
- ${\bf Close \ the \ discussion \ by \ summarizing \ the \ importance \ of \ honesty \ and \ work \ ethics \ for \ entrepreneurs.}$

UNIT 10.1.5: Creativity and Innovation

Unit Objectives | @



At the end of this unit, participants will be able to:

- List the characteristics of highly creative people
- List the characteristics of highly innovative people

Resources to be Used



- Participant Handbook
- Chart papers
- Marker pens

· Ask



- You must be aware of the term 'Rags to riches' and heard stories related to the term.
- What do these stories tell us?
- What was so special about these people?

Say



- Let's have a look at these stories.
- There are some inspiring stories about people which I would like to share with you.
- Narrate these stories to the class.

A.P.J. Abdul Kalam

Who has not heard of A.P.J. Abdul Kalam: Avul Pakir Jainulabdeen Abdul Kalam hailed from a very humble background. His father was a boat owner. To help his family, Kalam would work as a newspaper vendor. With limited resources, he graduated in Physics and studied aerospace engineering. He was instrumental in India's step towards nuclear energy. In 2002, he became the 11th President of India.

Water filter/purifier at source

Two young boys studying in classes 4 and 5, from Lingzya Junior High School, Sikkim designed a simple innovative low cost water purifier.

Inspiration behind the idea: Most people today prefer to use a water filter/purifier at their home.

Both the children have given idea to have filter/purifier at the source of water so that everyone has access to clean water without having to make an investment in purchasing a filter/purifier.

Soring's idea is to have a centralised purification system at the point of distribution like water tank while Subash's idea is to have such purifiers attached to public taps.

Source: http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-youngindians/20151208.htm

Solar seeder

This is a story of a innovative solar seeder and developed by Subash Chandra Bose, a class 8, student from St Sebasthiyar Matriculation School, Pudukkottai, Tamil Nadu. Subash has developed a solar powered seed drill, which can undertake plantation for different size of seeds at variable depth and space between two seeds.

Source: http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-youngindians/20151208.htm

Looms for physically challenged

Now this is really inspiring of two sisters, Elakkiya a Class 6 student and Pavithra a Class 9 student of SRC Memorial Matriculation, Erode, Tamil Nadu.

The two sisters have come up with loom for lower limbed physically challenged. In their loom they have $replaced \ the \ pedal \ operated \ system \ with \ a \ motor \ and \ a \ gear box \ attached \ to \ a \ pulley \ mechanism.$

Source: http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-youngindians/20151208.htm

- Ask |



- If they can, why can't you?
- Discuss concepts related to 'Creativity and Innovation' with the participants as given in the Participant Handbook.

Sav



- Recall the stories on motivation.
- What is the inner drive that motivates people to succeed?
- Let's learn more about such creative and innovative entrepreneurs with the help of an activity.

Team Activity



- This is a group activity.
 - Think of any one famous entrepreneur and write a few lines about him or her.

Activity De-brief

- Why did you choose this particular entrepreneur?
- What is his/her brand name?
- What creativity does he/she possess?
- What was innovative about their ideas?

Do

- Instruct the participants that this is group work.
- Divide the class into small groups of 4 or 6 depending on the batch size.
- Give each group a chart paper.
- Tell the participants they have to write a few lines about any one famous entrepreneur.
- Give the participants 10 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.
- Ask each group to read out what they have written.
- Ask the de-brief questions.

Summarize | 2



- Summarize the unit by asking participants if they know of some people who are highly creative and innovative in their approach.
- Ask them to share some experiences about these people with the class.

Notes for Facilitation



• Source for stories on innovations:

http://www.rediff.com/getahead/report/achievers-top-31-amazing-innovations-from-youngindians/20151208.htm

UNIT 10.1.6: Time Management

- Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- Discuss the benefits of time management
- List the traits of effective time managers
- Describe effective time management techniques

-Resources to be Used



Participant Handbook

Ask



Does this sound like you?

- I can never get enough time to finish what I am doing in a day.
- I have so many things to do that I get confused.
- I want to go for a walk and exercise, but I just do not have the time.
- I had so much to do, so I could not deliver that order on time.
- I would love to start my dream business; but, I just do not have the time.

Example |



• Let's look at these two examples:

Example 1:

Ankita works from home as a freelance writer. She says she can easily put in 8 hours of dedicated work in a day. Because she works from home, she saves money on travel and has a comfortable work routine. But there is a challenge and it is distraction. As she works from home, she can easily just get up and sit down on the sofa to watch TV, wasting valuable time. She may have chores to do, errands to run and bills to pay. She ends up working only two to three hours a day and the result is, her work gets piled up. She is unable to take on more work due to this. Even though her quality of work is appreciated her clients are not very happy about the delay in submission.

Example 2:

Javed has started a successful online selling company from home and makes a good living from his sales. He has set up a small office space in his living room. As both his parents are working full-time, he also has the role of taking care of his two younger siblings. He almost spends half of his day with the younger kids. He does not mind it but it means taking time away from the work. He is still able to manage his online business with these commitments. He wants to spend some more dedicated hours so as to increase his profits. He also wants to look into new business avenues. What should he be doing.

Ask



- Does this happen with you too?
- Do you find it difficult to prioritize your work?
- Are you able to manage your time effectively?

Activity



- Conduct a group discussion based on the above examples.
- Direct the discussion on how to prioritize work and manage time effectively.

Say



- Time management is not only about how hard you work but also about how smart you work.
- Discuss "What is Time Management" with the participants as given in the Participant Handbook.

Ask



- Why is it important to manage time? How does it help?
- What happens when you don't manage your time effectively?
- Do you find it difficult to prioritize your work?

Say



- Discuss the benefits of time management given in the Participant Handbook.
- Let's learn effective time management with the help of an activity.

Activity



Effective Time Management

• This activity has two parts:

PART 1

TO-DO LIST

- You have to make a to-do list.
- List all of the activities/ tasks that you have to do.
- Try to include everything that takes up your time, however unimportant it may be.
- If they are large tasks, break them into action steps, and write this down with the larger task.
- You can make one list for all your tasks or have separate to-do lists for personal and professional tasks.

PART 2

URGENT-IMPORTANT GRID

- You have to make a grid as shown on the board here. .
- This grid has four boxes. As you can see, each box has a different heading.
- At the heart of the urgent-important grid, are these two questions:
 - Is this task important?
 - Is this task urgent?
- Now, you have to think about each activity that you have written in your to-do list and put it into one of the four categories.
- · What do these categories depict?
- Category 1: Urgent/Important
 - This category is for the highest priority tasks. They need to get done now.

Category 2: Not Urgent/Important

- This is where you want to spend most of your time.
- This category allows you to work on something important and have the time to do it properly.
- This will help you produce high quality work in an efficient manner.
- The tasks in this category are probably the most neglected ones, but also the most crucial ones for success.
- The tasks in this category can include strategic thinking, deciding on goals or general direction and planning all vital parts of running a successful business.

• Category 3: Urgent/Not Important

- This is where you are busy but not productive. These tasks are often mistaken to be important, when they're most often busywork.
- Urgent but not important tasks are things that prevent you from achieving your goals.
- However, some may be activities that other people want you to do.

Category 4: Not Important and Not Urgent

- This category doesn't really include tasks, but rather habits that provide comfort, and a refuge from being disciplined and rigorous with your time management.
- Some may be activities that other people want you to do.
- These might include unplanned leisure activities as well.

TO- DO list format

1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

URGENT-IMPORTANT GRID

URGENT/ IMPORTANT

- Meetings
- Last minute demands
- Project deadlines
- Crisis

NOT URGENT/ IMPORTANT

- Planning
- Working towards goals
- Building relationship
- Personal commitments

1

2

3

4

- Interruptions
- Phone calls/ E-mails
- Other people's minor demands

URGENT/ NOT IMPORTANT

- Internet surfing
- Social media
- Watching TV

NOT URGENT/ NOT IMPORTANT

URGENT/ IMPORTANT GRID format

1 2
3 4
URGENT/ NOT IMPORTANT
NOT URGENT/ IMPORTANT



- Put down the formats for the to-do list and the urgent/important grid on the board.
- Instruct the participants to prepare their to-do list first.
- Give the participants 10 minutes to prepare the list.
- Once done, instruct them to divide the tasks in to-do list into the four categories.
- Explain the four categories to the participants giving examples specific to their context.
- As you explain the categories fill the grid with the type of tasks.
- Give the participants 40 minutes to fill the grid.
- Then explain how to balance the tasks between the four categories.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Say



Activity De-brief:

How can we balance tasks between the four categories?

How to manage time through this grid?

- Category 1: Urgent/Important
 - Try to keep as few tasks as possible here, with the aim to eliminate.
 - If you spend too much of your time in this category, you are working solely as a trouble shooter, and never finding time to work on longer-term plans.
- Category 2: Not Urgent/Important
 - Plan these tasks carefully and efficiently as they are most crucial ones for success.
 - If necessary, also plan where you will do these tasks, so that you're free from interruptions.
 - Include strategic thinking, deciding on goals or general direction and planning in your planning process.
- Category 3: Urgent/Not Important
 - Ask yourself whether you can reschedule or delegate them.
 - A common source of such activities is other people. Sometimes it's appropriate to say "no" to people politely, or to encourage them to solve the problem themselves.
- · Category 4: Not Important and Not Urgent
 - You also want to minimize the tasks that you have in this category.
 - These activities are just a distraction avoid them if possible.
 - You can simply ignore or cancel many of them.
 - Politely say "no" to work assigned by others, if you can, and explain why you cannot do it.
 - Schedule your leisure activities carefully so that they don't have an impact on other important tasks.
- Discuss the traits of effective time managers and effective time management techniques as given in the Participant Handbook.

Summarize



• Discuss the traits of effective time managers and effective time management techniques as given in the Participant Handbook.

Notes for Facilitation



- Here is a short story. You can conclude the session narrating the story. To make it more interesting you can
 perform the demonstration described and discuss the short story.
 - One day an expert in time management was speaking to a group of students. As he stood in front of the group, he pulled out a large wide-mouthed glass jar and set it on the table in front of him. Then he took out a bag of about a dozen rocks and placed them, one at a time, into the jar. When the jar was filled to the top and no more rocks would fit inside, he asked, "Is this jar full?" Everyone in the class said, "Yes." Then he said, "Really?"
 - He reached under the table and pulled out a bucket of gravel (small stones). He dumped some gravel in and shook the jar causing pieces of gravel to work themselves down into the space between the rocks. Then he asked the group once more, "Is the jar full?" By this time, the class began to understand. "Probably not," one of them answered. "Good!" he replied.
 - He reached under the table and brought out a bucket of sand. He started dumping the sand in the jar and it went into all of the spaces left between the rocks and the gravel. Once more he asked the question, "Is this jar full?" No!" the class shouted. Once again he said, "Good." Then he grabbed a jug of water and began to pour it in until the jar was filled to the brim. Then he looked at the class and asked, "What is the point of this illustration? "One student raised his hand and said, "No matter how full your schedule is, if you try really hard you can always fit some more things in it!" "No," the speaker replied, "that's not the point. The truth this illustration teaches us is: If you don't put the big rocks in first, you'll never get them in at all." What are the 'big rocks' in your life? Your children; your loved ones; your education; your dreams; a worthy cause; teaching or mentoring others; doing things that you love; time for yourself; your health; your mate (or significant other). Remember to put these BIG ROCKS in first or you'll never get them in at all. If you sweat about the little stuff (the gravel, sand, and water) then you'll fill your life with little things you worry about that don't really matter, and you'll never have the time you need to spend on the big, important stuff (the big rocks).
- End the story with these lines...

So, tonight, or in the morning tomorrow, when you are reflecting on this short story, ask yourself this question: What are the 'big rocks' in my life? Then, put those in your jar first

UNIT 10.1.7: Anger Management

Unit Objectives | @



At the end of this unit, participants will be able to:

- Discuss the importance of anger management
- Describe anger management strategies
- Discuss tips for anger management

-Resources to be Used



Participant Handbook

Ask



- What is anger? Is anger good or bad?
- Is anger normal or an abnormal behaviour? How can anger harm you?
- Why is it important for entrepreneurs to manage their anger?



- Talk about anger and the importance of anger management in entrepreneurs as discussed in the Participant Handbook.
- Let us do a small activity. This is an individual activity.
- Think of the incidents and situations that angered you and hurt you.

Do



- Instruct them to note down these situations under different categories (as given in the Activity).
- Give the class 3-5 minutes to think and note down their answers.
- At the end of 5 minutes, ask some participants to volunteer and present their answers.
- They can also share these situations with their fellow participants if they do not wish to share it with the entire class.

- Activity



- Do you remember any incident which has hurt
 - you physically
 - you mentally
 - your career
 - your relationships.

Ask



- Do you ever get angry?
- What are the things that make you angry?
- Do you remember any incident where your anger management helped you in maintaining healthy relationship?
- Do you remember any incident where someone lost business/friend/relationship due to temper (anger)?

Say



- There are a few strategies which can help in controlling your anger. Let's do an activity to understand the anger management process better.
- This is an individual activity.
- Think of the incidents/situations which trigger your anger (the cause).
- Then think what happened as a result of your anger (the effect).
- You need to come up with some techniques to manage your anger.

Do



- Give the class the anger triggers (the cause) as listed in the activity.
- Put down the activity format (Anger Triggers, Result of your Anger, Anger Management Techniques) on the board and instruct the class to write the answers under different categories.
- Give the class 3-5 minutes to think and note down their answers.
- At the end of 5 minutes, ask the participants who wish to volunteer and present their answers.

Activity 2



Trigger points and Anger Management Techniques Activity

Anger Triggers

List of triggers that make you angry:

Someone says you did something wrong.

You want something you can't have now.

You get caught doing something you shouldn't have been doing.

You are accused of doing something you didn't do.

You are told that you can't do something.

Someone doesn't agree with you.

Someone doesn't do what you tell him to do.

Someone unexpected happens that messes up your schedule.

Result of your anger:

Write the techniques that you use to manage your anger: **Anger Management Techniques**



- Now, let's discuss the problems and solution with all.
- The individual will first briefly describe trigger points to the class.
- Then discuss the result of the anger. Other participants are requested to remain quiet while one is making the presentation.
- Post presentation, other participants may ask questions.



- Congratulate each individual for sharing their points.
- Ask the audience to applaud for them.
- Ask de-brief questions after the presentation to the class.
- Keep a check on the time. Ask the participants to wind up the activity quickly if they go beyond the given time limit.

Ask



De-brief questions:

- In the situation described by the presenter, who was at fault?
- How could you have handled this situation alternatively?

Summarize |



- Close the discussion by summarizing the strategies and tips of anger management for entrepreneurs.
- Ask the participants what have they learnt from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.

- Notes for Facilitation



- Encourage the participants to share information about them while presenting the situations to the class.
- Keep the format of the Activity prepared in a chart paper so that it can be displayed during the session.

UNIT 10.1.8: Stress Management: What is stress?

Unit Objectives | ©



At the end of this unit, participants will be able to:

- Discuss the causes of stress
- Discuss the symptoms of stress
- Discuss tips for stress management

Resources to be Used



Participant Handbook

Ask



- You are waiting in the reception for an interview or a very important meeting, suddenly your legs are shaky, your hands are cold, you are feeling nervous. Have you ever been in this kind of situation?
- Have you had days when you had trouble sleeping?
- Have you ever been so worried about something that you ended up with a terrible headache?

Sav



You've probably heard people say, I'm really stressed out" or "This is making me totally stressed."

Ask



- What do you understand by stress?
- What gives you stress?
- How do you feel when you are stressed or what are the symptoms of stress?
- How can stress harm you?
- Why is it important for entrepreneurs to manage stress?

Say



- When we feel overloaded or unsure of our ability to deal with certain challenges, we feel stressed.
- Discuss about stress, causes of stress, and symptoms of stress as discussed in the Participant Handbook.
- Let's understand the causes of stress and how to deal with them with the help of some case scenarios.
- You will be given some cases.
- You have to analyse the case scenario and then find an appropriate solution to the problem.
- This will be a group activity.

Do



- Divide the class into four groups of 5-6 participants (depending on the batch size).
- Assign one case scenario to each group.
- Instruct them to read the case carefully.
- The group is expected to analyse and discuss the case amongst them and find a solution to the given problem.
- Explain their discussion should result in getting answers for the following questions:

- What was/were the cause(s) of stress?
- Was the stress avoidable or manageable under the given circumstances?
- If yes, how do you think that the stress could be avoided (managed)?
- If no, then why not?
- Give the class 10-12 minutes to discuss the case and note down their solutions.
- At the end of 12 minutes, the team should present their case solution to the larger group.
- Ask the group to select a group leader for their group.
- The group leader to discuss and assign roles to the group members for the presentation.

Team Activity



Case Study Analysis

Scenario 1

Akash's alarm doesn't go off and he gets late getting out of the house. He hits traffic and ends up 15 minutes late to work, which his boss notices. He gets to his desk and finds he has to complete 2 reports in next one hour. Just when he is about to begin work, a message pops up "Telecon with the client begins in 10 minutes. Please be in the conference room in 5 minutes."

His is not prepared for the call. He is stressed. He does not want to speak to his boss about this. He is stressed, feeling uncomfortable and sick. Not in a position to attend the call or finish the reports on time.

Scenario 2

While paying his overdue bills, Rahul realised that it's the middle of the month and he has only Rs 500 left in his account. He has already asked all of his friends, and family for loans, which he hasn't paid back yet. He is still contemplating over the issue when his phone rings. His sister's birthday is due next week and she has seen a beautiful dress which she wants to buy but cannot tell the parents as it is a bit expensive. She wishes if Rahul could buy the dress for her. Rahul has promised to buy her the dress for her birthday.

Rahul is stressed, does not understand what to do. He is unable to concentrate on his work and unable to complete the tasks assigned. His team leader has already warned him of the delay.

Scenario 3

Sheela calls the cable company as she has unknown charges on her bill. She has to go through the automated voice mail menu three times and still can't get through to a customer care executive. After 15 minutes of repeated efforts, her call is answered. She explains the entire issue to the customer care executive but before the person could suggest a way out, the call drops.

Now Sheela has to call back and repeat the whole process all over again with a new customer care executive. She is very angry and calls again but cannot connect this time.

She has to leave to office so she decides to call from office and check. When she connects this time she is angry and argues with the executive on the call. All her co-workers around are looking at her as her volume has suddenly increased. She bangs the phone and ends the call.

Her co-worker Neelam enquires what has happened to her. She ignores her and just walks off. She has become irritable and her behaviour and tone with other co-workers is not acceptable.

Scenario 4

Arpit is a young entrepreneur who started doing business through Facebook few weeks back. He had always been into a job. Although Arpit has very few financial liabilities, it wasn't an easy decision to leave a comfortable job at once and look for newer pastures. Arpit's boss warned him of the consequences and the challenges of starting a business when nobody ever in his family had been in business.

He has not been able to get a good deal till now. This is an important life shift for him which comes with unknown variables. Arpit is nervous and is wondering if he has what it takes to fulfill the requirement of his new role, or the new experiences he's likely to face.

Ask



De-brief questions:

- What was/ were the cause(s) of stress?
- Was the stress avoidable or manageable under the given circumstances?
- If yes, how do you think that the stress could be avoided (managed)?
- If no, then why not?

Say



- Now, let's discuss the problem and solution with the larger group.
- The group will first briefly describe the case to the class.
- Then discuss the issue identified and the proposed solution.
- Post presentation, the other groups may ask questions to the group that has presented.

Do



- Congratulate each group for sharing their points.
- Ask the audience to applaud for them.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time. Tell participants to wind up the discussion quickly if they go beyond the given time limit.

Say



- While it is common and normal to feel some tension. This feeling nervous and tensed can interfere with your thinking process and can have a negative impact on your performance.
- Stress can deplete the most vibrant of souls. It can have a negative effect on every aspect of a person's life including their health, emotional well-being, relationships, and career. However, one needs to understand the causes and types of stress before looking for ways to manage it.

De-brief:

Scenario 1

The cause of stress was lack of time management and the habit of procrastinating. If Akash would have managed his time well, planned alternate ways to get up on time, finished prior tasks on time and planned for client meetings in advance then he wouldn't have faced stress.

