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Skilling India in Electronics

Participant Handbook

Sector:
Electronics

Sub-Sector:
LED Lighting

Occupation:
LED Light Testing and Quality Assurance

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Electronic Sector Skills Council of India (ESSCI)
602-608, 6th Floor, Ansal Chambers-II. Bhikaji Cama Place, New Delhi-110066
Email: info@essc-india.org
Website: www.essc-india.org
Phone: +91-11-46035050

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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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Certificate

COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARD

Is hereby issued by the

Electronics Sector Skills Council of India

for

Skilling Content : **LED Light Repair Technician**

Complying to National Occupational Standards of

Job Role/QP : **LED Light Repair Technician**, QP No : **ELE/Q9302 Level 4**

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Acknowledgements

The need for having a standard curriculum for the Job Role based Qualification Packs under the National Skills Qualification Framework was felt necessary for achieving a uniform skill based training manual in the form of a Participant Handbook.

I would like to take the opportunity to thank everyone who contributed in developing this Handbook for the QP LED Light Repair Technician.

The Handbook is the result of tireless pursuit to develop an effective tool for imparting the Skill Based training in the most effective manner.

I would like to thank the team of KontentEdge for their support to develop the content, the SME and the team at the ESSCI along with the industry partners for the tireless effort in bringing the Handbook in the current format.

CEO

Electronics Sector Skills Council of India

About this Book

This Participant Handbook is designed to enable training for the specific Qualification Pack (QP). Each National Occupational (NOS) is covered across Unit/s.

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.

Symbols Used


Key Learning Outcomes


Steps


Time


Tips


Notes


Unit Objectives

Table of Contents

Skill India
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1. Basics of Electronics and LED

Key learning Outcomes

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

- Identify basic electronic components and its functions
- List the uses of current, voltage, power and energy in LED Lighting products
- Demonstrate the process of soldering
- Explain about LED working principle
- List the parameter which affect the overall life of LED
- Identify the LED power sources
- Describe series and parallel connection of LED
- Explain the passive thermal design and heat transfer procedure in an LED
- Describe constant current of LED Driver

UNIT 1.1: Basics of Electronic Components and Electricity

Unit Objectives

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

- Identify basic electronic components
- Explain the function of electronic components

1.1.1 Component Classifications

Electronic equipment is made of electronic parts. Each electronic component will always comprise of electrical terminals, either two or more than two. These terminals are generally soldered onto a PCB in order to form a circuit that can perform a particular function, such as amplifier, radio, mobile phones, and so on.

Classification of electronic components

An electronic component may be classified into three categories active, passive, or electro-mechanic.

Active components

Active components are those which are capable of amplifying (increasing the power of a signal) or processing electrical signals. They derive power from the direct current (DC) source and increase the power of signals. These include components such as transistors, diode and so on.

Passive components

A component is defined as a passive component it does not require a separate power source for its operation. The only thing that is required for its operation is the alternating current (AC) flowing in the circuit. A passive component does not produce any power gain. Examples of passive components are inductor, resistor, transformer, and capacitor.

Electromechanical switches

A switch which has a manual operation is an electromechanical part. However, the term electromechanical component is generally used for devices such as relays and vibrators which permit a voltage or current to regulate other separate voltages and currents using mechanical switching of sets of contacts and solenoids. By this process a voltage can activate a moving linkage. Vibrators change DC to AC by utilizing vibrating sets of contacts.

1.1.2 Resistor

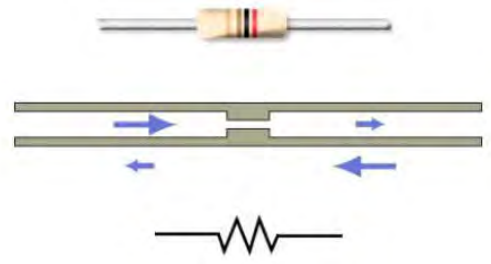
A resistor is a component in an electronic circuit which is built to resist or limit the flow of current in that circuit. This passive component reduces current flow, and lowers voltage levels within circuits, simultaneously. It can modify signal levels and cut off transmission lines. High-power resistors may be utilized in motor controls, in systems for power distribution or in generators as test loads. Variable resistors are typically used for altering circuit elements (such as to control the level of volume). It can also be utilized as a device to sense heat, light, humidity and so on.