Scenario 2

The cause of stress was lack of financial planning. Rahul should have planned his financial resources well in advance and saved some money for the rainy day. Also, differentiating between needs and wants and keeping a check on non-essential expenditure would have saved Rahul from this situation.

Scenario 3

Sometimes, stress is caused due to external factors instead of internal ones. In this case, the stress was unavoidable because we have no control over this customer care system. Every time, you will get in touch with a new executive and will have to explain all over again. This might cause stress but despite being frustrated and angry there is little that we can do about it. All Sheela could do was to find ways to calm herself down through some breathing exercises and meditation, reading some good book or listening to music and then start afresh.

Scenario 4

A positive, major life change can be a source of good stress. Regardless of how good the change is, it can be stressful. Stress caused by a positive and major life change can be beneficial because it causes a person to step out of their comfort zone and learn new skills. Here, Arpit may become a successful entrepreneur or learn new ways to do things differently.

Now let us see this scenario, can I have a volunteer to read out this case to the class.

Do



• Ask one of the participant who can volunteer and read out this scenario to the class.

Scenario 5

Rakesh lives in Kathmandu with his wife and two beautiful daughters Sarah and Sanya. Nepal was hit by a massive earthquake and Rakesh's building collapsed during the earthquake. During evacuation, Rakesh realised that though his wife and Sarah were fine and suffered only minor bruises, Sanya was nowhere in the scene. Panic stricken, he started calling her name and searching her frantically. A little later, he heard a meek voice from beneath the debris. He quickly removed the rubble to find a huge bed. Rakesh was pretty sure that Sanya was trapped underneath. Though he was badly bruised, he gathered all his courage and with all his might, he lifted the several-ton bed to save Sanya's life. Everyone was relieved to see Sanya alive and also extremely surprised to see this father's ability to access superhuman strength.

- Ask the audience to applaud for the participant after the scenario is read completely.
- Discuss the scenario, ask de-brief questions:
 - What kind of stress was Rakesh undergoing in this case?
 - Was the stress avoidable or manageable under the given circumstances?
 - What was the result of the stress?

Say



De-brief:

Not all stress is harmful; good stress is actually energizing. This was a case of lifesaving stress, or hero stress, which is an important example of good stress. You may have heard stories in which a person performs an impossible feat of physical strength in order to save their life or the life of someone they love. This type of stress causing a surge of adrenaline is good for us.

Summarize **2**

- Close the discussion by summarizing the tips to manage stress as given in the Participant Handbook.
- Ask the participants what they have learnt from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.

Notes for Facilitation



- Keep printed copies of the activities/ scenarios ready for the session.
- Put down the de-brief questions on a flip chart so that it can be displayed in the class during the activity.
- Encourage participation and make the discussions interative.

Notes			
	 	 	-
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UNIT 10.2: Digital Literacy: A Recap

Key Learning Outcomes



At the end of this unit, participants will be able to:

- 1. Identify the basic parts of a computer
- 2. Identify the basic parts of a keyboard
- 3. Recall basic computer terminology
- 4. Recall the functions of basic computer keys
- 5. Discuss the main applications of MS Office
- 6. Discuss the benefits of Microsoft Outlook
- 7. Identify different types of e-commerce
- 8. List the benefits of e-commerce for retailers and customers
- 9. Discuss Digital India campaign will help boost e-commerce in India
- 10. Describe how you will sell a product or service on an e-commerce platform

UNIT 10.2.1: Computer and Internet Basics: **Basic Parts of a Computer**

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- Identify the basic parts of a computer
- Identify the basic parts of a keyboard
- Recall basic computer terminology
- Recall the functions of basic computer keys

Resources to be Used



- Participant Handbook
- Computer Systems with the required applications

Sav



- Let's take a quick recap of the basic computer parts.
- Discuss 'Basic Parts of Computer' and 'Basic Parts of a Keyboard' with the class as given in the Participant Handbook.

Explain



Explain all the parts of the computer and the keyboard by demonstrating on the real system.

Ask



- Do you know about internet?
- Have you ever used internet?
- Why do you think internet is useful?
- What was the last task you performed on internet?

Say



- Let's look at some basic internet terms.
- Discuss 'Basic Internet Terms' with the participants as given in the Participant Handbook.

Summarize |



- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of computer and internet for entrepreneurs.

Practical |

- Conduct a practical session.
- Ask the participants to assemble in the computer lab.
- Give some hands on practice exercises.

Do 🗸

- Group the participants for the activity depending on the batch size and the number of computer systems available in the lab.
- Explain the purpose and duration of the activity.
- Ensure the participants complete the practical exercises assigned.

UNIT 10.2.2: MS Office and Email: About MS Office

Unit Objectives | @



At the end of this unit, participants will be able to:

- Discuss the main applications of MS Office
- Discuss the benefits of Microsoft Outlook

-Resources to be Used



- Participant Handbook
- Computer Systems with MS Office

Ask



- What is the most frequent activity that you do on the computer?
- Do you know how to make presentations on the computer?



- Give a brief introduction of MS Office as given in the Participant Handbook.
- Discuss the most popular office products. Explain in brief their application, benefits and working.
- Microsoft Word is a word processing program that allows for the creation of documents. The program is equipped with templates for quick formatting. There are also features that allow you to add graphics, tables, etc.
- Microsoft Excel is a tool for accounting and managing large sets of data. It can also simplify analysing data. It is also used to create charts based from data, and perform complex calculations. A Cell is an individual data box which will have a corresponding Column and Row heading. This gives the cell a name, referred to as the Cell Reference. There can be multiple pages in each workbook. Each page, or sheet, is called a Worksheet. When you open a new Excel file, it automatically starts you with three worksheets, but you can add more.

-Explain



Explain the working and frequently used features of Office on a real system.

Ask



- What do you know about e-mails?
- Do you have an email id?
- How often do you check your e-mails?

Sav



- Communication is vital for every business. The fastest and the safest way to communicate these days are through emails. MS Outlook helps to manage your emails in a better way and also offers a host of other benefits.
- Discuss "Why Choose Microsoft Outlook?" with the participants as given in the Participant Handbook.



- Ask the participants to assemble in the computer lab.
- Explain the working of Outlook on a real system..

Demonstrate |

- Demonstrate how to create email id.
- Demonstrate how to write new mails, send mails.
- Demonstrate how to use MS Office application to create a letter and send it as attachment in an email.
- Demonstrate how to use other MS Office applications.

-Practical | 💥



- Give some hands on practice exercises
- Group the participants for the activity depending on the batch size and the number of computer systems available in the lab.
- Explain the purpose and duration of the activity.

–Summarize |



- Ask the participants what they have learnt from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.

UNIT 10.2.3: E-Commerce

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- Identify different types of e-commerce
- List the benefits of e-commerce for retailers and customers
- Discuss Digital India campaign will help boost e-commerce in India
- Describe how you will sell a product or service on an e-commerce platform

Resources to be Used



- Computer System with internet connection
- Participant Handbook

-Ask



- How many of you have done shopping online?
- Can you name at least five shopping websites?
- What is the product that you most frequently buy online?
- Why do you do shopping online instead of going to the market?

Say



- Give a brief introduction of "What is E-commerce". Refer to the Participant Handbook.
- E- commerce emerged in the early 1990s, and its use has increased at a rapid rate. Today, many companies sell their products online. Everything from food, clothes, entertainment, furnitureand many other items can be purchased online.

-Ask



What other types of transactions have you performed on the internet other than buying products?



• Give examples of e-commerce activities from Participant Handbook.

Team Activity



E-commerce examples

- Instruct the participants to list some of the payment gateways that they have used for e-commerce activities.
- Give them 5 minutes to make this list.
- Discuss payment gateways and transaction through payment gateways.
- Conclude the discussion by mentioning how important e-commerce has become in our day to day transactions.

Say



- E-commerce activities can be classified based on the types of participants in the transaction.
- Discuss "Types of E-commerce" from the Participant Handbook.

-Do



- Discuss all types of E-commerce by giving examples and names of some popular websites which use them.
- Make the discussion interactive by asking the class to share some popular e-commerce sites of each type.

Say



- E-commerce activities bring a host of benefits for both, retailers and customers.
- Discuss benefits of E-commerce from the Participant Handbook.

-Explain



- The majority of the population that uses E-commerce activities lives in tier-1 and tier-2 cities. To encourage the use of digital money in tier-3 and 4 areas, PM Mr. Modi launched the "Digital India Campaign".
- Discuss "Digital India Campaign" from the Participant Handbook.
- By Digital India project the government will deliver services via mobile connectivity and in doing so, is expected to bring the internet and broadband to remote corners of the country. This connectivity will in turn enhance e-commerce activities also. Furthermore, the Indian Government is also modernizing India Post and aims to develop it as a distribution channel for e-commerce related services.

Say



- Now let us discuss how to sell a product using E-commerce.
- Every product has to be sold on a platform on the internet. Think of it as a shop that you have to sell your product. Now this shop can be your own or shared or rented. If the shop is your own or rented there will be only your products in that shop. If the shop is shared, there will be products of multiple sellers in that shop. A common example is a departmental store which has products from multiple brands in the shop.
- Similarly, in E-commerce the shop is the website where your products are displayed. If it is your own website it will exclusively showcase your products. In this case the cost that you will incur will be:
 - Developing the website
 - Hosting the website
 - Maintenance of the website
- If you rent a website it will also showcase your own products but the development, hosting and maintenance parts goes to the owner. This saves time and the cost to manage these activities.
- Smaller companies usually go for renting a website and the bigger ones develop their own website.
- The concept of shared platforms has become very popular in recent times. In this platform the sellers have to register and then they can sell their goods on a common platform. Among the most popular of these are Amazon, Myntra, Flipkart, etc.

-Role Play



- Tell the participants to choose a product or service that they want to sell online.
- Tell them to write a brief note explaining how they will use existing e-commerce platforms, or create a new e-commerce platform to sell their product or service.

Ask



- How much money are you carrying in your wallet?
- Do you have a credit/debit card?
- How do you make payments while doing online shopping?



- Demonetization has made carrying cash in the wallet very difficult. People either shop through cards or some other form of digital money.
- So what do you think is digital money?
- In this form the money is both paid and received digitally. There is no hard cash involved. It is an instant and convenient way to make payments.
- There are various types of digital payments. Let us discuss some of them in brief here.
- The first one is the most commonly used system i.e. the cards. Debit card, credit card, prepaid card, all fall under this category.
- Then is the e-wallet or the mobile wallet. This has become the most used form of digital money after demonetization. Examples are Paytm, state bank buddy, Freecharge, etc.
- Many other forms of digital money are also coming up in market like mobile apps, Aadhar card based payment, etc.

Do



Demonstrate how to make and receive payments through digital models like Paytm and state bank buddy.

-Ask



Why do you think people have started using digital money instead of hard cash? Is demonetization the only reason?



- Digital money gives a lot of advantages over the conventional hard cash. Some of them are:
 - Digital payments are easy and convenient. You do not need to take loads of cash with you, a mobile phone or a card will suffice.
 - With digital payment modes, you can pay from anywhere anytime.
 - Digital payments have less risk.

Summarize |



- Ask the participants what they have learnt from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of e-commerce and digital money.

Notes			
	 	 	-
			-



UNIT 10.3: Money Matters

Key Learning Outcomes



At the end of this unit, participants will be able to:

- 1. Discuss the importance of saving money
- 2. Discuss the benefits of saving money
- 3. Discuss the main types of bank accounts
- 4. Describe the process of opening a bank account
- 5. Differentiate between fixed and variable costs
- 6. Describe the main types of investment options
- 7. Describe the different types of insurance products
- 8. Describe the different types of taxes
- 9. Discuss the uses of online banking
- 10. Discuss the main types of electronic funds transfer

UNIT 10.3.1: Personal Finance – Why to Save?

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- Discuss the importance of saving money
- Discuss the benefits of saving money

Resources to be Used



Participant Handbook

Ask



- How many of you save money?
- Why do you feel the need to save it?
- Do you plan your savings?
- Where do you keep the money you save?
- How do you use the money that you have saved?

-Example



Let's look at these two examples:

Example 1:

Suhani works in a good company and earns Rs.30, 000 month. She always saves 5000 per month and keeps it aside as a personal saving. She keeps the money at home and has saved quite a lot. One day her mother has a medical emergency and has to be taken to the hospital. Her family is worried about the amount they have to spend for the treatment. It will cost them at least 40,000.

Suhani says tells her family not to worry and that she has about 50,000, which she has saved over the months.

Example 2:

Jasmeet works in the same company and earns the same as Suhani. She is very fond of shopping and spends most of her money on buying new clothes. At the end of the month, she is always asking her father for money as her pay is finished.

Ask



- Who do you identify with -Suhani or Jasmeet?
- How do you think Suhani manages to save money which Jasmeet is unable to do?



- We should always set aside some and save some money from our monthly pay. The future is unpredictable. Saving money not only gives you a sense of financial security but it can be used in case of emergencies.
- Discuss "Importance of Saving" with the participants as given in the Participant Handbook.

-Ask



- What are the benefits of saving money?
- What does being financially independent mean to you?

Say



- Discuss "Benefits of Saving" with the participants as given in the Participant Handbook.
- Now let us continue with Suhani's story. Suhani has told her family not to worry and that she has about 50,000, which she has saved over the months. The family is happy about Suhani's decision of saving money, which will be of great help for them now.

Suhani is going to the hospital today to pay the first instalment for the treatment. Suddenly finds only 35,000 in her cash box when she counts and does not remember using it. She has not kept any record and now she is upset.

Ask



- Was it a good decision by Suhani to save a part of her earnings every month?
- Was it a wise decision to keep all her savings as cash in a cash box?
- Could she have managed to save money in a better and more effective manner?
- Do you want to learn how to save money and use it effectively?

Say



· Let's learn personal saving with the help of a group activity.

Team Activity



Personal Finance-Why to save

• This activity has two parts:

PART 1

WAYS TO SAVE MONEY

- You are earning 30,000/- per month. You have recently changed your job and have to move to a metropolitan city. You are now living as a paying guest paying 10,000/- per month. Your other estimated expenditures like travel, food, recreation would be around Rs. 17,000 per month.
- Make a list of different ways to save money.

PART 2

HOW WILL YOU USE THE MONEY

- After a year how much have you been able to save?
- How will you use the money that you have saved?

Do



- Divide the class into groups of four.
- Instruct the participants to think and prepare a list of the various ways they can save money.
- Give the participants 10 minutes to prepare the list.
- Once done, instruct them to think of how they could use the money they have saved.
- Give the participants 10 minutes to prepare the list.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Activity De-brief

- What were the different ways you could save money?
- How much money were you able to save?
- How will you use the money you have saved in one year?

Say



• Discuss the importance of personal finance and why it is important to save money.

-Summarize



You can summarize the session by discussing:

- The importance of saving money.
- Ways to save money.
- How the money saved can be used for different purposes.

UNIT 10.3.2: Types of Bank Accounts, Opening a Bank Account

-Unit Objectives 🏻 🍪



At the end of this unit, participants will be able to:

- Discuss the main types of bank accounts
- Describe the process of opening a bank account

Resources to be Used



- Account opening sample forms
- Participant Handbook

Ask



- How many of you save money?
- Where do you keep the money you save?
- How many of you have a bank account?
- What type of account do you have?

-Example



• Let's look at the given example:

Reena is in the third year of college but in the evening she gives tuitions for children living in her colony. She earns 15,000/- per month. As her students stay in different parts of the city, she has to walk a lot.

To save time, she decides to buy a second hand scooter for herself. But she has to save money for it. Her class mate advises her to open a recurring deposit account in the bank.

She goes to the bank close to her home. The personal manager gives her some forms to fill. She is confused as she has never done this before. Her elder sister has an account in the same bank. She asks for help from her sister. She goes to the bank the next day with her sister. The personal banker gives her a list of documents that she will need to submit with the form for opening an account. The banker advises her to open a 6 months recurring deposit.

-Ask



- Do you try to save money monthly but have to spend it on unforeseen expenditure?
- Have you ever thought of depositing your savings in a bank?

Say



- Before opening a bank account, you need to know the types of accounts we have in India.
- Discuss "Types of Bank Accounts" with the participants as given in the Participant Handbook.

-Ask



Can someone say what are the different types of bank accounts?

Say



• Let's learn about the different types of bank accounts through an activity.

Team Activity 💃



- Divide the class in four groups.
- Label the groups as savings account, current account, recurring account and fixed deposit.
- On a chart paper, ask them to write the key points of their account.

Activity De-brief

• Ask each group to present the key points of their account.

-Say



- Now that you know about the four different types of accounts, let's learn how to open a bank account.
- Discuss "Opening a Bank Account" with the participants as given in the Participant Handbook.
- Discuss "Tips" that the participants should keep in mind while opening a bank account as given in the Participant Handbook.

-Ask



- What are the main documents required for opening a bank account?
- What are some important points to ask the bank personnel while opening an account?

Say



- Mention officially valid KYC documents (refer to the Participant Handbook)
- Now, let's understand the procedure of opening a bank account through an activity.

Team Activity



Opening a Bank Account

- This activity is done in groups.
- Divide the class in groups of four or six.

PART 1

FILLING A BANK ACCOUNT OPENING FORM

- You have to fill a bank opening form.
- You can refer to the section "Opening a Bank Account" of your Handbook for reference.
- List all the steps that you will be required to fill in the form.
- List the documents that you needs for filling the form.
- Now fill in the form.

Activity De-brief

How did you design the form?

- What all details did you fill in the form?
- What were your KYC documents?
- How would this activity help you in future?



- Instruct the participants to read the section "Opening a Bank Account' of the Participant Handbook.
- Give each group one sample account opening form.
- Give the participants 5 minutes to read the form.
- Give them 15 minutes to fill it.
- Assist them by explaining each category and how to fill it.
- Keep a check on time.

No. of Dependents

Tell the group to wind up quickly if they go beyond the given time limit.

-Summarize 📜



Note:

- You can summarize the unit through a role play.
 - A person wanting to open an account in the bank.
 - What is the procedure that he will go through?
 - Discuss the key points of different types of bank accounts.
 - How to select the type of account
 - How to fill the account opening form.
- A sample account opening form is given in the following page for reference. Use it for the activity in the class.

Sample Bank Account Opening form.		
Photograph		XXX Bank
SAVIN	IG BANK ACCOUNT OPENING FO	RM
Account No.:		Date:
Name of the Branch		
Village/Town		
Sub District / Block Name		
District		
State		
SSA Code / Ward No.		
Village Code / Town Code	Name of Village / To	own
Applicant Details:		
Full Name Mr./Mrs./Ms. First	Middle	Last Name
Marital Status		
Name of Spouse/Father		
Name of Mother		
Address		
Pin Code		
Tel No. Mobile	С	Date of Birth
Aadhaar No.	P	Pan No.
MNREGA Job Card No.		
Occupation/Profession		
Annual Income		

Detail of Assets	Owning Hous	se :	Y/N	Owning Farm :	
	Y/N No. of Anima	ıls ·		Any other :	
Existing Bank	110.017111110			ruly sulei	
A/c. of family)	/ / N	If y	es, No. of A/cs	
members /					
household	MI - II	1.1.	N//N		
Kisan Credit Card	Whether Elig		Y/N		
I request you to is					
I also understand that I am eligible for an Overdraft after satisfactory operation of my account after 6 months of opening my account for meeting my emergency/ family needs subject to the condition that only one member from the household will be eligible for overdraft facility. I shall abide by the terms and conditions stipulated by the Bank in this regard.					
Declaration: I hereby apply for opening of a Bank Account. I declare that the information provided by me in this application form is true and correct. The terms and conditions applicable have been read over and explained to me and have understood the same. I shall abide by all the terms and conditions as may be in force from time to time. I declare that I have not availed any Overdraft or Credit facility from any other bank. Place: Date: Signature / LTI of Applicant					
Nomination:					
I want to nomin					
Name of Nominee	Relationship	Age	Date of Birth in case of minor	Person authorised in case to receive the amount of deposit on behalf of the nominee in the event of my /minor(s) death.	
Place:					
Date:	Date: Signature / LTI of Applicar			Signature / LTI of Applicant	
Witness(es)*					
1					
2					
۷.					

UNIT 10.3.3: Costs: Fixed vs. Variables: What are Fixed and Variable Costs?