Types of Resistors

Resistors can be of two types:

i. Fixed resistors – These comprise of metal films, wires having high resistance or carbon constituents.

ii. Variable resistors – These possess terminal resistance that can be changed by moving a dial, a screw, or something similar and appropriate.



Resistance is measured in Ohms (Ω) 1000Ω = 1kΩ, 1,000,000Ω = 1MΩ

A resistor can also be rated according its capacity to carry power, such as 1/4W, 0.5W, 1W, 5W etc.

1.1.3 Resistance Colour Coding Table

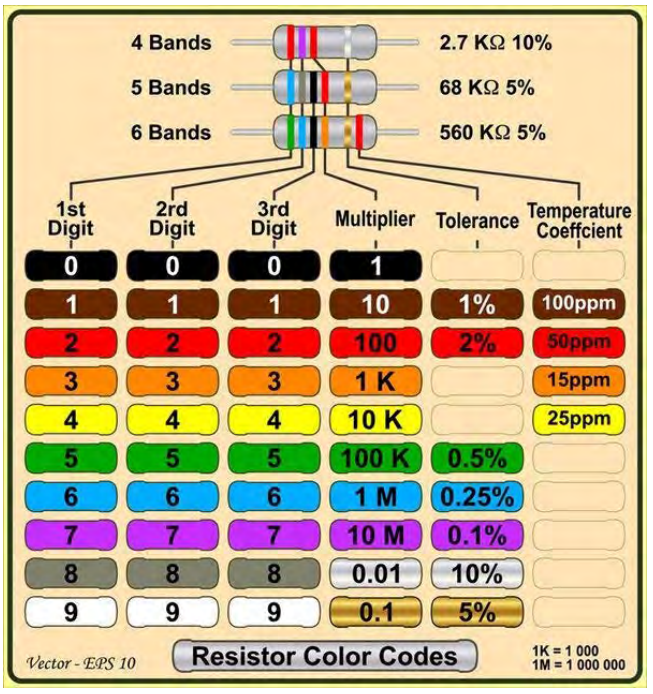
Colour coding was formulated to identify small sized resistors on which the resistance value could not be printed.

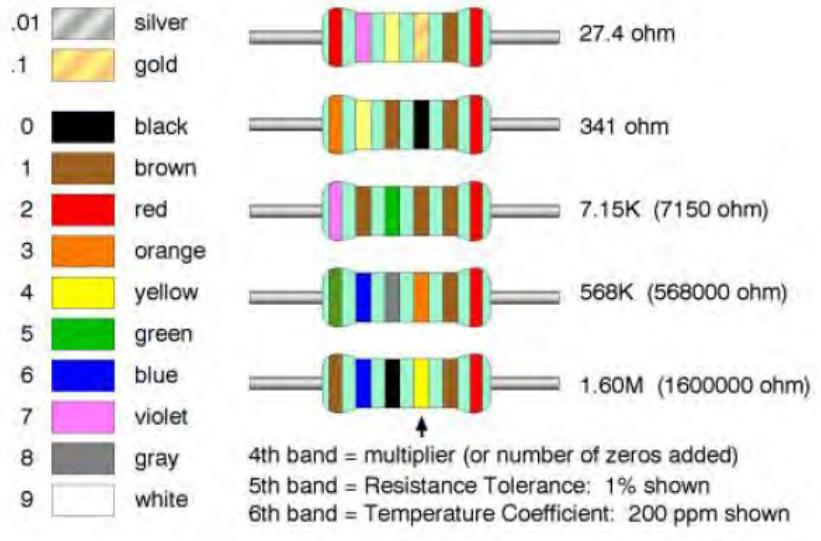
i. Colour bands should be read from that end which has the bands nearest to it.

ii. The 1st and 2nd bands stand for the first two digits.

iii. The 3rd band represents the power-of-ten multiplier (the number of zeroes after the second digit).

iv. The 4th band represents the manufacturer's tolerance (accuracy of the resistor).