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

Differentiate between fixed and variable costs

Resources to be Used



- Participant Handbook
- Blank sheets of paper
- Pens

-Ask



- Will a telephone bill fall under the category of a fixed or variable cost?



Discuss: Fixed and Variable cost with examples. Let us do a small activity.

-Team Activity



Identify the type of cost

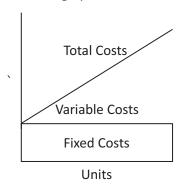
- Rent
- Telephone bill 2.
- Electricity bill 3.
- Machinery 4.
- 5. Insurance
- 6. Office supplies/Raw materials
- 7. **Employee salaries**
- 8. Commision percentage given to sales person for every unit sold
- Credit card fees 9.
- 10. Vendor bills



- Divide the class into two groups. Read out the list of costs given in the activity.
- Read out each item from the cost list and ask the groups in turns to identify whether it is a fixed or variable cost.



- We saw that your utility bills like rent, electricity, telephone etc. are all fixed costs because you have to pay it every month.
- Variable costs is an expense which varies with production output or volume. For example commission, raw material etc.
- Discuss "Cost: Fixed vs. variables" with the participants as given in the Participant Handbook.
- Illustrate the relation between the costs with a graph.



Let's learn the difference between fixed and variable cost with the help of an activity.

Team Activity



Fixed vs. Variable Costs

- This is a group activity.
 - You want to start your own entrepreneur business.
 - State the type of business you want to start.
 - List down all the cost or requirements for your business.
 - How will you differentiate between the fixed and variable cost.

Activity De-brief

- What is the total cost of your business?
- What are the fixed costs?
- What are the variable costs?
- How did you differentiate between the fixed and variable costs?



- Instruct the participants that this is group work.
- Divide the class into small groups of 4 or 6.
- Give each group a sheet of paper.
- Tell the participants that they have to start their own entrepreneur business.
- Ask them the type of business they want to start.
- Instruct them to differentiate between the fixed and the variable costs of the business they want to start.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

-Summarize 📜



· Note: You can summarize the unit either by having a role play between a consultant and a budding entrepreneur explaining the differences between fixed and variable costs or by discussing the key points of the unit.

Notes for Facilitation



Answers for the activity - Identify the type of cost

Rent (Fixed) 1.

Telephone bill (Fixed) 2.

3. Electricity bill (Fixed)

Machinery (Fixed) 4.

(Fixed) Insurance 5.

6. Office supplies/ Raw materials (Variable)

7. **Employee salaries** (Fixed)

Commission percentage given to sales person for every unit sold (Variable) 8.

Credit card fees (Variable)

10. Vendor bills (Variable)

UNIT 10.3.4: Investments, Insurance and Taxes

-Unit Objectives 🏻 🍪



At the end of this unit, participants will be able to:

- Describe the main types of investment options
- Describe the different types of insurance products
- Describe the different types of taxes

Resources to be Used



Participant Handbook

Ask



- Ask the participants- "What do you see first thing in when you get your mobile bill? Apart from the amount and due date do you have a look at the taxes you are being billed for?
- Why do you think people get their cars insured or have a medical insurance?
- You have saved money and want to invest it, how would you decide what is the best investment for your money?

-Example



Let's have a look at a few scenarios.

Ranbir has sold his house and deposited the money in his bank. His Chartered Accountant tells him that he will have to re-invest the money otherwise he will have to pay capital tax. What is capital tax and how is it different from income tax?

Jasmeet and Anup are blessed with a baby girl. They decide to have an insurance policy that will mature when their daughter is ready to higher education.

Shivani is working in a corporate office and getting good pay. She will have to pay income tax so she decides to invest her money in tax saving schemes. She goes to the bank manager to discuss the best products in which she can invest.

-Say



Discuss the Investment, Insurance and Taxes as given in the Participant Handbook.

·Ask



How do investments, insurances and taxes differ from each other?

Say



Let's learn the differences between the three by having an activity.



We will have a quiz today.

Team Activity



The activity is a quiz.

·Do



- Divide the class into groups of three and give a name to each group
- Explain the rules of the quiz. For each correct answer the group gets 1 mark. If the group is unable to answer the question is rolled over to the next group.
- Explain the purpose and duration of the activity.
- On the blackboard write the names of the groups.
- Ask the questions of the quiz.
- Keep a score for the groups.
- Set guidelines pertaining to discipline and expected tasks.

·Summarize | 燵



Summarize the unit by discussing the key points and answering question

Notes for Facilitation



Questions for the quiz

1. What are bonds?

Bonds are instruments used by public and private companies to raise large sums of money.

2. Who issues the bonds?

Private and public companies issue the bonds.

3. Why are bonds issued?

To raise large amount of money as it cannot be burrowed from the bank.

4. Who is the buyer of stocks and equities?

The general public is the buyer.

5. What types of scheme is the Sukanya Samriddhi Scheme?

Small Saving Scheme

6. What is the difference between mutual and hedge funds?

Mutual funds are professionally managed financial instruments that invest the money in different securities on behalf of investors. Hedge funds invest in both financial derivatives and/or publicly traded securities.

7. Why is a loan taken from the bank to purchase real estate?

To lease or sell to make profit on appreciated property price.

8. Name the two types of insurances?

Life Insurance and Non-life or general insurance

9. Which insurance product offers financial protection for 15-20 years?

Term Insurance

10. What is the benefit of taking an endowment policy?

It offers the dual benefit of investment and insurance.

11. Mr. Das gets monthly return on one of his insurance policies. Name the policy?

Money Back Life Insurance

12. What are the two benefits of a Whole Life Insurance?

It offers the dual benefit of investment and insurance

13. Which policy covers loss or damage of goods during transit?

Marine Insurance

14. After what duration is the income tax levied?

One financial year

15. What is long term capital gain tax?

It is the tax payable for investments held for more than 36 months.

16. Name the tax that is added while buying shares?

Securities Transaction Tax

17. What is the source of corporate tax?

The revenue earned by a company.

18. Name the tax whose amount is decided by the state?

VAT or Value Added Tax

19. You have bought a T.V. What tax will you pay?

Sales Tax

20. What is the difference between custom duty and OCTROI?

Custom duty is the charges payable when importing or purchasing goods from another country. OCTROI is levied on goods that cross borders within India.

UNIT 10.3.5: Online Banking, NEFT, RTGS, etc.

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- Discuss the uses of online banking
- Discuss the main types of electronic funds transfer

Resources to be Used



- Participant Handbook
- Computer System with internet connection
- Debit card

-Ask



- When was the last time you visited a bank?
- How do you pay your bill for electricity and telephone?
- Have you ever tried to transfer money from one bank account to another bank account using the online banking facility?



- Most of us lead a busy life. Time has become more important than money. In this busy schedule no one has time to stand in bank queues. That's where Online Banking comes in. Online banking or internet banking means accessing your bank account and carrying out financial transactions through the internet.
- Discuss "What is online banking?" from the Participant Handbook.
- There are various advantages of online banking:
 - It saves time, as you need to visit the branch.
 - You can conduct your banking transactions safely and securely without leaving the comfort of your home.
 - Online Banking also gives you round the clock access.
 - Online Banking makes it possible for you to pay your bills electronically.

- Show them how they can use the internet banking.
- Use the computer system and show the demo videos on how to use internet banking provided on most banking sites. the computer system.
- Tell the class the various features of online banking:
 - Through their website set-up your online account.
 - Choose a secure username and password.
 - Set-up your contact information.
 - Once your information is verified, you are good to go.
 - Once you enter the portal explore all the features and learn your way through the portal.
- Discuss about maintaining the security of the online account.

Say



- One of the biggest advantage that online banking offers, as discussed earlier, is transferring money from one
 account to another. This transaction is called electronic funds transfer. Electronic transfers are processed
 immediately with the transferred amount being deducted from one account and credited to the other in real
 time, thus saving time and effort involved in physically transferring a sum of money.
- Discuss "Electronic Funds Transfer" from the Participant Handbook.

Do



- Discuss how to transfer money from one account to another using online banking (NEFT/RTGS, etc.).
- Illustrate with an example.

Summarize 📜



- Close the discussion by summarizing the about online banking.
- Ask the participants if they have any questions related to what they have talked about so far.

Notes			
	 	 	-
			-



UNIT 10.4: Preparing for Employment & Self Employment

Key Learning Outcomes



At the end of this unit, participants will be able to:

- 1. Discuss the steps to follow to prepare for an interview
- 2. Discuss the steps to create an effective Resume
- 3. Discuss the most frequently asked interview questions
- 4. Discuss how to answer the most frequently asked interview questions
- 5. Identify basic workplace terminology

UNIT 10.4.1: Interview Preparation: How to Prepare for an Interview?

-Unit Objectives



At the end of this unit, participants will be able to:

Discuss the steps to follow to prepare for an interview

Resources to be Used



Participant Handbook

-Ask



- Have you ever attended an interview?
- How did you prepare before going for an interview?



- An interview is a conversation between two or more people (the interviewer(s) and interviewee) where questions are asked by the interviewer to obtain information from the interviewee.
- It provides the employer with an opportunity to gather sufficient information about a candidate and help them select the ideal candidate.
- It also provides the interviewee with an opportunity to present their true potential to the employer, build confidence and help make a decision about the job by asking questions regarding designation, salary, perks, benefits, promotions, transfers, etc.
- Let's do an activity to understand how to prepare for interviews better.

-Activity 1 💯



· Introducing Yourself

·Do



- Select a participant and ask him/her to answer the following questions: "What can you tell me about yourself."
- Give the participant at least one minute to speak.
- Once he/she is done, ask the rest of the participant what they gathered about the participant who was providing information.
- Now repeat the exercise with five other participants.

-Ask



- What information you should include when you are describing or introducing yourself in an interview?
- What information you should not include when you are describing or introducing yourself in an interview?



- Tell the participants that when an interviewer asks you to say something about yourself, he/she is not asking you to present your life history.
- Introduction should be short and crisp, and should present you in a positive light. It should include the following points:
 - Any work experience that you might have
 - A brief summary of your educational qualifications
 - Your strengths and achievements
 - Any special projects that you might have been part of
- The following topics should be avoided during an introduction:
 - Detailed description of your family (unless you are specifically asked to do so)
 - Too much information about your weaknesses
 - Information that is not true

Do



- Congratulate each participant for sharing their points.
- Ask the audience to applaud for them.
- Ask de-brief questions to cull out the information from each group.
- Keep a check on time.

-Activity 2



Planning the right attire

Do



Describe 2 individuals to the participants. One is wearing a casual t-shirt, jeans, and slippers. He has not combed his hair and neither has he trimmed or shaved his beard. The other individual is dressed formally with a shirt and pant, and is well-groomed. He has also worn formal shoes and a belt. Ask the participants which person would they prefer to hire in their organization and why?

Summarize 🔀



- Close the discussion by discussing 'how to prepare for an interview' as discussed in the Participant Handbook.
- You can add the following points to it:
 - · Tell the participants to create a positive and good impression in an interview. It is important for them to prepare for an interview beforehand.
 - The interviewer analyses not only your technical knowledge in relation to the job, but also whether or not you are a fit for the organization.
 - Every employer looks at the whole package and not just one or two things in isolation. Therefore, the way you dress and the way you present yourself is also important along with your skills and talents.
 - The participants will get only one chance to create a good first impression.

UNIT 10.4.2: Preparing an Effective Resume: How to Create an Effective Resume?

-Unit Objectives



At the end of this unit, participants will be able to:

· Discuss the steps to create an effective Resume

Resources to be Used



- Participant Handbook
- Blank papers
- Pens

-Ask



- When preparing for an interview, what are the most important things that you need to do?
- What documents do you carry with you, when you go for an interview?
- What is a resume?
- Why do you need a resume?

·Say



- Resume is not just a sheet of paper with your qualifications printed on it.
- It is a selling tool that will help the employer to see how and what you can contribute for company.
- Talk about the steps involved in creating an effective/attractive resumes discussed in the Participant Handbook.
- Now let's prepare a resume to understand the process in a better way.

Do



- This is an individual activity.
- · Give the details of the activity.
- Instruct them to read the activity carefully.
- The participant is expected to make an attractive resume based on the information provided.
- Give the class 25-30 minutes to study the case and create a resume.
- At the end of 30 minutes, the participants should exchange the resume with the person sitting next to him or her.
- Every participant will evaluate the resume prepared with their fellow participants.

Say



- Do you think the candidate should apply for the job posting described in the advertisement?
- We have already discussed the steps involved in creating an effective/attractive resumes.
- Now let's prepare a resume for the candidate details given in the activity.



Case Study Analysis

- In the first section of the activity, you are being given the information about a candidate who is applying for a particular job.
- In the second section, you are being given the detailed description of the job posting. Create a resume for the candidate to apply for the job posting.
- Use the information that has been provided about the candidate to create this resume.

Candidate Details

Nipesh Singla was born on 20th April, 1988 in Chandigarh, India. He currently resides at 1XX7, Sector XX D, Chandigarh –160018. His mobile number is 988XXXXXV01, and e-mail address is nxxxxxxxxxla@gmail.com. Nipesh attended middle and senior school at Government Boys Senior Secondary School, Sector 15, Chandigarh. He has been a very talented boy since school. He was fond of painting and watching old Hindi movies. As part of a school charity program, he volunteered at the children's hospital during his senior years.

In July 2007, he joined Westwood School of Hotel Management, Zirakpur to pursue a diploma course in Hotel Management and Catering. After completing this course, he joined XYZ Group of Hotels as a Housekeeping intern in June 2010 for six months. In this role, he was responsible for cleanliness and maintenance of one floor in the hotel. Taking advantage of his strong interpersonal skills, he also got opportunities to make housekeeping arrangements for corporate meetings. While pursuing education, he gained working knowledge of Microsoft Word, Excel, Access and PowerPoint.

Nipesh is detail-oriented, flexible and adaptable. He has successfully worked with a diverse work force. He gelled well with his peers, both in college and during his internship. After completing the internship, his objective has been to find a job opportunity where he can use his skills and experience. Backed by experience, he is confident about his skills as housekeeping assistant.

Job Posting

* Do you see yourself as a HOUSEKEEPING SUPERVISOR?

What's your passion? Whether you're into cricket, reading or hiking, at IHG we are interested in YOU. At IHG, we employ people who apply the same amount of care and passion to their jobs as they do in their hobbies people who put our guests at the heart of everything they do. And we're looking for more people like this to join our friendly and professional team.

THE LOCATION:

At the moment, we are looking for HOUSEKEEPING SUPERVISOR to join our youthful and dynamic team at Holiday Inn Amritsar, Ranjit Avenue in Amritsar, Punjab (India). Holiday Inn Amritsar is ideally located in Amritsar's commercial district on Ranjit Avenue with the world famous Golden Temple located only a short distance away. Sparkling chandeliers mark an incomparable arrival experience as you escape to the welcoming environment that is, Holiday Inn Amritsar. The fresh international brand to celebrate and explore Amritsar.

Salary: Negotiable

Industry: Travel / Hotels / Restaurants / Airlines / Railways

Functional Area: Hotels, Restaurants

Role Category: Housekeeping

Role: Housekeeping Executive/Assistant.

Desired Candidate Profile

Friendly, pleasant personality, Service - oriented.

You should ideally be Graduate/ Diploma holder in HM and at least 2 years of experience as a supervisor in good brand with good communication skills, English is a must.

In return we'll give you a competitive financial and benefits package. Hotel discounts worldwide are available as well as access to wide variety of discount schemes and the chance to work with a great team of people. Most importantly, we'll give you the room to be yourself.

*Please get in touch and tell us how you could bring your individual skills to IHG.

Education-

UG: Any Graduate/Diploma holder

PG: Post Graduation Not Required

Say



• Now, let's share the resume with the fellow participant sitting next to you and evaluate each other's effort.

Do



- Congratulate each participant for making their first attempt towards creating an effective resume.
- As a follow up activity, you can suggest them to prepare their own resume and show it to you the next day.

Summarize 📜



- Close the discussion by showing some effective resume samples to the candidates.
- Ask the participants what they have learnt from this activity.
- Ask if they have any questions related to what they have talked about so far.

Notes for Facilitation



- Keep printed copies of the activity ready for the session.
- Put down the suggested format of the resume on the board while explaining the steps in preparing a resume.
- Do check the participants' resume and suggest necessary changes.
- Suggested example for the case presented:

Nipesh Singla

#1XX7, Sector XX-D

Chandigarh-160018

Mobile No: 91-988XXXXX01

E-mail: nxxxxxxxxxla@gmail.com

Objective: Seeking an opportunity to use my interpersonal skills and experience to contribute to your company's growth, profitability and objectives.

Professional strengths:

- Proficient in housekeeping
- Experienced in and capable of working with a diverse work force
- Team player and friendly in nature
- Successful working in a multi-cultural environment

- Detail oriented, flexible, and adaptable
- Knowledge of Microsoft Word, Excel, Access and PowerPoint

Educational background:

- Diploma in Hotel Management and Catering, Westwood School of Hotel Management, Zirakpur
- High School, Government Boys Senior Secondary School, Sector 15, Chandigarh

Professional internships:

- Housekeeping Intern, XYZ Group of Hotels, New Delhi (June 2010 August 2010)
 - Responsible for cleanliness and maintenance of one floor in the hotel.
 - Got opportunities to make housekeeping arrangements for corporate meetings.

Volunteer Work:

• Student volunteer at children's hospital in Chandigarh.

Nipesh Singla

UNIT 10.4.3: Interview FAQs

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- Discuss the most frequently asked interview questions
- Discuss how to answer the most frequently asked interview questions

-Resources to be Used 🕼



Participant Handbook



- Tell the participants you will provide them with interview situation and questions and they have to try to answer them.
- Tell them you will also explain the different ways to approach these questions.

Do



- Divide the class in pairs and ask the participants to perform a role play.
- One partner will play the role of the interviewer while the other will play the role of the interviewee.
- Tell them the interviewer can start the interview by asking the interviewee to introduce himself/herself.
- Call all the pairs one by one in front of the class to enact the role play.
- Follow the same pattern for all other situations.
- Time allotted for each situation is 8-10 minutes.
- Congratulate each participant for giving their input.
- Ask the class to applaud each time a team has completed their role play.
- Keep a check on time.

-Role Play 🔽



Conduct a role play for the situation given.

Situation 1

- The interviewer will start by asking the interviewee a few generic questions such as:
 - What is your name?
 - Tell me something about yourself?
 - Can you tell me something about your family?
- Then, the interviewer will bluntly ask the following questions:
 - How do you explain this huge time gap in your resume?
 - What is the reason for this?
 - Weren't you looking for a job or is it that no one selected you?

Say



De-brief:

- When you put information on your resume, you should be prepared to answer any questions about it.
- Be present and focused on the questions being asked to you.
- One way of tackling the blunt questions is to tell the interviewer you did not come across an opportunity where you were sufficiently satisfied with both the remuneration offered as well as the profile. Therefore, you waited for the right opportunity to come along while looking for an ideal job.

-Role Play 😴



Conduct a role play for the situation given.

Role Play - Situation 2

- The interviewer will start by asking the interviewee a few generic questions such as:
 - What is your name?
 - Tell me something about yourself?
 - Can you tell me something about your family?
- Then, at the end of the interview, ask the interviewee:
 - There are over 200 people who have applied for this job, some with excellent work experience. Why should I hire you?

Say



De-brief:

- There is nothing wrong with stating your strengths and achievements. However, do not come across as arrogant or too boastful.
- You need show the interviewee that you have unique skills or talents to contribute to the company. The interviewer needs to know how you stand apart from the rest of the crowd.
- Tell the interviewer you are looking forward to working with the company and that you are a hard-working individual.

-Role Play

Conduct a role play for the situation given.

Role Play - Situation 3

- The interviewer will start by asking the interviewee a few generic questions such as:
 - What is your name?
 - Tell me something about yourself?
 - Can you tell me something about your family?
- Then, lean forward, clasp your hands on the table and in a soft voice ask the interviewee:
 - Did you ever experience any neglect or disregard from your previous office? In other words, did you ever suffer because your office or team displayed favouritism?

Say



De-brief:

- Keep this in mind: Do not criticize anyone during an interview.
- You are free to express your opinion, however, your language, answers, body language, and the tone of your voice should remain constructive and neutral.
- Since criticism will show you in negative light, you should keep your answers honest yet diplomatic.
- You can tackle such questions by saying, "I got along well with most of my faculty and peers."

Role Play 🥰

Conduct a role play for the situation given.

Role Play - Situation 4

- The interviewer will start by asking the interviewee a few generic questions such as:
 - What is your name?
 - Tell me something about yourself?
 - Can you tell me something about your family?
- Then very bluntly ask the interviewee:
 - How long do you plan to stay with this company if you are selected?
- After the candidate responds, ask sarcastically:
 - Do you seriously mean that?

Say



De-brief:

- Don't provide unreal and idealistic answers.
- Your answers should be honest yet diplomatic. In a situation like this, the interviewer does not expect you to provide a specific timeline.
- You can say something like, "I would like to stay with the company as long as I can contribute constructively and develop as an employee, within the organization, professionally and financially."

Role Play



Conduct a role play for the situation given.

Role Play - Situation 5

- The interviewer will start by asking the interviewee a few generic questions such as:
 - What is your name?
 - Tell me something about yourself?
 - Can you tell me something about your family?
- Ask him/her how important he/she thinks it is to be punctual in the corporate world.
- After he/she answers, look up sternly at the interviewee and in a crisp voice, say:
 - You were late for this interview by 10 minutes. That surely does not seem to be in line with what you just said?

Say



De-brief:

- Politely apologize for being late.
- You can add something such as, "I assure you this is not a habit". All your future actions should be in line with this statement.
- Avoid giving any excuses.
- You might feel obligated to provide a justification for your tardiness, but the interviewer is not interested in that.
- Do not over apologize. Once this response is out of the way, turn your focus back to the interview.



Conduct a role play for the situation given.

Role Play - Situation 6

- The interviewer will start by asking the interviewee a few generic questions such as:
 - What is your name?
 - Tell me something about yourself?
 - Can you tell me something about your family?
- After asking a few academic or job-related questions, ask the interviewee:
 - If you get this job, what salary package do you expect us to give you?

Sav



De-brief:

· If there is no way for you to avoid this question, respond to the interviewer by providing a reasonable and well-thought out salary range.

Role Play 🔽



Conduct a role play for the situation given.

Role Play – Situation 7

- The interviewer will start by asking the interviewee a few generic questions such as:
 - What is your name?
 - Tell me something about yourself?
 - Can you tell me something about your family?
- Then, bringing the interview to a close, ask the interviewee:
 - Do you have any questions for me?

Say



De-brief:

- Ask relevant questions.
- Don't bombard the interviewer with questions.
- If you have questions about the result of the interview, you can limit your questions to 1 or 2. Keep them short and relevant like:
 - When will I be informed about the results of the interview?
 - What are the working hours?
 - Will the job require me to travel?

-Explain



- Tell the participants to be prepared for answering different types of questions in an interview.
- Stay calm and focused, and take a moment to think about how you should respond. Always maintain a confident tone.
- Even if you don't intend to, your body language conveys your level of discomfort with a particular question. Try to keep your actions, tone, and gestures neutral.
- Maintain your composure while answering personal question.

Do

- Tell all the participants to form pairs again.
- Tell them to use the following list of frequently asked interview questions to conduct mock interviews.
- They will use all or some of these questions to conduct mock interviews with their partners.
- One partner will play the role of the interviewer while the other will play the role of the interviewee.
- After they are through asking and answering the questions, the roles will be reversed.
- The same list of questions will be used again.
- After each mock interview ask the interviewer to provide feedback and clear any doubts that may arise.
- Time allotted for each situation is 30-35 minutes.



Mock Interview Questions

Mock Interview Questions

Tell me something about your family.

What qualities would you look for in a Manager or a Supervisor?

Why did you apply for this job?

What do you know about this company?

How do you deal with criticism?

How do you plan to strike a good work-life balance?

Where do you see yourself five years from now?

Have you applied for jobs in other companies?

What kind of salary do you expect from this job?

Do you have any questions for me?

-Summarize 🔎



- Close the discussion by discussing the questions in the both activities.
- Ask the participants what they have learned from this activity.
- Ask if they have any questions related to what they have talked about so far.

UNIT 10.4.4: Work Readiness – Terms and Terminology

-Unit Objectives | @



At the end of this unit, participants will be able to:

Identify basic workplace terminology

Resources to be Used 🎏



- Participant Handbook
- Chart papers
- Blank sheets of paper
- Pens

-Ask



- What do you understand by workplace terminology?
- Are offer letter and contract of employment the same?



Let's start this unit with an activity.

Team Activity



Workplace terminology

This is a group activity conducted in three parts.

Part 1

Sheila received a call from the recruiter of MND Company. Before she is recruited by the company, think of the recruitment process she will have to go through. Start from the telephone call to signing her letter of acceptance. Write down all the words that come to your mind.

Activity De-brief

- Have the participants read out the words they have written
- Encourage all the participants to participate in the activity

-Do



- Divide the class into small groups of 4 or 6.
- Instruct the participants that they will be doing a brainstorming activity.
- Give them one chart paper each. Tell them to divide the chart in two parts.
- Instruct them that they have to use one half of the chart paper now. The other half will be used later.
- The participants have to write all the words that come to their mind related to the recruitment process.
- Give them 10 minutes to do the activity.
- Tell them that there are no right or wrong answers.
- Keep a track of the time.

Say



- You all know guite a few words related to the terms used in the office.
- Let us talk about some new terms that have been missed out.
- Discuss "Work Readiness Terms and Terminology" with the participants as given in the Participant Handbook.

Ask



- Why is it important to know the workplace terms?
- · How do they help?
- Can the words be categorised further?

Say



• Let's now continue the activity.

Team Activity



Terms and Terminology

• This is again a group activity. The members of the group remain the same as in Activity 1.

Part 2

With the help of the new terms you have learned, make a flow chart of the hiring process of MND Company.

Activity De-brief

• Ask the groups to share the flow charts and the new terms they added while preparing the flow chart.

-Do



- Instruct the participants that they have to use the 2nd half of the same chart they had used before.
- Using the new terminology and the terms they had previously written on the chart, they have to make a flow chart of the hiring process of the MND Company.
- Give them 10 minutes for this activity.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Say



· Let's go ahead with the activity.

Team Activity



Terms and Terminology

• The activity continues with the same group members.

Part 3

Sheila now works for the MND Company. She is not aware of the company culture and policies. She goes to the HR Department to get her doubts clarified. Can you think of the terms for which she wants clarity? Make a list of those words.

Activity De-brief

• Ask the groups to share their list of words. Some of the words are benefits, comp. time, deduction, employee training, holidays, lay-off, leave, maternity leave, mentor, notice, paternity leave, and time sheet.

- Instruct the participants to identify the key terms an employee of a company should know. They can use the same chart paper for this activity.
- Give them 5 minutes for this activity.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

-Summarize 📜



Note: You can either summarize the key points of the unit or have a role play where an employee has just joined a company and the HR Manager explains the terms of employment.



UNIT 10.5: Understanding Entrepreneurship

Key Learning Outcomes



At the end of this unit, participants will be able to:

- 1. Discuss the concept of entrepreneurship
- 2. Discuss the importance of entrepreneurship
- 3. Describe the characteristics of an entrepreneur
- 4. Describe the different types of enterprises
- 5. List the qualities of an effective leader
- 6. Discuss the benefits of effective leadership
- 7. List the traits of an effective team
- 8. Discuss the importance of listening effectively
- 9. Discuss how to listen effectively
- 10. Discuss the importance of speaking effectively
- 11. Discuss how to speak effectively
- 12. Discuss how to solve problems
- 13. List important problem solving traits
- 14. Discuss ways to assess problem solving skills
- 15. Discuss the importance of negotiation
- 16. Discuss how to negotiate
- 17. Discuss how to identify new business opportunities
- 18. Discuss how to identify business opportunities within your business
- 19. Explain the meaning of entrepreneur
- 20. Describe the different types of entrepreneurs
- 21. List the characteristics of entrepreneurs
- 22. Recall entrepreneur success stories
- 23. Discuss the entrepreneurial process
- 24. Describe the entrepreneurship ecosystem
- 25. Discuss the purpose of the Make in India campaign
- 26. Discuss key schemes to promote entrepreneurs
- 27. Discuss the relationship between entrepreneurship and risk appetite
- 28. Discuss the relationship between entrepreneurship and resilience
- 29. Describe the characteristics of a resilient entrepreneur
- 30. Discuss how to deal with failure

UNIT 10.5.1: Concept Introduction (Characteristic of an Entrepreneur, types of firms/ types of enterprises)

-Unit Objectives



At the end of this unit, participants will be able to:

- Discuss the concept of entrepreneurship
- Discuss the importance of entrepreneurship
- Discuss the characteristics of an entrepreneur
- Describe the different types of enterprises

-Resources to be Used



Participant Handbook

Say



Let's start this session with some interesting questions about Indian entrepreneurs.

-Team Activity 🙀



Quiz Questions

1. Who is the founder of Reliance Industries?

Dhirubhai Ambani

2. Who is the Chairman of Wipro Limited?

Azim Premji

3. Who launched e-commerce website Flipkart?

Sachin Bansal and Binny Bansal

4. Who is the founder of Paytm?

Vijay Shekhar Sharma

5. Who is CEO of OLA Cabs?

Bhavish Aggarwal

6. Who is the founder of Jugnoo?

Samar Singla (autorickshaw aggregator)

7. Who is the founder of OYO Rooms?

Bhavish Aggarwal

-Do



- Tell them that you will ask them few questions about a few entrepreneurs.
- Divide the class in to two groups.
- In turns ask the quiz questions to the groups.
- If the answer is incorrect pass the question to the other group.
- Share the answer if the groups are not able to answer.
- Congratulate the participants who answered correctly.

Ask



- What do you understand by entrepreneurs?
- What is the importance of entrepreneurship in today's scenario?
- What do you think are the characteristics of successful entrepreneurs?
- What are different types of enterprises that an entrepreneur in India can own and run?



- Talk about entrepreneurs, importance of entrepreneurship, characteristics of successful entrepreneurs, and different types of enterprises in India as discussed in the Participant Handbook.
- Tell the participants, stories of successful Indian entrepreneurs- their struggles, the moments of heartbreak, the perseverance and triumph.
- Ask them if they know of any such entrepreneur.

·Summarize 📜



• Close the discussion by summarizing about the opportunities for entrepreneurs in India.

-Notes for Facilitation



- · Check out different Government schemes for small entrepreneurs. Share the information with the participants.
- You can tell them about the government websites like Start Up India, mudra.org.in etc.
- Discuss about various schemes and policies by the Government of India for entrepreneurs.

UNIT 10.5.2: Leadership and Teamwork

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

- List the qualities of an effective leader
- Discuss the benefits of effective leadership
- List the traits of an effective team

-Resources to be Used



- Participant Handbook
- Blank sheets of paper
- Pens

·Do



- Show the picture given below to the class.
- Ask them to quickly write on a piece of paper what comes to their mind after seeing the picture.
- Now ask them, "What do you understand from this picture?"
- Encourage participants to share their thoughts.





-Say



- This picture depicts the qualities of a leader and the difference between a leader and a boss.
- A boss focuses on structure and inspires fear whereas a leader follows vision and generates enthusiasm.
- A boss blames employees for the breakdown whereas a leader fixes breakdowns.
- A boss depends on authority whereas a leader depends on goodwill.
- A boss says "I" and a leader says "We."
- A boss drives employees whereas a leader coaches them.
- A boss takes credit whereas a leader gives credit.

-Say



• Talk about leadership and leadership qualities for an entrepreneur as discussed in the Participant Handbook.

·Ask



Why is it important for a leader to be effective? How does it help the organization?



- Let us discuss benefits of effective leadership as discussed in the Participant Handbook.
- "Out-of-the-box thinking" is one of the new leadership styles. It means thinking differently and from a new perspective.

-Ask



· Do you consider yourself a team player?

Team Activity



Long Chain

• This is a group activity.



- Divide the class into 2 teams.
- Ask each team to create a chain using materials they have in class such as shoe laces, belts, paper, handkerchief, ribbons, etc.
- The team that creates the longest chain wins the game.
- Observe if the participants are interacting with their team or working in isolation.
- Share your observations with the class.

Sav



De-brief:

- What did the winning team do differently?
- Who was responsible for the winning team's success?
- How does this activity explain the role of teamwork in entrepreneurial success?

Sav



- Tell the class that both the teams performed well.
- Discuss that the objective of this activity was to open communication channels and how this has been achieved.
- The participants should aim to keep the communication channels open when interacting with their peers and team members.
- It will set the pace and enthusiasm required for all the ensuing teamwork activities.
- Talk about teamwork and importance of teamwork in entrepreneurial success as discussed in the Participant Handbook.

Summarize | 📜



- Close the discussion by summarizing about the importance of teamwork for employees.
 - Teamwork helps in reducing stress for the employees.
 - Teamwork helps employers in generating more number of solutions to a problem and developing improved communication amongst employees.
- Ask the participants what they have learned from these exercises.
- Ask if they have any questions related to what they have talked about so far.

UNIT 10.5.3: Communication Skills: Listening & Speaking: The Importance of Listening Effectively

-Unit Objectives



At the end of this unit, participants will be able to:

- Discuss the importance of listening effectively
- Discuss how to listen effectively
- Discuss the importance of speaking effectively
- Discuss how to speak effectively

-Resources to be Used 🎏



Participant Handbook

-Activity 1



Activity - Chinese Whisper

Step 1: Form a circle.

Step 2: Start a whisper chain. Any one participant will whisper a message into his/her neighbour's ear. No one else must hear the message. The message can be serious or downright silly.

Step 3: The next person who first heard the message should whisper the message very quickly to the person sitting next to them.

Step 4: The game goes on until the last person says whatever they heard out loud and the first person reveals the real message.

Compare them and have a great laugh!

Ask



De-brief questions:

- Was the original message the same as the message that is communicated at the end of the game?
- Why do you think there was a difference in the messages?

Say



- No, the original message was not same at the end of game.
- The barriers to communication like language, disturbance and noise, poor listening skills, boredom, poor speaking skills, etc. are the potential reasons this happens.
- There are various aspects to communication. Speaking skills and listening skills are two major components to any communication. There is always some room for improvement in the way we communicate.
- It is important to accept the reality of miscommunication and work to minimise its negative impacts.

Say



- Communication is a two-way process where people exchange information or express their thoughts and feelings
- It involves effective speaking and effective listening.
- If I go to the store to get bread, I exchange money for the bread. I give something and get something in return. Communication takes place in the same manner. You have to provide and receive information for communication to take place.

Ask



- How often do you hear these statements?
 - "You're not listening to me!"
 - "Why don't you let me finish what I'm saying?"
 - "You just don't understand!"
- What do you think the other person is trying to convey to you through these sentences?
- We will not talk about the importance of listening effectively as discussed in the Participant Handbook.

Say



• Let's play a game to understand effective listening process better.

Do



- This is a class activity.
- The participants need to answer the questions they hear.
- · Instruct them to listen carefully.
- You will read it at a stretch and if need be repeat it once more.
- Tell the participants to raise their hand if they know the answer to the question asked.
- Keep a check on time.

-Activity 2



Riddles:

Is there any law against a man marrying his widow's sister?

If you went to bed at eight o'clock at night and set the clock's alarm to ring at nine o'clock, how many hours of sleep would you get?

Do they have a 26th of January in England?

If you had only one match and entered a dark room that had a kerosene lamp, oil heater, and a wood stove, what would you light first?

The Delhi Daredevils and the Chennai Super Kings play five IPL matches. Each wins three matches. No match was a tie or dispute. How is this possible?

There was an airplane crash. Every single person died, but two people survived. How is this possible?

If an airplane crashes on the border of two countries, would unidentified survivors be buried in the country they were travelling to or the country they were travelling from?

A man builds an ordinary house with four sides except that each side has a southern exposure. A bear comes to the door and rings the doorbell. What is the colour of the bear?

Answers:

There's no law against a man marrying his widow's sister, but it would be the neatest trick in the book since to have a widow, the man would have to be dead.

You'd get one hour's sleep since alarm clocks do not know the difference between morning and night.

Oh, yes. They have a 26th of January in England. They also have a 27th, a 28th, and so on.

First of all, you would light the match.

Who said the Delhi Daredevils and the Chennai Super Kings were playing against each other in those games?

Every SINGLE person died, but those two were married.

You can't bury survivors under any law especially if they still have enough strength to object.

The bear that rang the doorbell would have to be a white bear. The only place you could build a house with four southern exposures is at the North Pole where every direction is in South.

-Ask



De-brief question:

- · What were the barriers that came into your way of listening?
- How can you overcome barriers to listening?

Say



- There is a difference between hearing and listening.
- If you don't listen properly, the message may be misunderstood.
- Be open-minded while listening to someone.
- It is important to listen effectively and carefully without making assumptions.

-Activity 3



Elevator Pitch:

You are in the lift of a hotel and you bumped into your former client who is a famous businessman. He has financed a lot of small business ventures and can finance your new start-up too. After exchanging pleasantries, he asks you what your new company does. You open your mouth, and then pause. Where do you even begin?

Then, as you try to organize your thoughts, his meeting is called, and he is on his way. If you would been better prepared, you're sure that he would have stayed long enough to schedule a meeting with you too.

If you were given another chance, what would you have said to this person?

Do



- Start off the task by providing a beginning sentence to get the story started, and then go around the classroom getting each one to add a new sentence to keep the story going.
- This task should be done spontaneously allowing only a little time to think (30 seconds).
- For example: There was once a student who was looking for a job after graduation.

-Notes for Facilitation



- Tell the participants to follow these steps to create a great pitch, but bear in mind that you'll need to vary your approach depending on what your pitch is about.
 - 1. **Identify Your Goal:** Start by thinking about the objective of your pitch. For instance, do you want to tell the potential clients about your organization? Do you have a great new product idea that you want to pitch to an executive or do you want a simple and engaging speech to explain what you do for a living?
 - 2. **Explain What You Do:** Start your pitch by describing what your organization does. Focus on the problems that you solve and how you help people. Ask yourself this question as you start writing: what do you want your audience to remember most about you? Keep in mind that your pitch should excite you first. After all, if you don't get excited about what you're saying neither will your audience. People may not remember everything that you say, but they will likely remember your enthusiasm.
 - 3. **Communicate Your USP:** Your elevator pitch also needs to communicate your unique selling proposition or USP. Identify what makes you, your organization or your idea unique. You'll want to communicate your USP after you've talked about what you do.
 - 4. **Engage with a Question:** After you communicate your USP, you need to engage your audience. To do this, prepare open-ended questions (questions that can't be answered with a "yes" or "no" answer) to involve them in the conversation. Make sure that you're able to answer any questions that he or she may have.
 - 5. **Put it all Together:** When you've completed each section of your pitch, put it all together. Then, read it aloud and use a stopwatch to time how long it takes. It should be no longer than 20-30 seconds. Remember, the shorter it is, the better!

Example:

Here's how your pitch could come together:

"My company deals with cloth retail online business and we use various e-commerce platforms to sell our products. This means that you can do shopping with ease and spend time on other important tasks. Unlike other similar companies, we have a strong feedback mechanism to find out exactly what people need. This means that, on average, 95 percent of our clients are happy with our products. So, how can you help us in creating our own web portal?

6. **Practice:** Like anything else, practice makes perfect. Remember, how you say it is just as important as what you say. If you don't practice, it's likely that you'll talk too fast, sound unnatural or forget important elements of your pitch. Set a goal to practice your pitch regularly. The more you practice, the more natural your pitch will become. Practice in front of a mirror or in front of colleagues until the pitch feels natural.

Summarize



• Close the discussion by summarizing how to speak effectively as discussed in the Participant Handbook.

UNIT 10.5.4: Problem Solving & Negotiation Skills

Unit Objectives



At the end of this unit, participants will be able to:

- Discuss how to solve problems
- · List the important problem solving traits
- Discuss ways to assess problem solving skills
- · Discuss the importance of negotiation
- · Discuss how to negotiate

Resources to be Used



Participant Handbook

Ask



- What is a 'problem'?
- What do you think are the problems you may face in the process of becoming a successful entrepreneur?

Say



- Discuss the definition of problem as given in the Participant Handbook.
- In a hurdle race the hurdles are the obstacles on the way to reach your goal.
- Similarly, obstacles are the hurdles you may face while reaching your goal i.e. to set-up your own business. Your goal will be to reach the finishing line after crossing these hurdles.

-Ask



- What do you do when you face a problem?
- How do you resolve it? You can pick examples from the question asked previously 'the problems they are likely to face in the process of becoming a successful entrepreneur'.

Say



Discuss how to solve problems as given in the Participant Handbook.

Team Activity



- This is a group activity.
- The groups will solve the problem and come up with the best solution in each case.
- 1. Unable to arrange for some extra finance for setting up a beauty parlour. The loan sanctioned and disbursed is not enough. You have tried all your contacts, friends and relatives. But unable to manage the extra amount. Bank will not sanction more amount as you have used up the complete sanction limit.
- 2. You have rented a space for your business and all arrangements are done. You will be operating from the office space rented in two days. Now the owner comes up to you and says he wants to sell the place and wants you to vacate in 15 days.
- 3. You have just set up your business and need extra human resource. You have tried invieing a few also tied up with an agency for getting the right candidate. But you are unable to get the right candidate. If the candidate is good, you cannot offer the salary demanded. If the candidate agrees to the salary, he/she has other demands like working hours to be reduced, leaves etc. which may not work for your set up.

Do



- Divide the class into three groups. Give one scenario to each group.
- Explain the purpose and duration of the activity.
- Ask the groups to build on the scenario and present their solution as a role play.



De-brief questions:

- 1. What was the problem?
- 2. Is there any other alternative solution?
- 3. Is this the best solution presented?

Ask



Try to think of some people around you who are able to solve problems very easily. Even you or your friends might be approaching them when there is a problem. What qualities do they have? What personality traits do such people possess?



Discuss the important traits for problem-solving as given in the Participant Handbook.

Ask



In order to build a successful organization, you need to hire people who possess good problem solving skills. How would you assess the level of problem solving skills of potential candidates before hiring them?



Discuss how to assess for problem-solving skills as given in the Participant Handbook.

Summarize | 📜



- Ask the participants the things that they have learnt so far.
- Ask if they have any questions related to what they have talked about so far.
- Summarize the discussion on problem solving.

- Activity



The activity is to organise an election event. Select three volunteers from the group. They have to give a speech on their election manifesto to the class. They have to negotiate with the fellow participants and convince them to vote for them. The best negotiator will win the election.

Do



- Ask three participants to volunteer for the activity.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Ask



- Out of the three contestants, whom would you support? Why? What did they say or do which convinced you to make your decision?
- Have you ever tried to negotiate in your personal or professional life?
- Ask the class to share some of their experiences where they have been able to strike a deal by negotiating.

Say



• Discuss "What is Negotiation?" as given in the Participant Handbook.

Ask



 Why is it important to negotiate? As an entrepreneur, where do you think that negotiation skills will be needed?

Say



• Discuss the importance of negotiation while starting a business as given in the Participant Handbook.

Say



• Discuss the important steps to negotiate as given in the Participant Handbook.

-Role Play



- · Conduct a role play activity.
- · Ask the participants to assemble together.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.

Do



- Divide them into groups of four (4) (depending on the batch size).
- Give them the hand-outs for role play scenarios.
- Two groups to be given scenarios on problem solving.
- Other two groups to be given scenarios on negotiation.
- The groups will build on the scenarios and prepare for the role play.
- Give the groups atleast 5 mins to discuss and be ready with the role play.
- Invite each group one by one to come and present their role play.

Problem solving Scenario 1

Avinash has a Mobile Repair Store in Allahabad. His outlet is one of the most popular one in the vicinity and he has great rapport with his customers. He is always well-dressed, jovial and full of energy.

It's around 11 AM, when a customer barges in to the shop and starts shouting at Avinash for giving her back the instrument which is still not working. The screen of her mobile is also cracked from one side. Avinash remembered thoroughly checking the handset before handing it over to the customer. The customer threatens to sue the company and to go to Consumer Court for cheating her.

Problem solving Scenario 2

You are running a successful small scale business, Shreeji Aggarbattis,. Your staff members do door to door selling and organise marketing campaigns in local markets. Your brand has established it's name in last few years.

Recently, lot of customers have been coming to you and lodging complaints that your staff members indulge in malpractices. Few of them informed you that a staff member engaged them in a friendly conversation. In the meanwhile, the other gave them lesser packets of aggarbattis than they paid for.

Another set of customers lodged complaint about the misconduct and rude behaviour of a particular staff member.

You often hear from your customers that the orders don't get delivered on time or wrong products get delivered.

You have already been struggling with shortage of staff and such complaints are a serious concern as it is hampering your brand image. What strategies will you adopt to solve this problem?

Negotiation Scenario 1

You have interviewed a prospective new employee who could be a key member of your new entrepreneurial venture. The new person is demanding a salary that is 20% higher than you thought based on your business plan. Finances are tight, yet you believe this person could make a significant impact on future profits. If you paid the required salary for the new person, then you would have to restructure your entire business plan. You've been searching for an individual with this skill level for three months. to the candidate is waiting for your response. Now you have to call him in to make the final negotiations.

Negotiation Scenario 2

You are a young entrepreneur who has just registered his start up project and applied for a bank loan accordingly. You receive a letter saying that your loan application has been rejected as your start up idea did not appeal to the bank and they think that it is not a revenue generating model. You have taken an appointment to meet the manager and show your negotiation skills to get your loan approved.

Notes for Facilitation



Facilitating Role Plays

Preparing for the activity

- 1. Carefully review the details of the scenario and the character descriptions.
- 2. Become familiar with the key issues being addressed in the scenario.
- 3. Study the provided material so that you are ready to address issues related to the situations depicted in the role-plays.
- 4. Anticipate and know how to address issues participants might raise during the activity.

Conducting the activity

- 1. Introduce the activity. Emphasize that role-playing provides participants with an opportunity to apply their new knowledge, skills, and tools in situations that simulate actual interactions with customers.
- 2. Ask participants to form pairs. Direct the members of each group to choose who will play the roles. Remind the groups that each participant should be given the opportunity to play/practice the different roles.
- 3. Conduct a demonstration so that participants become familiar with the expectations related to the roles and support materials.
- 4. Give the pairs/groups 10 to 15 minutes to conduct the role-play (depending on the duration of the session).
- 5. After all the groups have finished with the role-play, conduct a debriefing session on each role-play.
- 6. Ask the groups to take five minutes to talk about what happened during the role-play. The groups should discuss the questions given in the debriefing for each role-play. Encourage participants to provide constructive criticism during their discussions.

-Summarize



• Wrap the unit up after summarizing the key points and answering questions.

UNIT 10.5.5: Business Opportunity Identification: Entrepreneurs and Opportunities

-Unit Objectives



At the end of this unit, participants will be able to:

- Discuss how to identify new business opportunities
- Discuss how to identify business opportunities within their business

Resources to be Used



- Participant Handbook
- Blank sheets of paper
- Pens

-Ask



- How does an entrepreneur identify an opportunity?
- What do you think are the common queries or concerns faced by entrepreneurs?
- How can you identify new business opportunity?

Say



- Let's talk about opportunity, common queries or concerns faced by entrepreneurs, idea as an opportunity, factors to consider when looking for opportunities, ways to identify new business, and opportunity analysis as discussed in Participant Handbook.
- Let's do an activity to understand ways to identify business opportunities within your business.

Do



- Tell the class that this is an individual activity.
- Tell the participants to create a matrix on their notebooks.
- There will be four boxes in your matrix.
- Strength, Weakness, Opportunity and Threats will be the four headings of the matrix. This is called the SWOT matrix.
- Read out the questions to them and tell the participants they need to answer the questions asked in each matrix.
- Tell them they can also use their own understanding of themselves to fill the SWOT matrix.

Activity



Do your SWOT analysis

Strength

What are your strengths?

What unique capabilities do you possess?

What do you do better than others?

What do others perceive as your strengths?

Opportunity

What trends may positively impact you?

What opportunities are available to you?

Weakness

What are your weaknesses?

What do your competitors do better than you?

Threat

Do you have solid financial support?

What trends may negatively impact you?

Do



- Congratulate everyone for the class activity.
- Ask the audience to applaud for themselves.
- Allot the participants sufficient time to complete this activity, but do keep a check on time.
- Ask de-brief questions to cull out information from the participants.

-Ask



De-brief questions:

- What are your weaknesses according to your SWOT analysis?
- Do you think you can change your weakness into strength? How?
- Do you think you can work on your threats? How?

-Summarize 📜



- Close the discussion by summarizing ways to identify business opportunities within your business.
- Ask the participants what they have learned from this exercise.
- Ask if they have any questions related to what they have talked about so far.

UNIT 10.5.6: Entrepreneurship Support Eco-System

Unit Objectives | ©



At the end of this unit, participants will be able to:

- · Explain the meaning of entrepreneur
- Describe the different types of entrepreneurs
- List the characteristics of entrepreneurs
- Recall entrepreneur success stories
- Discuss the entrepreneurial process
- Describe the entrepreneurship ecosystem
- Discuss the purpose of the 'Make in India' campaign
- Discuss the key schemes to promote entrepreneurs

-Resources to be Used



- Participant Handbook
- Chart papers
- Marker pens
- Pencils
- Colour pencils
- Scale
- Eraser
- Other requisite stationery material

-Ask



- Do you think that entrepreneurs need support?
- What do you think is an eco-system?
- What do you think 'entrepreneurship support eco-system' means?

-Sav



- Let's learn what entrepreneurship support eco-system means.
- Discuss 'Entrepreneurship Support Eco-System' as given in the Participant Handbook.

-Ask



- Can you define entrepreneurship support eco-system?
- What are the key domains of the support eco-system?

-Say



- Let's learn more about these domains by conducting an activity.
- You have to make a poster showing the components of the six main domains of entrepreneurship support eco-system.

Team Activity



Making a poster showing the entrepreneurship support eco-system.

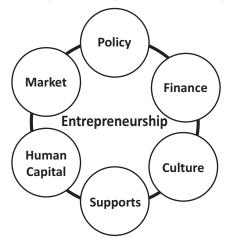
Do



- Divide the class into groups of four or six.
- Hand out chart paper and coloured pens.
- Explain the purpose and duration of the activity.
- Go around checking the progress of each group.
- Set guidelines pertaining to discipline and expected tasks.

Activity De-brief

Ask each group to display their poster and explain the key domains of entrepreneurship support eco-system.



-Ask



What kind of government support eco-system is available for entrepreneurs in India?

Say



Discuss 'Make in India' campaign as given in the Participant Handbook.

Team Activity



Presentation on key schemes to promote entrepreneurs



- Divide the class into pairs.
- Number each pair from 1-15.
- Assign a scheme, same as their group number, to each group.
- Ask them to read the scheme carefully and present it to the class.
- Explain the purpose and duration of the activity.
- Go around checking the progress of each group.
- Set guidelines pertaining to discipline and expected tasks.

Activity De-brief

• Ask each group to explain the scheme offered by government to promote entrepreneurs.

Summarize | 🎘



Summarize the unit by discussing the key points and answering questions the participants may have.

UNIT 10.5.7: Risk Appetite & Resilience

Unit Objectives 🏻 🍪



At the end of this unit, participants will be able to:

- Discuss the relationship between entrepreneurship and risk appetite
- Discuss the relationship between entrepreneurship and resilience
- Describe the characteristics of a resilient entrepreneur

Resources to be Used



- Participant Handbook
- Chart papers
- Blank sheets of paper
- Pens
- Marker pens

Ask



- Can you define risk or explain what constitutes a risk?
- What do you people mean when they say, "This may be a risky proposition"?
- What risks are they talking about?

-Example | 💝



• Let's have a look at these two examples:

Rohit and his family were travelling by car from Delhi to Nainital. It was their second trip there. Rohit was familiar with the road. His friends told him that the highway after Rampur was in a bad condition. They advised him to take a shortcut and turn left from Moradabad and take the Kaladhungi road. This road is in a better condition.

Since he was going with his family, and did want take the risk of getting lost, he left early. He took the Kaladhungi road and reached Nainital well in time.

Suresh and his family too were travelling by car from Delhi to Nainital. It was their second trip there. His friends too advised him to take a shortcut and turn left from Moradabad and take the Kaladhungi road as this road was in a better condition.

Suresh too decided to take the Kaladhungi road but he left Delhi in the afternoon. It was dark by the time he reached Kaladhungi, and he was sure that he was taking the correct turn. As it was late, he could not find anyone to give him directions. He ended up being in an unknown place that was scarcely inhabited.



- Let's see what type of risks Rohit and Suresh took.
- Discuss 'Risk Appetite and Resilience' with the participants as given in the Participant Handbook.



Let's learn more about risk appetite and resilience with the help of an activity.

Team Activity



Risk Appetite

- This is a group activity.
 - In the previous unit, you read success stories of Mr Dhirubhai Ambani and Dr Karsanbhai Patel.
 - Mr Ambani left his job and started his company Reliance with just Rs. 50,000/-.
 - Dr Patel kept his job, went door-to-door to sell Nirma, and only when the brand started gaining popularity did he start his own company.
 - What types of risk did both of them take?
 - What risk factors, do you think, did they keep in mind before launching their company?
 - Write the Risk Appetite Statement of both the companies.

Activity De-brief

- Who took a greater risk?
- What are the differences between the Risk Appetite Statement of both the companies?

Do I



- Instruct the participants that this is group work.
- Divide the class into small groups of 4.
- Give each group a chart paper.
- Tell the participants that they have to evaluate the risks taken by Mr Dhirubhai Ambani and Dr Karsanbhai Patel.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Ask



- Do you think all entrepreneurial ventures are successful?
- What happens if the first venture is not successful?
- Should the entrepreneur stop when faced with challenges or face them?

-Example|



Let's have a look at the following example:

Vijay Shekhar Sharma is the founder of Paytm, which is a giant Indian e-commerce. He was born in a middleclass family in Uttar Pradesh. He started his first job at an MNC. He quit after six months and built a company One97 with his friends. As One97 grew bigger, it needed more money because it was running more servers, bigger teams, and had to pay royalty. At that time, the tech bubble popped and technology companies were running in losses. Finally, money ran out. So One97 took loans and then more loans at higher rates of interest, as high as 24 per cent, and became caught in a vicious cycle.

In 2014, Paytm was launched with online wallet services after which, the company enabled online payment transactions. The company got licenses from RBI in 2016 to launch India's first ever payment bank. Moreover, the main motive of Paytm was to transform India into a cashless economy.

After demonetization came into effect, Vijay Shekhar Sharma started promoting online and digital transactions to deal with the cash crunch. In fact, the service of the company's mobile wallet is accepted across India. The logo of Paytm is now popular almost everywhere from tea stalls to major companies.



- Let's see what qualities made Vijay Shekhar Sharma a resilient entrepreneur.
- Discuss Entrepreneurship and Resilience with the participants as given in the Participant Handbook.

Say



Let's learn more about entrepreneurship and resilience with the help of an activity.

Team Activity



Entrepreneurship and Resilience

- This is a group activity.
 - Think of some entrepreneurship ventures that faced challenging times, but later resulted in success stories.
 - Who is the founder of that company?
 - What challenging times did it face?
 - How did it overcome those challenges?
 - List the resilient characteristics of the entrepreneur.

Activity De-brief

- Each group to give their presentation.
- Why did you choose this company?
- What is the success story of the company?

Do



- Instruct the participants that this is group work.
- Divide the class into small groups of 4.
- Give each group a chart paper.
- Tell the participants that they have to think of an entrepreneur who faced challenging times, but eventually succeeded.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Summarize | **建**



- You can summarize the key points of the unit.
- Ask the participants what they learned from the activities.
- Clarify any questions or doubts they might have.

UNIT 10.5.8: Success and Failures

-Unit Objectives 🏻 🎯



At the end of this unit, participants will be able to:

Discuss how to deal with failure

Resources to be Used



Participant Handbook

-Ask



- Have you heard the quote 'nothing is impossible'?
- What do you think it means?
- Do you think that all successful entrepreneurs became famous overnight or did they have to struggle or face failure before succeeding?

-Example 🛭 🗬



Let's have a look at this example.

Shah Rukh Khan, also known as, SRK or King Khan is a force to reckon with. Did he achieve stardom overnight? Shah Rukh Khan, who has seen many struggles in his life - he has slept on streets, struggled to support himself and his sister at a very young age, and lost his parents very early in life, which led to his sister seeking mental health support. Amidst all the chaos and challenges, he kept pushing himself, and today he stands tall as the 'Badshah of Bollywood'. Certainly those years were not easy for him.

When he was young, he stood at Marine Drive and said, "I will rule this city one day". Failure was not just his companion during or before his stardom, it is still a substantial part of his life. Success does not come easy. What made him a star was his acceptance of failure and the urge to improve.



- How do you define success and failure?
- What is fear?
- Discuss "success and failure" with the participants as given in the Participant Handbook.

Ask



- Have you felt or experienced fear?
- What led you to feel that emotion?
- How did you handle it?



Let's learn the about success and failure with the help of an activity.

Team Activity

- Divide the class into groups of four.
- Instruct them to think of one scenario where they have to interview a successful entrepreneur.
- Explain the purpose and duration of the activity.
- Set guidelines pertaining to discipline and expected tasks.
- They have to choose one person from the group as the interviewee and one as the interviewer.
- Go around and make sure they have understood what is to be done and are discussing the roles properly.
- Check that everyone understands their role. Give clarifications if needed. Give the participants about 5 minutes to discuss and decide their roles.
- Ask the groups to stop the discussion as soon as the time is over.
- Invite each group one by one to come and present their interview as a role play.

- Notes for Facilitation



Facilitating Role Plays

Preparing for the activity

- 1. Carefully review the details of the scenario and the character descriptions.
- 2. Become familiar with the key issues being addressed in the scenario.
- 3. Study the provided material so that you are ready to address issues related to the situations depicted in the role plays.
- 4. Anticipate potential questions that might be raised by the participants and be ready to address them.

Conducting the activity

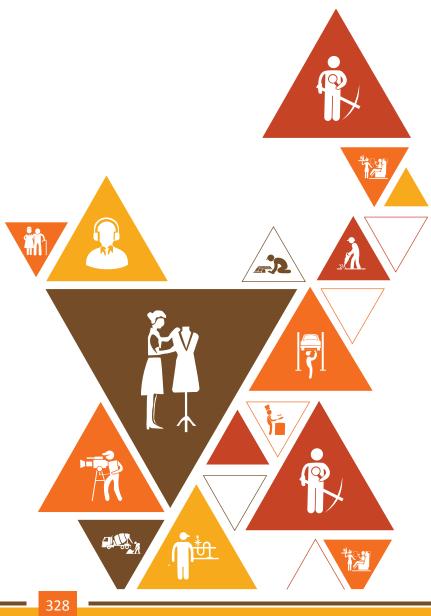
- 1. Introduce the activity. Emphasize that role playing provides participants with an opportunity to apply their new knowledge, skills, and tools in situations that simulate actual interactions with customers.
- 2. Ask participants to form pairs. Direct the members of each group to choose who will play the roles. Remind the groups that each participant should be given the opportunity to play/practice the different roles.
- 3. Conduct a demonstration so that participants become familiar with the expectations related to the roles and support materials.
- 4. To maintain spontaneity of the interactions during the role play, ask the participants not to discuss the details of their roles prior to the role play.
- 5. Give the pairs 15-20 minutes to conduct the role play.
- 6. Circulate among the groups to answer any questions that may arise and provide guidance as needed.
- 7. After all the pairs have finished with the role play, conduct a de-briefing session on each role play.
- 8. Ask the groups to take five minutes to talk about what happened during the role play. The groups should discuss the questions given in the de-briefing for each role play. Encourage participants to provide constructive criticism during their discussions.
- 9. Conclude the activity by asking participants to think about whether and how they might use scripted role plays in their real life.

Summarize



• Wrap the unit up after summarizing the key points and answering questions.

Notes		



UNIT 10.6: Preparing to be an Entrepreneur

Key Learning Outcomes



At the end of this unit, participants will be able to:

- 1. Discuss how market research is carried out
- 2. Describe the 4 Ps of marketing
- 3. Discuss the importance of idea generation
- 4. Recall basic business terminology
- 5. Discuss the need for CRM
- 6. Discuss the benefits of CRM
- 7. Discuss the need for networking
- 8. Discuss the benefits of networking
- 9. Discuss the importance of setting goals
- 10. Differentiate between short-term, medium-term and long-term goals
- 11. Discuss how to write a business plan
- 12. Explain the financial planning process
- 13. Discuss ways to manage your risk
- 14. Describe the procedure and formalities for applying for bank finance
- 15. Discuss how to manage their own enterprise
- 16. List the important questions that every entrepreneur should ask before starting an enterprise

UNIT 10.6.1: Market Study/ The 4Ps of Marketing/ Importance of an IDEA: Understanding Market Research

- Unit Objectives



At the end of this unit, participants will be able to:

- Discuss how market research is carried out
- Describe the 4 Ps of marketing
- Discuss the importance of idea generation

Resources to be Used



- Participant Handbook
- Chart papers
- Markers pens
- · Blank sheets of paper

Ask



- Suppose, you want to open a restaurant, what are the factors you will consider?
- How will you promote your restaurant?

Example 🗣



• Let's have a look at this example.

Arjun was an MBA working in a company. But he wanted to start a low cost budget hostel for foreign tourists coming to India. He did a lot or market research before starting the project. Based on the information he gathered, he made his business plan. His hostel is now flourishing and he is thinking of expanding to other tourist destinations.

Say



- Discuss "Market Study" with the participants. Refer to the Participant Handbook.
- Let's learn about market study and research with the help of an activity.

Team Activity



Market Study

- · This is a group activity.
- You want to start your own tuition centre.
- What type of research will you do?

Activity De-brief

- Ask each group to come forward and give a brief presentation.
- Encourage other groups to be interactive and ask questions.
- What factors did you keep in mind while doing your research?
- Based on our research would you go ahead and open a tuition centre?

Do



- Instruct the participants that this is group work.
- Divide the class into small groups of 4 or 6.
- Give each group a chart paper.
- Tell the participants that they have to start their own tuition centre.
- Give the participants 10 minutes to discuss and write the research work they need to do.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Say



• By opening a tuition centre you are offering a service.

Ask



What factors will you keep in mind before opening it?

Say



• Discuss "The 4Ps of Marketing" with the participants as given in the Participant Handbook.

Say



Let's learn about the 4Ps of Marketing with the help of an activity.

Team Activity



4 Ps of Marketing

- This is a group activity.
- You have to sell a pen to four different segments:
 - 1. Rural villagers
 - 2. Rural middle class
 - 3. Urban middle class
 - 4. Upper end rich people (Niche market)

Keeping the 4Ps of Marketing in mind, what marketing strategy will you design to sell the pen?

Activity De-brief

- Ask each group to to present their strategy.
- Encourage other groups to be interactive and ask questions.

Do



- Instruct the participants that this is group work.
- Divide the class into four groups.
- · Give each group a chart paper.
- Assign each group a target audience for selling the pens:
 - 1. Rural villagers
 - 2. Rural middle class
 - 3. Urban middle class

- 4. Upper end rich people
- Tell the participants that they have to design a marketing strategy keeping the 4Ps of Marketing in mind.
- Give the participants 20 minutes to discuss and come up with their strategy.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit

Activity De-brief

- Ask each group to come forward and give a brief presentation.
- Ask each group what they kept in mind while designing their marketing strategy.
- Encourage other groups to be interactive and ask questions.



- Each entrepreneur has an idea of wants he wants to sell. It may be a service or a product.
- Discuss "Importance of an IDEA" as given in the Participant Handbook.

Summarize | 📜



- Summarize the key points of the unit.
- Ask the participants what they learnt from the activities.
- Encourage them to ask if they have any doubts.

UNIT 10.6.2: Business Entity Concepts

- Unit Objectives



At the end of this unit, participants will be able to:

Recall basic business terminology

- Resources to be Used



Participant Handbook

Say



- Let's recall some basic business terminology.
- Discuss the Business Entity Concepts as given in the Participant Handbook.
- Let's learn some basic business terminology by having an activity.
- We will have a quiz today.

Activity



The activity is a quiz.

Do



- Divide the class in two groups and give a name to each group.
- Explain the rules of the quiz. For each correct answer the group gets 1 mark.
- If the group is unable to answer the question is passed to the next group.
- Explain the purpose and duration of the activity.
- Ask the questions of the quiz.
- Keep a score of the groups.
- Set guidelines pertaining to discipline and expected tasks.

Summarize | 📜



• Summarize the unit by discussing the key points.

Notes for Facilitation



QUESTIONS FOR THE QUIZ

1. What does B2B mean?

Business to business

2. What is a financial report?

A comprehensive account of a business' transactions and expenses

3. Who is a sales prospect?

A potential customer

4. How is working capital calculated?

Current assets minus current liabilities

5. What is an estimation of the overall worth of a business called?

Valuation

6. You are buying a house. What type of transaction is it?

Complex transaction

7. How will you calculate the net income?

Revenue minus expenses

8. How is Return on Investment expressed?

As percentage

9. How will you calculate the cost of goods sold?

Cost of materials minus cost of outputs

10. What is revenue?

Total amount of income before expenses are subtracted.

11. What is a Break-Even Point?

This is the point at which the company will not make a profit or a loss. The total cost and total revenues are equal.

12. What is the formula used to calculate simple interest?

A = P(1 + rt); R = r * 100

13. What are the three types of business transactions?

Simple, Complex and Ongoing Transactions

14. The degrading value of an asset over time is known as

Depreciation

15. What are the two main types of capital?

Debt and Equity

UNIT 10.6.3: CRM & Networking

Unit Objectives | @



At the end of this unit, participants will be able to:

- · Discuss the need for CRM
- Discuss the benefits of CRM
- Discuss the need for networking
- Discuss the benefits of networking

Resources to be Used |



Participant Handbook

Ask



- Can your business run without customers/buyers?
- Who is the most important entity in any business?



- The key to every success business lies on understanding the customer's expectations and providing excellent customer service.
- Discuss about CRM and its benefits. Refer to the Participant Handbook.
- Providing excellent customer service entails:
 - Treating your customers with respect.
 - Be available as per their need/schedule.
 - Handling complaints effectively.
 - Building long lasting relationships.
 - Collecting regular feedback.
- Handle customer complaints proactively. Ask "what happened", "why it happened", "how can it be avoided next time", etc.
- Collecting feedback from the customers regularly will enable you to improve your good/service.
- "Let's understand it better with the help of some case scenarios. You will be given some cases within your groups. You have to analyse the case scenario that has been given to you and then find an appropriate solution to the problem."

Do



- Divide the class into four groups of maximum six participants depending on the batch size.
- Give one case study to each group.
- Instruct them to read the case carefully.
- The group is expected to analyse and discuss the case amongst them and find a solution to the given problem.
- Put down the discussion points (de-brief questions) on the board. Give the class 5-10 minutes to discuss the case and note down their solutions.
- At the end of 10 minutes, the team should present their case solution to the class.

Team Activity 🙀



Case Study Analysis

Raju runs a business of wooden furniture. He has a huge list of customers on Facebook and WhatsApp who give him orders regularly. Ankita is one of his old and regular customers. She placed an order for a new chester and TV cabinet via WhatsApp and requested Raju to send them as soon as possible. When the parcel reached Ankita through courier she found that chester was broken and the TV unit was chipped from the bottom. Ankita was heartbroken. It was a complete waste of money. She sent a message to Raju on WhatsApp, expressing her anger and disappointment. Raju might lose an old customer forever if he doesn't satisfy the customer. What should Raju do to retain his customer?

Scenario 2

Rajni runs a boutique shop. She sells suits and sarees. She is one of the most successful designer in her city. Rajni swears that all the clothes in her boutique have unique designs. Smita has to attend her cousin's wedding; she goes to Rajni's boutique to buy a saree. Smita wanted a unique designer saree. Rajni customized a saree for her and sent it over the courier. When Smita had a look at the saree she realised her two friends had the same design sarees. She sent a message to Rajni on WhatsApp, expressing her anger and disappointment. Did Rajni make a false promise? Were her designs copied? What could happen to Rajni's image after this incident? What would you do if you were in Rajni's place?

Scenario 3

Shama is a beautician who offers parlour services to ladies by making home visits. Recently, Shama got her name registered on an e-commerce website. Two days earlier, she got a message from Mrs Sushma. The appointment was fixed for next day, 11:00 am and the remuneration for the services was decided beforehand. When Shama reached there at 10:50 am, Mrs Sushma was not at home. When Shama called her, she asked her to wait for a while. Mrs Sushma reached home at 11:45 am. Meanwhile, Shama had to reschedule her next appointment. After availing Shama's services, Mrs Sushma refused to pay the requisite amount and started finding faults in the services provided by her. Who was at fault in this scenario? What should you do in case the customer behaves unreasonably? What would you do if you were in Shama's place?

Scenario 4

Shailender is the manager of a car showroom. He proactively takes part in all the transactions that happen in his showroom. Vinita wants to buy a new car. She has chosen a car from Shailender's showroom. The salesperson has given her a very good discount and has also promised free service for one year. Vinita goes to the showroom and asks to complete all the formalities to purchase the car. When she sees the final bill she realize that she has not received the promised discount neither was there any mention of the free services. She immediately demands to see the Shailender. When Shailender's head asks how much discount Vinita was promised, he realised the discount will make the sale in loss. The car showroom owner might lose a customer and deal due to false commitments made by his manager. Besides, the customer might tell this to other people, creating a bad name and image for the showroom. If you owned that showroom, how would you have convinced your customer?



- Now, let's discuss the problem and solution with the class.
- The group will first briefly describe the case to the class.
- Then discuss the issue identified and the proposed solution.
- Present the solution as a role play.
- Post presentation, the other groups may ask questions from the group that has presented.

Do



- Congratulate each group for the presentation/role play.
- Ask the audience to applaud for them.
- Keep a check on time. Tell the group to wind up the discussion quickly if they go beyond the given time limit.

Say



- If your customers are happy with you they will give referrals which will help to grow your business.
- One more way of growing business is 'Networking'.
- Discuss Networking and its benefits. Refer to the Participant Handbook.

Activity



Group Discussion

• Conduct a group discussion in the class on how they can do networking for their business.

Summarize | **2**



- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of CRM and Networking for entrepreneurs.
- Close the discussion by summarizing the importance of CRM and Networking for entrepreneurs.

UNIT 10.6.4: Business Plan: Why Set Goals?

Unit Objectives



At the end of this unit, participants will be able to:

- Discuss the importance of setting goals
- · Differentiate between short-term, medium-term and long-term goals
- Discuss how to write a business plan
- · Explain the financial planning process
- · Discuss ways to manage your risk

Resources to be Used



- · Participant Handbook
- Chart papers
- · Blank papers
- Marker pens
- Ruler

Ask



- Remember we had written SMART Goals in a previous session? Let's try and recall why it is important to set goals?
- While framing SMART goals, we talked about 'T' in SMART, which was 'Time Bound'? What do we mean by time bound goals?
- What time limit did you set for your goal- 3 weeks, 3 years, 10 years?

Say



• Talk about short term, long term and medium term goals, as discussed in the Participant Handbook.

Ask



• As you are planning to become an entrepreneur, you must have thought of an idea for a start-up. What is your business idea?

Do



• Ask few participants to share their business ideas.

Ask



- Have you created a business plan for your business idea?
- Do you think it is important to have a business plan in place? Why/ why not?

Say



- Talk about 'Why Create a Business Plan' as discussed in the Participant Handbook.
- Let's understand it better with the help of an activity.



Writing a business Plan

- This is a group activity.
- Give the groups the required resources such as chart paper and markers.
- This activity is divided into two parts:
 - 1. Create a business idea
 - 2. Develop a business plan
- The group will discuss and come up with a new business idea and present their idea to the class.
- In the second part of the activity the group will develop a business plan for the business idea.
- The business plan prepared will be presented by the groups to the class.

MY BUSINESS PLAN
Executive Summary: What is your Mission Statement?
Business Description: What is the nature of your business?
Market Analysis: What is your target market?
Organization and Management: What is your company's organizational structure?
Service or Product Line: What is the lifecycle of your product/ service?
Marketing and Sales: How will you advertise and sell your products?
Funding Request: How much fund is required and from where?

Say |



- Teams will need to brainstorm for this part of the activity.
- Use the blank papers for the second part of this activity
- Make your business plan on a chart paper based on the following parameters:
 - 1. Executive Summary
 - 2. Business Description
 - 3. Market Analysis
 - 4. Organization and Management
 - 5. Service or Product Line
 - 6. Marketing and Sales
- Explain each parameter in detail as done in the Participant Handbook.
- Discuss each parameter with the business idea examples of the groups.
- Groups will discuss and develop the business plan for their business idea.

Say



- Now, let's share our plan with the class.
- Each group will briefly describe the plan to the class.
- Post presentation, the other groups may ask questions to the group who have presented their plan.

Do



- Congratulate each group for sharing their points.
- Ask the audience to applaud for them.
- Keep a check on time. Tell group to wind up the discussion quickly if they go beyond the given time limit.

Say



- Along with a business plan, you need to create a financial plan and evaluate the risk involved with your start up.
- Discuss 'Financial Planning' and 'Risk Management' in detail as given in the Participant Handbook.

Summarize |



- Ask the participants what they have learnt from this exercise/ activity.
- Ask if they have any questions related to what they have talked about so far.

- Notes for Facilitation



• Keep the business plan format ready in a flipchart to display it during the activity.

UNIT 10.6.5: Procedures and Formalities for Bank Finance

Unit Objectives | ©



At the end of this unit, participants will be able to:

Describe the procedure and formalities for applying for bank finance

Resources to be Used



- Participant Handbook
- Bank loan/finance form sample

Ask



While preparing a business plan in the last session, we discussed financial planning to arrange financial resources for your start-up. Therefore, how will you collect funds to start your business?



- While most entrepreneurs think 'product' is the most difficult thing to decide for a business, start-up capital poses an even a bigger obstacle. Though there are various ways of funding the business, to convince investors to invest money is the most challenging.
- Some of the funding options available in India are:
 - **Bootstrapping**: Also called self-financing is the easiest way of financing
 - **Crowd funding**: Funds are collected by consumers pre-ordering or donating for starting the business.
 - Angel investors: Individual or group of investors investing in the company
 - Venture capitalists: Venture capitals are professionally managed funds who invest in companies that have huge potential. They usually invest in a business against equity.
 - Bank loans: The most popular method in India.
 - Microfinance Providers or NBFCs
 - **Government programmes**
- Let us know discuss the most popular method i.e. bank finance in detail here.



- Discuss the list of documents that are required to apply for a loan like letter of introduction, business brochure, references of other banks, and financial statements.
- Explain the details to be filled in a loan application form.
- Divide the class into groups. Give each group a loan application form.
- Ask the groups to discuss and fill the form.

Summarize



- Close the discussion by summarizing the important documents needed for bank loan.
- Ask the participants if they have any questions related to what they have talked about so far.

Notes for Facilitation

(in case of partnership firm)



- Checklist of documents is provided as resources for the session.
- You can make some copies and distribute it during the group activity.
- Download sample loan application forms from any nationalised bank's website. Print sufficient copies to circulate it amongst the groups.

CHECKLIST OF DOCUMENTS TO BE SUBMITTED ALONG WITH LOAN APPLICATION (Common for all banks) 1. Audited financial statements of the business concern for the last three years 2. Provisional financial statements for the half – year ended on 3. Audited financial statements of associate concern/s for the last three years 4. Copy of QIS II for the previous quarter ended on 5. Operational details in Annexure I 6. CMA data for the last three years, estimates for current year and projection for the next year 7. Term loan/DPG requirements in Annexure II 8. List of machinery in respect of machinery offered as security in Annexure III 9. Additional details for export advances furnished in Annexure IV 10. Property statements of all directors/partners/proprietor/guarantors 11. Copies of ITAO of the company for the last three years 12. Copies of ITAOs/WTAOs of the directors/partners/proprietor and guarantors 12. Copies of certificate from banks and financial institutions certifying the latest liability with them 14. Copy of board resolution authorizing the company to apply to your bank for the credit facilities mentioned in application 15. Copy of memorandum and article of association (in case of limited company)/partnership deed

16. Cash budget for the current year and next year in case of contractors and seasonal industries

UNIT 10.6.6: Enterprise Management – An Overview: How to Manage Your Enterprise?

- Unit Objectives



At the end of this unit, participants will be able to:

• Discuss how to manage their own enterprise

-Resources to be Used



Participant Handbook

Ask



- Having set-up a business, do you think it is possible to do everything on your own?
- Does one require trained persons for help?
- What does management mean?

Say



Let's have a look at this example:

Kapil had a small business that was beginning to pick up pace. He wanted to expand his business, and therefore employed few more people. One day, as he was walking past Ramesh, one of his new employees, he overheard Ramesh talking rudely to a customer on the phone. This set him thinking. Kapil realised that he should have regular team meetings to motivate his employees and speak with them about any problems they might be facing during work. He should also conduct training sessions on new practices, soft skills, and technology, and develop work ethics manual for managing his enterprise.

Say



- Was Kapil correct in his approach or he should have scolded Ramesh instantly in front of his other employees?
- Discuss "Enterprise Management An Overview" with the participants as given in the Participant Handbook.

Say



• Let's learn how to effectively manage an enterprise or business through an activity.

Team Activity



Enterprise Management

- This is a group activity.
- Design a matrix listing the topics and key words that are needed to run an enterprise effectively and smoothly.

Activity De-brief

- Have each group present their matrix.
- Encourage participants of the other groups to ask question about each other's presentation.

Do



- Instruct the participants that this is group work.
- Divide the class into small groups of 4.
- Give each group a chart paper and coloured pen.
- Tell the participants that they have make a matrix they need to fill.
- They have to write the main topics and key words that will them effectively manage their enterprise.
- Give the participants 15 minutes to discuss and write.
- Keep a check on time. Tell the group to wind up quickly if they go beyond the given time limit.

Summarize | 📜



- Ask the participants what they have learned from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.
- Close the discussion by summarizing the importance of effective management to run an enterprise as given in the Participant Handbook.

UNIT 10.6.7: 20 Questions to Ask Yourself before Considering Entrepreneurship

- Unit Objectives



At the end of this unit, participants will be able to:

• List the important questions that every entrepreneur should ask before starting an enterprise

Resources to be Used



- Participant Handbook
- Blank sheets of paper
- Pens

Ask



· Why do you want to become an entrepreneur?

Say



- It is very important to know why you want to become an entrepreneur. Your personal goals for becoming an
 entrepreneur play a key role in the success of your business. Your goals should be clear well before you start
 your business.
- Apart from the goals, the other aspects of business that you need to bear in mind are the potential problems that you may face to set-up, your areas of interest, and all the other dimensions of the business.
- Let's understand it better with the help of some questions that every entrepreneur should ask before starting their own business.
- Open the Participant Handbook section named '20 Questions to Ask Yourself Before Considering Entrepreneurship'. You have to answer the questions individually.
- Then, we will have a class discussion on all the questions.

Do



- Read out the questions one by one in front of all the participants.
- Participants have to answer all the one by one questions.
- Give the class 10-15 minutes to note down their answers.
- At the end of 15 minutes, open the discussion for all the questions.
- Moderate the discussion by focusing on the relevant points.
- Keep a check on time and don't let the discussion get sabotaged or lose track of time. Ensure all the questions
 are covered and discussed.

Summarize



- Ask the participants what they have learned from this exercise/activity.
- Ask if they have any questions related to what they have talked about so far.

Notes 📋		
Notes 🔳		









11. Annexures

Annexure I: Training Delivery Plan

Annexure II: Assessment Criteria



Annexure I Training Delivery Plan

Training Delivery Plan	1						
Program Name:	Certific	cate Course in '	Welding and Quality Technician				
Qualification Pack Name & Ref. ID	Weldir	ng and Quality	Technician - ACS/Q3109				
Version No.	1.0	.0 Version Update Date 05-04-2019					
Pre-requisites to Training (if any)	Class 1	.0th Standard F	Pass				
Training Outcomes	By the	end of this pro	ogram, the participants will be able to:				
	1.	Identify the co	omponent requirements and the equipn	nent to be used.			
	2.	Perform oper from the supe	ration of welding machine as per the wervisor.	ork instructions/ guidance			
	3.	Support the c	perator/supervisor in various kinds of w	elding operations.			
	4.	Perform mind	or machine maintenance activities.				
	5.	Perform comp drawing.	plete dimensional, layout inspection and	visual check as per product			
	6.		ading of finished goods from the produce designated area.	uction line and store them			
	7.	Record the ob	oservations in the inspection check sheet	t.			
	8.	•	n equipment and instruments such as s gauges and similar other items.	Vernier Micrometer, height			
	9.	Carry out doc	k audit consisting of visual, labelling and	packaging checks.			
	10	. Conduct regu	lar cleaning and maintenance of equipm	ent.			
	11	11. Maintain a safe and healthy work place by adhering to the safety go the working area of the organization and following the practices wh impacting the environment in a negative manner.					
	12	and documer	n the work premises by sorting, streamled atation, cleaning, standardization and submises of the organization.				

SI. No	Module Name	Session Name	Session Objectives	NOS Reference	Methodology	Training Tools/Aids	Duration
1	Introduction	Icebreaker	 General Discipline in the class room General Safety Rules 		Group Activity: Passing the Parcel	Class Room SizeChairs/TablesComputer with Internet	8 hour

			 Introduction to Automotive Industry Familiarization about various auto manufacturers Familiarization of terms associated with the sector Brief outline about the course Job Opportunities for a welding and quality technician Career growth path for a welding and quality technician 			 LCD Projector with Screen Trainer chair and table Demonstration table Pin up boards White Board with Marker Work table with Bench Vice 	
2	Understand welding job requirements and related processes	Basic engineering drawing, tools and equipment required, SOP, parameter setting, different types of joints	 Understand the engineering drawing, sketches and work order Understand what process and equipment will be used to deliver required output. Understand what process and equipment will be used to deliver required output. 	ASC/ N3103 PC1, PC2, PC3, PC4, PC5 KB1, KB2, KB3, KB4, KB5, KB6, KB7 SA1, SA2, SA3, SA4, SA5, SA6, SA7, SA8 SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9, SB10, SB11, SB12	Facilitator- led- discussion Videos	 Different types of joints Bench Drill Drills & Taps Bench Grinder AC/DC Arc welder Electrode Holder Electrodes (M.S) Welding booth with Exhaust (3' x 2.5' x 3.5') Metal Inert Gas welding (MIG) Set (Single phase) Wire feeder and Roll Co2 gas cylinder + Regulator + gas heater & flow meter Torch with Nozzle 	8 hrs 8 hrs 8 hrs 8 hrs

Understand what process and equipment will be used to deliver required output.	 Tungsten Inert gas Welding (TIG) set with Electrode Argon gas cylinder 8 hrs 8 hrs
Understand the does and don'ts of the manufacturing process as defined in SOP/ work instruction or defined by supervisors	 Hammer/ Chipping Wire Brush Spot/Projection Welding machine with tips Equipment for Brazing and
Understand impact of various physical parameters like temperature, pressure, electrode distance on the properties of final output product like durability, ductility & surface feel etc.	Soldering 8 hrs Tool Box with different sizes of Round & open end spanners Hydraulic & lubricating oil Consumables like electrodes gas cylinder & similar item Fixtures for holding
Understand impact of various physical parameters like temperature, pressure, electrode distance on the properties of final output product like durability, ductility & surface feel etc.	components • Defective & good samples of weld • Control plan, operation std & work Instructions • Vernier • Micrometer • Surface plate • V Block (magnetic)

			Height Gauge	
			Straight Edge &	
			Squares	
			Abrasive Cutter	
			for Samples	
			Polishing machine	
			HNo3 Acid for	
			Penetration	
			check	
			• Hardness	
			Tester	
			Sample parts	
			from small	
			to big for	
			practicing welding	
			in various	
			thickness	
			• Goggles	
			• Protective	
			Gloves	
			• Shields	
			• Ear Plugs	
			• Aprons	
			Safety Shoes	
			• Fire Fighting	
			Equipment	
			• First Aid Box	
			Maintenance Manuals	
			and Welding	
			handbooks	
			• Necessary	
			spares of	
			machines	
			voltage & current meters	
			• Standards	
			for welding	
			symbols	
			• Standards of	
			GD & T BIS,	
			ASME & ASTM	
			• Welding Simulators	
			Simulaturs	

	Prepare the welding machine for the welding process	Welding positions, welding process, welding parameter, material and accessories require	right welding methodology and process to be adopted for completing the work order from the supervisor. • Understand the right welding methodology and process to be adopted for completing the work order from the supervisor. • Understand the various welding parameter like electrode distance (gaps) welding current, voltage, process time before starting welding parameter like electrode distance (gaps) welding current, voltage, process time before starting welding parameter like electrode distance (gaps) welding current, voltage, process time before starting welding process • Understand the material required and the equipment availability for executing the activity.	ASC/ N3104 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13 KB1, KB2, KB3, KB4, KB5, KB6, KB7 SA1, SA2, SA3, SA4, SA5, SA6, SA7, SA8 SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9, SB10, SB11, SB12, SB13	led- discussion • Skill Practice (Activity)	 Different types of joints Bench Drill Drills & Taps Bench Grinder AC/DC Arc welder Electrode Holder Electrodes (M.S) Welding booth with Exhaust (3' x 2.5' x 3.5') Metal Inert Gas welding (MIG) Set (Single phase) Wire feeder and Roll CO2 gas cylinder + Regulator + gas heater & flow meter Torch with Nozzle Tungsten Inert gas Welding (TIG) set with Electrode Argon gas cylinder Hammer/Chipping Wire Brush Spot/Projection Welding machine with tips Equipment 	8 hrs
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	- 11	fan Dari	0.1
	Understand the	for Brazing	8 hrs
	material required	and Soldering	
	and the equip- ment availability	• Tool Box with	
	· 1	different sizes	
	for executing the	of Round &	
	activity.	open end	
	Understand the	spanners	
	type of elec-	 Hydraulic & 	
	trode in terms of	lubricating oil	
	electrode mate-	 Consumables 	
	rial & thickness,	like	
	filler material and	electrodes	
	flux which will be	gas cylinder &	
	required for the	similar item	
	selected welding	• Fixtures	
	process before		
	start of welding.	for holding	
		components	
	 Understand set- 	Defective &	8 hrs
	ting up welding	good samples	
	apparatus as	of weld	
	per the selected	 Control plan, 	
	welding process	operation	
	& SOP and the	std & work	
	setting standards	Instructions	
	of machine.	 Vernier 	
	Remove any extra	Micrometer	
	material, sharp		
	edges which	 Surface plate 	
	might impact	 V Block 	
	the final welded	(magnetic)	
	product	 Height Gauge 	
		Straight Edge	
	Remove any extra	& Squares	5 hrs
	material, sharp	Abrasive	21112
	edges which	Cutter for	
	might impact	Samples	
	the final welded	·	
	product	• Polishing	
		machine	
		• HNo3 Acid for	
		Penetration	
		check	
I			

						Hardness Tester Sample parts from small to big for practicing welding in various thickness Goggles Protective Gloves Shields Ear Plugs Aprons Safety Shoes Fire Fighting Equipment First Aid Box Maintenance Manuals and Welding handbooks Necessary spares of machines voltage & current meters Standards for welding symbols Standards of GD & T BIS, ASME & ASTM Welding Simulators	
4	Support the welder in the welding process	Installation of welding machine, parameter setting, welding operation, measuring material	• Install the work pieces on the welding apparatus keeping in mind the electrode distance, contact area, pressure, temperature, application as per welding SOP/control plan	ASC/ N3105 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10 KB1, KB2, KB3, KB4, KB5, KB6	 Facilitator- led- discussion Skill Practice (Activity) 	 Different types of joints Bench Drill Drills & Taps Bench Grinder AC/DC Arc welder 	8 hrs

of Round & open end spanners Hydraulic & lubricating oil Consumables like electrodes gas cylinder & similar item Fixtures for holding components Defective & good samples of weld Control plan, operation std & work	8 hrs
spanners Hydraulic & lubricating oil Consumables like electrodes gas cylinder & similar item Fixtures for holding components Defective & good samples of weld Control plan, operation std & work	8 hrs
 Hydraulic & lubricating oil Consumables like electrodes gas cylinder & similar item Fixtures for holding components Defective & good samples of weld Control plan, operation std & work 	8 hrs
lubricating oil Consumables like electrodes gas cylinder & similar item Fixtures for holding components Defective & good samples of weld Control plan, operation std & work	8 hrs
 Consumables like electrodes gas cylinder & similar item Fixtures for holding components Defective & good samples of weld Control plan, operation std & work 	8 hrs
like electrodes gas cylinder & similar item • Fixtures for holding components • Defective & good samples of weld • Control plan, operation std & work	8 hrs
electrodes gas cylinder & similar item • Fixtures for holding components • Defective & good samples of weld • Control plan, operation std & work	8 hrs
gas cylinder & similar item • Fixtures for holding components • Defective & good samples of weld • Control plan, operation std & work	8 hrs
& similar item • Fixtures for holding components • Defective & good samples of weld • Control plan, operation std & work	8 hrs
item • Fixtures for holding components • Defective & good samples of weld • Control plan, operation std & work	8 hrs
 Fixtures for holding components Defective & good samples of weld Control plan, operation std & work 	8 hrs
for holding components • Defective & good samples of weld • Control plan, operation std & work	8 hrs
components • Defective & good samples of weld • Control plan, operation std & work	8 hrs
 Defective & good samples of weld Control plan, operation std & work 	8 hrs
good samples of weld • Control plan, operation std & work	8 hrs
of weld • Control plan, operation std & work	8 hrs
• Control plan, operation std & work	8 hrs
operation std & work	8 hrs
std & work	8 hrs
	5
Instructions	1
IIISTI UCTIONS	
Vernier	
Micrometer	
Surface plate	
• V Block	
(magnetic)	
	8 hrs
	5 1113
Hardness	
Tester	
	 Micrometer Surface plate V Block (magnetic) Height Gauge Straight Edge & Squares Abrasive Cutter for Samples Polishing machine HNo3 Acid for Penetration check Hardness

			 Measure final welding pieces & compare the dimension as given in the work order engineering drawing Measure final welding pieces & compare the dimension as given in the work order engineering drawing 			 Sample parts from small to big for practicing welding in various thickness Goggles Protective Gloves Shields Ear Plugs Aprons Safety Shoes 	8 hrs
			In case part is not as per drawing, remove extra material by using chippers, grinders, etc			 Fire Fighting Equipment First Aid Box Maintenance Manuals and Welding handbooks Necessary spares of machines voltage & current meters Standards for welding symbols Standards of GD & T BIS, ASME & ASTM Welding Simulators 	5 hrs
5	Remove the finished goods and store them in the designated place	Post welding operations, clamping material, checking output and quality	 Understand the output product shape and decide the suitable mechanism to lift the output Understand the output product shape and decide the suitable mechanism to lift the output 	ASC/ N3106 PC1, PC2, PC3, PC4, PC5, PC6, PC7 KB1, KB2 SA1, SA2, SA3, SA4, SA5, SA6, SA7	 Facilitator-led-discussion Skill Practice (Activity 	 Different types of joints Bench Drill Drills & Taps Bench Grinder AC/DC Arc welder Electrode Holder 	8 hrs

Clamp the product and lift the output using suitable equipment like hoist, life, trolley	SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9, SB10,	 Electrodes (M.S) Welding booth with Exhaust (3' x 2.5' x 3.5') 	8 hrs
Clamp the product and lift the output using suitable equipment like hoist, life, trolley	SB11	 Metal Inert Gas welding (MIG) Set (Single phase) Wire feeder and Roll CO2 gas 	8 hrs
Ensure there is no damage to the lifted work piece		cylinder + Regulator + gas heater & flow meter	8 hrs
Identify by tag the right quality pieces.		 Torch with Nozzle Tungsten Inert gas Welding (TIG) set with Electrode Argon gas cylinder Hammer/ Chipping Wire Brush Spot/ Projection Welding machine with tips Equipment for Brazing and Soldering Tool Box with different sizes of Round & open end spanners 	5 hrs

			T	
			Hydraulic & Inbrigating oil	
			lubricating oil Consumables	
			like	
			electrodes	
			gas cylinder &	
			similar item	
			• Fixtures	
			for holding	
			components	
			Defective &	
			good samples of weld	
			• Control plan,	
			operation	
			std & work	
			Instructions	
			• Vernier	
			Micrometer	
			Surface plate	
			• V Block	
			(magnetic)	
			Height Gauge	
			• Straight Edge & Squares	
			• Abrasive	
			Cutter for	
			Samples	
			 Polishing machine 	
			 HNo3 Acid for Penetration 	
			check	
			Hardness	
			Tester	
			Sample parts	
			from small	
			to big for	
			practicing	
			welding in various	
			thickness	
1				

						 Goggles Protective Gloves Shields Ear Plugs Aprons Safety Shoes Fire Fighting Equipment First Aid Box Maintenance Manuals and Welding handbooks Necessary spares of machines voltage & current meters Standards for welding symbols Standards of GD & T BIS, ASME & ASTM Welding Simulators 	
6	Conduct quality checks and inspection of the finished metal cast products	Doing quality checks, using measuring instruments, removing damage material and repairing work	 Measure the specifications of the finished product using devices like micrometers, vernier calipers, gauges, rulers, weighing scales and any other inspection equipment and compare with the parameters given in the work order Compare texture, color, surface properties, hardness and strength with the given product specifications 	ASC/ N0007 PC1, PC2, PC3, PC4, PC5, PC6 KB1, KB2, KB3 SA1, SA2, SA3, SA4, SA5, SA6 SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9, SB10, SB11	Facilitator-led-discussion Skill Practice (Activity	 Different types of joints Bench Drill Drills & Taps Bench Grinder AC/DC Arc welder Electrode Holder Electrodes (M.S) Welding booth with Exhaust (3' x 2.5' x 3.5') Metal Inert Gas welding (MIG) Set 	8 hrs

Note down the	(Single phase)	8 hrs
observations of the basic inspection process and identify pieces which are OK and also not meeting the specified standards • Separate the defective pieces into two categories – pieces which can be repaired/ modified and pieces which are beyond repair • Discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework	 (Single phase) Wire feeder and Roll CO2 gas cylinder + Regulator + gas heater & flow meter Torch with Nozzle Tungsten Inert gas Welding (TIG) set with Electrode Argon gas cylinder Hammer/ Chipping Wire Brush Spot/ Projection 	8 hrs
 Maintain records of each category of work outputs Rectify minor defects like excess slag, shape deformation, sharp edges, rough surfaces, grooves, holes etc. by Fettling, chipping, Cutting, sawing, filling, shearing, hammering etc. Escalate all issues related to change in colour, surface properties, hardness etc. so that the manufacturing equipment can be reset to achieve the specified output 	· ·	6 hrs

			• Defective & good samples
			of weld
			 Control plan,
			operation
			std & work
			Instructions
			• Vernier
			Micrometer
			Surface plate
			• V Block
			(magnetic)
			Height Gauge
			Straight Edge
			& Squares
			• Abrasive
			Cutter for
			Samples
			Polishing machine
			HNo3 Acid for
			Penetration
			check
			Hardness
			Tester
			Sample parts
			from small
			to big for
			practicing
			welding
			in various thickness
			• Goggles
			Protective
			Gloves
			• Shields
			• Ear Plugs
			• Aprons
			• Safety Shoes
			• Fire Fighting
			Equipment

						 First Aid Box Maintenance Manuals and Welding handbooks Necessary spares of machines voltage & current meters Standards for welding symbols Standards of GD & T BIS, ASME & ASTM Welding Simulators 	
7	Inspect and maintain the product quality	Inspection of final product, inspection methods, reporting and documentation of damage material	 Conduct an inspection of a part covering the following check points Visual inspection of the part for scratches, dents, damages, packing as per the norm set Visual inspection of the part for scratches, dents, damages, packing as per the norm set Conduct complete dimensional/layout inspection as per drawing Conduct complete dimensional/layout inspection as per drawing 	ASC/N6301 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19 KB1, KB2, KB3, KB4, KB5, KB6, KB7, KB8, KB9, KB10 SA1, SA2, SA3, SA4, SA5, SA6, SA7, SA8 SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9, SB10, SB11, SB12, SB13, SB14, SB15, SB16,	Facilitator-led-discussion Skill Practice (Activity	 Sample of Rejected parts for defects like dent, scratch, damage and burrs Packaging standards with visual aids List of approved labs (NABL accredited) for outsourced testing Stickers & labels for ok, reject and Hold materials Formats for dimensional, material & function testing of parts 	8 hrs 8 hrs 8 hrs

Note down the observations of basic inspection process and identify ok & not meeting specification parts a) Separate the defective parts into two categories 1. Parts which can be repaired / modified and pieces which are beyond repair and repair the pieces with minor defects, maintain record of basic inspection parts Note down the observations of basic inspection parts a) Separate the defective parts into two categories 1. Parts which can be repaired / modified and pieces which are beyond repair and repair the pieces with minor defects, maintain record of each category. Note down the observations of basic inspection parts a) Separate the defective parts into two categories 1. Parts which can be repaired / modified and pieces which are beyond repair. 2. Discard the pieces which are beyond repair and repair the pieces which are beyond repair. 2. Discard the pieces which are beyond repair and repair the pieces with minor defects, maintain record
of each category.

Coordination with	
the respective process owners/ seniors in QA and implement CAPA for discrepancies in the parameters identi- fied in the report on	
• Coordination with the respective process owners/ seniors in QA and implement CAPA for discrepancies in the parameters identi-	8 hrs
fied in the report on immediate basis. • Participate in check-	8 hrs
ing effectiveness of implementation and report the pro- cess till the discrep- ancies are resolved.	
 Participate in checking effectiveness of implementation and report the process till the discrepancies are resolved. Document the observation of the inspection & maintain records 	8 hrs
Document the observation of the inspection & maintain records	2 hrs

8.	Conduct regular cleaning and maintenance of the equipment	Housekeeping of workshop, maintenance of tools and equipment, checking and inspection of tools and machines	 Arrange all equipment in a proper order as indicated in the equipment manual Store equipment auxiliaries and spare parts in proper designated areas tag process related equipment parts/ spare parts as per part number or serial number so that sorting of equipment becomes easy Check the working of all bearing, rollers, shafts etc. and oil all moving parts of the equipment on a periodic basis Check the working of nonmoving parts and periodically conduct preventive maintenance to prevent machine failure Periodically check the equipment calibration and report any errors to the maintenance teams for 	ASC/ N0008 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11 KB1, KB2, KB3, KB4 SA1, SA2, SA3, SA4, SA5, SA6, SA7 SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8, SB9, SB10, SB11	Facilitator-led-discussion Skill Practice (Activity)	 Different types of joints Bench Drill Drills & Taps Bench Grinder AC/DC Arc welder Electrode Holder Electrodes (M.S) Welding booth with Exhaust (3' x 2.5' x 3.5') Metal Inert Gas welding (MIG) Set (Single phase) Wire feeder and Roll CO2 gas cylinder + Regulator + gas heater & flow meter Torch with Nozzle Tungsten Inert gas Welding (TIG) set with Electrode Argon gas cylinder Hammer/Chipping Wire Brush Spot/Projection Welding machine with 	8 hrs

Prepare periodic log sheets of equipment maintenance dates, maintenance schedules and maintenance activity conducted on the equipment Prepare periodic log sheets of equipment maintenance and maintenance activity conducted on the equipment	 Equipment for Brazing and Soldering Tool Box with different sizes of Round & open end spanners Hydraulic & lubricating oil Consumables like electrodes gas cylinder & similar item Fixtures for holding components Defective & good samples of weld Control plan, operation std & work Instructions Vernier Micrometer Surface plate V Block (magnetic) Height Gauge Straight Edge & Squares Abrasive Cutter for Samples Polishing machine HNO3 Acid for Penetration check
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• Hardness Tester
Sample parts
from small
to big for
practicing welding
in various
thickness
• Goggles
• Protective
Gloves
• Shields
• Ear Plugs
• Aprons
Safety Shoes
• Fire Fighting
Equipment Equipment
• First Aid Box
Maintenance
Manuals
and Welding
handbooks
• Necessary
spares of
machines voltage &
current
meters
• Standards
for welding
symbols
• Standards
of GD & T
BIS, ASME &
ASTM
• Welding
Simulators

9.	Maintain a safe and healthy working environment	Maintaining health and safety at workplace, PPE, Safe working procedure, emergency procedure, hazards, first aid	 Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals ,loud noise Create awareness amongst other by sharing information on the identified risks Operate the machine using the recommended Personal Protective Equipment (PPE) Maintain a clean and safe working environment near the work place and ensure there is no spillage of chemicals, production waste, oil, solvents etc. Maintain high standards of personal hygiene at the work place Ensure that the waste disposal is done in the designated area and manner as per organization SOP. 	ASC/N0006 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11 KB1, KB2, KB3, KB4 SA1, SA2, SA3, SA4, SA5, SA6, SA7 SB1, SB2, SB3, SB4, SB5, SB6, SB7, SB8	Facilitator-led-discussion Skill Practice (Activity	 Teaching Aids: Charts, CBTs, Videos, White board Markers, White board / Flip charts. Personal Protection Equipment: Gloves, Safety Shoes, goggles, ear plugs, Workshop Safety: Fire extinguishers First Aid Safety signs SOP Charts on safety norms and drills Charts of dos and Don'ts in work area. Standards, procedures and policies related to Health, Safety and Environment followed in 	8 hrs 8 hrs
			Ensure that the waste disposal is done in the designated area and manner as per organization SOP.				1 hr

10	Maintain 5S at the work premises	5S safety system, waste management, waste management methods, storing and stacking of material	 Follow the sorting process and check that the tools, fixtures & jigs that are lying on workstations are the ones in use and un-necessary items are not cluttering the work benches or work surfaces. Ensure segregation of waste in hazardous/ non Hazardous/ non Hazardous waste as per the sorting work instructions Segregate the items which are labelled as red tag items for the process area and keep them in the correct places Properly stack the various types of boxes and containers as per the size/ utility to avoid 	ASC/N0021 PC1, PC2, PC3, PC4, PC5, PC6, PC7, PC8, PC9, PC10, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC20, PC21, PC22, PC23, PC24, PC25, PC26 KB1, KB2, KB3, KB4, KB5, KB6, KB7, KB8, KB9, KB10, KB11, KB12, KB13, KB14 SA1, SA2,	Facilitator-led-discussion Skill Practice (Activity	 Tools, fixtures & jigs Personal Protection Equipment: Gloves, Safety Shoes, goggles, ear plugs SOP document and charts on segregation and disposal of waste SOP on health safety and environment Safety sign boards/signs Risk mitigation plan SOP on safety and fire drills Bins, containers, drums, trays, cabinets, 	8 hrs 8 hrs
		Properly stack the various types of boxes and containers as per the size/utility to avoid any fall of items/breakage and also enable easy sorting when required **KB7, KB8, KB9, KB10, KB11, KB12, KB13, KB14 **SA1, SA2, SA3, SA4, SA5, SA5, SA5, SA5, SA5, SB1, SB2,	KB5, KB6, KB7, KB8, KB9, KB10, KB11, KB12, KB13, KB14 SA1, SA2, SA3, SA4, SA5,		 SOP on safety and fire drills Bins, containers, drums, trays, 	8 hrs	
			Make sure that all material and tools are stored in the designated places and in the manner indicated in the 5S instructions	SB5, SB6, SB7, SB8, SB9, SB10		equipment	8 hrs

• Ensure that the area has floors swept, machinery clean and generally clean. In case of cleaning, ensure that proper displays are maintained on the floor which indicate potential safety hazards	Sample fluids, oils, lubricants, solvents, chemicals tools/ equipment/ fasteners/ spare parts	8 hrs
• Ensure self-clean- liness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene		8 hrs
 Participate actively in employee work groups on 5S and encourage team members for active participation 		8 hrs
Participate actively in employee work groups on 5S and encourage team members for active participation		1 hr

Annexure II Assessment Criteria

CRITERIA FOR ASSESSMENT OF TRAINEES

Assessment Criteria	
Job Role	Welding and Quality Technician
Qualification Pack	ASC/Q3109, Version 1.0
Sector Skill Council	Automotive

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria.
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in each NOS.
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP.

					Marks Allocation	
Assessment outcome	Assessment criteria (PC)		Total Marks	Out Of	Theory	Skills Practical
(NOS Code and Description)						
ASC/N3103 Understand welding job requirements and related processes	PC1.	understand the work order (work output) required from the process and discuss the same with the operator		17	4	13
	PC2.	refer all engineering drawings and sketches related to the work output to understand the measurement and shape of the required work output	100	17	4	13

	PC3.	clearly understanding the does and don'ts of the manufacturing process as defined in SOPs/ Work Instructions or defined by supervisors		16	4	12
	PC4.	refer the queries to the Operator/ Welder if they cannot be resolved by the assistant welder on own discuss and conclude		16	4	12
	PC5.	obtain help or advice from specialist if the problem is outside his/her area of competence or experience		17	4	13
	PC6.	confirm self - understanding to the Operator once the query is resolved so that all doubts & queries can be resolved before the actual process execution		17	5	12
			Total	100	30	70
ASC/N3104 Prepare the welding machine for the welding	PC1.	discuss with the operator right welding methodology and process to be adopted for completing the work order	100	8	2	6
process	PC2.	discuss the various welding parameters like temperature, pressure, electrode type, electrode distance (gap), Welding current, voltage, process time etc. before starting the welding process		8	2	6
	PC3.	discuss the material required and the equipment availability for executing the activity with the team members		7	2	5
	PC4.	discuss with the operator on the type of electrode material and thickness, filler material and flux to be used for the welding process		8	6	6
	PC5.	ensure that the required material is procured from the store before starting the welding process		6	1	5
	PC6.	clean the surface of the electrodes and the welding gun and remove dust or any other impurities		6	1	5
	PC7.	clean other welding machine auxiliaries(Welding Transformer, Gas Discharge unit, Flux wire) before the initiation of the welding process		7	2	5

	PC8.	setup the welding apparatus as per process standard and the work instruction		8	2	6
	PC9.	clean the surface to the metal parts (work pieces) which need to be joint		7	2	5
	PC10.	remove any extra material, sharp edges etc. which might impact the final welded product		7	2	5
	PC11.	ensure the work pieces available for welding is in line with the product drawing/ sketches available with the operator		8	2	6
	PC12.	in case the parts are not as per the given measurements, remove extra material by using chippers, grinders etc.		7	2	5
	PC13.	immediately refer the queries to a operator and the supervisor		7	2	5
	PC14.	confirm self-understanding to the operator once the query is resolved so that all doubts & queries can be resolved before the actual process execution		7	2	5
			Total	100	25	75
ASC/N3105 Support the welder in the welding process	PC1.	hold the parts which need to be welded together using a clamp and align them with the electrodes as per the job requirement so that the work pieces do not fall down/ turn		11	2	9
	PC2.	install the work pieces on the Welding apparatus keeping in mind the electrodes distance, contact area, pressure, temperature application etc. as specified in the Welding process/work instructions		11	3	8
	PC3.	check for operation of core welding equipment like welding gun, welding transformer, gas cylinders, gas discharge units as per welding process/work instructions	100	9	2	7
	PC4.	support the operator in conducting destructive and non-destructive test activity		9	2	7
	PC5.	support the operator in the Gas Discharge welding by holding		9	2	7

P	PC6.	help the welder in monitoring the welding process parameters (Pressure, Temperature, gas discharge flow, electrode force, electrode distance etc.) by observing various instrument and gauges and correct if not within standards		10	2	8
P	PC7.	measure the final welded piece and compare the dimensions as prescribed in the work order engineering drawing		11	3	8
P	PC8.	in case the parts are not as per the given measurements, remove extra material by using chippers, grinders etc.		10	3	7
P	PC9.	if there are any bulges, then hammer the bulges and give the work pieces the desired shape		10	3	7
P	PC10.	keep the operator informed of any inconsistency in the welding process, quality issues etc. so that the same can be dealt immediately		10	3	7
			Total	100	25	75
ASC/N3106 Remove the finished goods	PC1.	depending on the shape/weight of the output select a suitable method for movement		15	4	11
and store them in the designated place	PC2.	clamp the product and lift the output object using suitable equipment like hoist, lifts, crane etc.		14	4	10
P	PC3.	ensure that there is no damage to the lifted work pieces		14	3	11
P	PC4.	carry the output product to the designated area using hangars, conveyor belts, cranes, forklifts etc.	100	14	3	11
P	PC5.	post inspection process, tag the right quality pieces for future identification		14	4	10
P	PC6.	carry the tagged pieces to the storage areas using suitable method of movement means		15	4	11
P	PC7.	keep a record of the finished goods along with the storage		14	3	11
		identification numbers for easy sorting				

ACC/NICOCC	D.0.					
ASC/N6301 Inspect and maintain the product quality	PC1.	as per instructions/under supervision, carry out process of Inspection at various stages of manufacturing process: complete dimensional/ Layout Inspection at development stage & later as per the periodicity such as annual for re- validation; in the Production phase, as per the CP/ Quality plan/ sampling plan/ stage inspection plans/ First off IR		6	2	4
	PC2.	as per instructions/under supervision handle Inspection equipment and Instruments: vernier, micrometers, height Gauge & surface plate; acceptance/ Combination Gauges, simple gauges - bore, air, profile for safe storage, calibration at pre-decided frequency and have an acceptable level of R & R as per SOP of the organization	100	6	2	4
	PC3.	as per instructions/under supervision conduct an inspection of the product covering the following check points: visual Inspection of the part for scratches, dents, damages, packing as per the norms etc. for special inspection co-ordinate with other agencies e.g.: Material Lab, Standards Room, assembly/ performance trials etc. put identification sticker/ number/ label on the product for ok, rework and rejected material		6	2	4
	PC4.	coordinate with the respective process owners / seniors in QA and implement CAPA for discrepancies in the parameters identified in the report on immediate basis		6	2	4
	PC5.	participate in checking the effectiveness of implementation and repeat the process till the discrepancies are resolved		5	1	4
	PC6.	document the observations of the inspection and maintain records		5	1	4

PC7.	where applicable maintain ERP-System records and special process capability index calculation/ charting as per the SOP. Raise a scrap note and dispose off the scrapped product in the scrap yard as per the defined procedure maintaining the HSE compliance		6	1	5
PC8.	as is the case i.e. New product/ process development / Production phase, the reports and Part Submission Warrant, PPAP are to be prepared.		5	1	4
PC9.	based on the implementation of information flow system in organization like ERP/SAP , upload the reports	6	1	5	
PC10.	as per instructions/under supervision carry out dock audit of a sample batch from the production lot of the ready to dispatch final products covering the following checkpoints: Product to be in good shape with no visible damage, no presence of sharp edges in the product, part to be with specification as the drawing, packaging of product according to specification, packaging boxes as per the requirement for preservation and customer PO Number on the shipping labels		6	2	4
PC11.	label the boxes correctly with packer name, count on the Bill of Lading match the count on the pallet, boxes stacked neatly in case of pallet arrangement. No damages of the pallet like nails sticking out, broken boards, etc should be there		5	1	4
PC12.	review the effectiveness of implementation and repeat the process till the discrepancies are resolved		5	1	4
PC13.	under instruction/in discussion with superiors to review the effectiveness of implementation and repeat the process till the discrepancies are resolved		5	1	4

	PC14.	based on the implementation of information flow system in organization like ERP/SAP , upload the reports		6	2	4
	PC15.	where applicable, upload data in systems like ERP/ SAP		6	1	5
	PC16.	work as a Cross Functional Team member for solving a problem pertaining to the products handled. Collect data regarding the problem as decided in the team discussions		5	1	3
	PC17.	participate for preparation of Fault tree, conducting simulation and implementation of actions		5	1	4
	PC18.	participate for updating relevant documentation		5	1	4
	PC19.	assist the concerned department in efficient development of the new product by sharing all the observed problems related to QCD (quality cost and delivery)		6	2	4
			Total	100	25	75
ASC/N0021 Maintain a safe 5S at the work premises	PC1.	identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals ,loud noise		9	2	7
	PC2.	inform the concerned authorities about the potential risks identified in the processes, workplace area/layout, materials used etc		9	2	7
	PC3.	inform the concerned authorities about damages which can potentially harm man/ machine during operations	100	9	2	7
	PC4.	create awareness amongst other by sharing information on the identified risks		9	2	7
	PC5.	follow the instructions given on the equipment manual describing the operating process of the equipments		9	3	6
	PC6.	follow the Safety, Health and Environment related practices developed by the organization		9	3	6
	PC7.	operate the machine using the recommended Personal Protective Equipments (PPE)		10	3	7

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	PC8.	maintain a clean and safe working environment near the workplace and ensure there is no spillage of chemicals, production waste, oil, solvents etc		9	2	7
	PC9.	maintain high standards of personal hygiene at the work place		9	2	7
	PC10.	ensure that the waste disposal takes place in the designated area as per organization SOP		9	2	7
	PC11.	inform appropriately the medical officer/ HR in case of self or an employee's illness of contagious nature so that preventive actions can be planned for others		9	2	7
			Total	100	25	75
ASC/N0007 Conduct quality checks and inspection of the finished metal cast products	PC1.	measure the specifications of the finished product using devices like micrometers, vernier calipers, gauges, rulers, weighing scales and any other inspection equipment and compare with the parameters given in the work order		17	4	13
	PC2.	compare texture, color, surface properties, hardness and strength with the given product specifications	100	17	4	13
	PC3.	note down the observations of the basic inspection process and identify pieces which are OK and also not meeting the specified standards	100	17	4	13
	PC4.	separate the defective pieces into two categories – pieces which can be repaired/ modified and pieces which are beyond repair		16	4	12
	PC5.	discard the pieces which are beyond repair and repair the ones which need minor modifications/ rework		17	5	12
	PC6.	maintain records of each category of work outputs		16	4	12
			Total	100	25	75

ASC/N0008	PC1.	arrange all equipment in a		9	2	7
Conduct regular cleaning and		proper order as indicated in the equipment manual				
maintenance of the equipment	PC2.	store equipment auxiliaries and spare parts in proper designated Areas		9	2	7
	PC3.	clearly tag process related equipment parts/ spare parts as per part number or serial number so that sorting of equipment becomes easy		9	2	7
	PC4.	cover equipment so that there is limited dust collection and moisture contact	100	9	2	7
	PC5.	regularly clean the equipment and process auxiliaries to remove any dust, moisture, waste material which would have got collected on the equipment		9	3	6
	PC6.	regularly open the equipment and clean the internal parts of the Equipment		9	3	6
	PC7.	regularly clean the working area under the process and create a healthy, clean and safe working environment		9	3	6
	PC8.	check the working of all bearing, rollers, shafts etc. and oil all moving parts of the equipment on a periodic basis		9	2	7
	PC9.	check the working of non- moving parts and periodically conduct preventive maintenance to prevent machine failure		9	2	7
	PC10.	periodically check the equipment calibration and report any errors to the maintenance teams for rectification		9	2	7
	PC11.	prepare periodic log sheets of equipment maintenance dates, maintenance schedules and maintenance activity conducted on the equipment		10	2	8
			Total	100	25	75

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ASC/N0006 Maintain a safe and healthy working environment	PC1.	follow the sorting process and check that the tools, fixtures & jigs that are lying on workstations are the ones in use and un-necessary items are not cluttering the workbenches or work surfaces		4	1	3
	PC2.	ensure segregation of waste in hazardous/ non Hazardous waste as per the sorting work instructions		4	1	3
	PC3.	follow the technique of waste disposal and waste storage in the proper bins as per SOP		4	1	3
	PC4.	segregate the items which are labelled as red tag items for the process area and keep them in the correct places	100	4	1	3
	PC5.	sort the tools/ equipment/ fasteners/ spare parts as per specifications/ utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/ work instructions		4	1	3
	PC6.	ensure that areas of material storage areas are not overflowing		3	1	2
	PC7.	properly stack the various types of boxes and containers as per the size/ utility to avoid any fall of items/ breakage and also enable easy sorting when required		4	1	3
	PC8.	return the extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area		4	1	3
	PC9.	follow the floor markings/ area markings used for demarcating the various sections in the plant as per the prescribed instructions and standards		4	1	3
	PC10.	follow the proper labelling mechanism of instruments/ boxes/ containers and maintaining reference files/ documents with the codes and the lists		4	1	3
	PC11.	check that the items in the respective areas have been identified as broken or damaged		3	0	3
	PC12.	follow the given instructions and check for labelling of fluids, oils. lubricants, solvents, chemicals etc. and proper storage of the same to avoid spillage, leakage, fire etc.		4	1	3

PC13. make sure that all material and tools are stored in the designated places and in the manner indicated in the 55 instructions PC14. check whether safety glasses are clean and in good condition PC15. keep all outside surfaces of recycling containers are clean PC16. ensure that the area has floors sweet, machinery clean and generally clean. In case of cleaning, ensure that proper displays are maintained on the floor which indicate potential safety hazards PC17. check whether all hoses, cabling & wires are clean, in good condition and clamped to avoid any mishap or mix up PC18. ensure workbenches and work surfaces are clean and in good condition PC19. follow the cleaning schedule for the lighting system to ensure proper illumination PC20. store the cleaning material and equipment in the correct location and in good condition PC21. ensure self-cleanliness - clean uniform, clean shoes, clean lemitest, personal hygiene PC22. tollow the daily cleaning standards and schedules to create a clean working environment PC23. sturd all training programs for employees on 5 S PC24. support the team during the audit of 5 S PC25. participate actively in employee work groups on 55 and encourage team members for active participation PC26. follow the guidelines for What to do and What not to do to build sustainability in 55 as mentioned in the 55 check lists/ work instructions						
Clean and in good condition	PC13.	tools are stored in the designated places and in the manner		4	1	3
PC16. ensure that the area has floors were that the area has floors when the floor which indicate potential safety hazards PC17. check whether all hoses, cabling & wires are clean, in good condition and clamped to avoid any mishap or mix up PC18. ensure workbenches and work surfaces are clean and in good condition PC19. follow the cleaning schedule for the lighting system to ensure proper illumination PC20. store the cleaning material and equipment in the correct location and in good condition PC21. ensure self-cleanliness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene PC22. follow the daily cleaning standards and schedules to create a clean working environment PC23. attend all training programs for employees on 5 S PC24. support the team during the audit of 5 S PC25. participate actively in employee work groups on SS and encourage team members for active participation PC26. follow the guidelines for What to do and What not to do to build sustainability in SS as mentioned in the SS check lists/ work instructions	PC14.	, 0		3	1	2
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for the lighting system to ensure proper illumination PC20. store the cleaning material and equipment in the correct location and in good condition PC21. ensure self-cleanliness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene PC22. follow the daily cleaning standards and schedules to create a clean working environment PC23. attend all training programs for employees on 5 S PC24. support the team during the audit of 5 S PC25. participate actively in employee work groups on 5S and encourage team members for active participation PC26. follow the guidelines for What to do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work instructions	PC18.	surfaces are clean and in good		3	1	2
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of 5 S PC25. participate actively in employee work groups on 5S and encourage team members for active participation PC26. follow the guidelines for What to do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work instructions	PC23.			4	1	3
work groups on 5S and encourage team members for active participation PC26. follow the guidelines for What to do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work instructions	PC24.			4	1	3
do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work instructions	PC25.	work groups on 5S and encourage team members for active		5	1	4
	PC26.	do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work		4	1	3
		mstructions	Total	100	25	75

Do



- Explain each Guideline for Assessment in detail
- Explain the score that each trainee needs to obtain
- Recapitulate each NOS one-by-one and take participants through the allocation of marks for Theory and Skills Practical.
- Explain the Allocation of Marks. Explain that they will be assessed on Theory and Skills Practical.
- Explain that for the first NOS, 25 marks are allotted for Theory and & 75 for Skills Practical.

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Address: Sat Paul Mittal Building, 1/6, Siri Institutional Area, Khel Gaon Road,

New Delhi, Delhi 110049

Email: info@asdc.org.in

Web: www.asdc.org.in

Phone: 011 4186 8090

Price: ₹