1.1.4 Capacitor

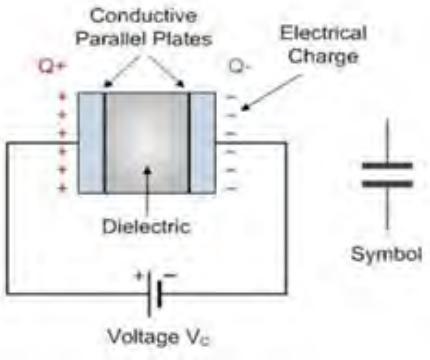
A capacitor is a device which is made up of one or more pairs of conductors and an insulator separating them. It is a passive electrical component with two terminals and is utilized to store energy in an electric field. The conductors can be made of thin films, foils, a conductive electrolyte and so on. The non-conducting dielectric functions to raise the charge capacity of the capacitor. It can be made of glass, plastic film, air, paper, an oxide layer and so on. Capacitors are extensively used in electrical circuits of general electrical devices.

Types of capacitors –

- Polarized
  Examples are electrolytic capacitors.
- Non-polarized
  Examples are film capacitors, ceramic capacitors, paper capacitors etc.

1.1.5 Capacitor Construction

The parallel plate capacitor is the simplest form of a capacitor, which is typically made by placing two metal or metalized foil plates in parallel with a gap between them. The value of the capacitance of such capacitors is determined using the surface area of the plates and their distance. The capacitance gets affected if any of these two values are altered changes.



The plates store the energy of the electrons as electrical charge on, which means, greater the plates and lesser the distance, more will be the capacitance.

If V is the voltage of a capacitor and Q is the charge on the plates, the ratio of the charge Q to the voltage V is the capacitance of the capacitor. It is written as: $C = Q/V_T$.

There is an electrostatic field between the two conducting plates which stores the energy within the charge. When electric current passes into a capacitor it gets charged and the energy is stored in the electrostatic field, making it stronger. When the current flows out of the capacitor it gets discharged and the electrostatic field becomes weak. A capacitor is like a battery having low capacity. A capacitor in series allows DC to pass through it while resisting DC. It is generally utilized for eradicating noise or stabilizing the supply voltage of a circuit.

1.1.6 The Capacitance of a Capacitor

The capacitor's ability to store an electrical charge on its plates is called its capacitance. The unit of capacitance is Farad (F) and it is denoted by the symbol C. It is always positive. A capacitor is said to have the capacitance of one Farad when a charge of one Coulomb is stored on the plates by a voltage of one volt. Sub-multiples of Farad are commonly used, such as micro-farads, Nano-farads and pico-farads, as Farad is a big unit of measurement.

Standard Units of Capacitance

Microfarad (µF) 1µF = 1/1,000,000 = 0.000001 = 10–6 F

Nanofarad (nF) 1nF = 1/1,000,000,000 = 0.000000001 = 10–9 F

Picofarad (pF) 1pF = 1/1,000,000,000,000 = 0.000000000001 = 10–12 F

1.1.7 Inductors

An inductor consist of a coil or a wire loop. This component is used to store energy in form of a magnetic field. The more the turns in the coil, the more will be the inductance. It resists changes in the electric current passing through it by inducing a voltage in the conductor.

Inductance is the ratio of the voltage to the rate of change of current. Its unit is Henries (H). Inductors generally range from 1 µH (10−6H) to 1 H. Most of the inductors have a magnetic centre within the coil, which strengthens the magnetic fields and thus the inductance. Inductors are extensively used in AC electronic equipment, especially radio equipment. They are used to allow DC to flow but not AC. Inductors specifically made for this function are known as chokes, which are also used in electronic filters to divide signals having different frequencies. When these inductors are combined with capacitors, they form tuned circuits, typically used to tune radio and television receivers.

The different types of Inductors are as follows:

- Air Core Inductor
- Ferromagnetic Core Inductor
- Variable Inductor

1.1.8 Diodes

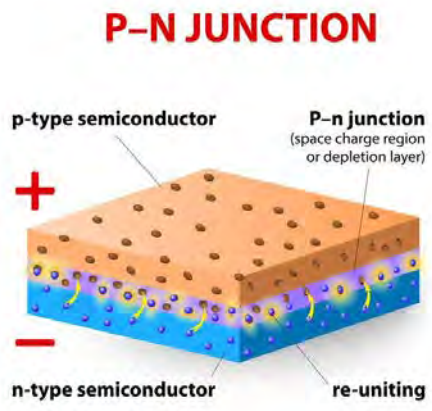
A diode is a specialized electronic component with two terminals known as the anode and the cathode. It is also called as PN-junction diode and is formed by joining together n-type and p-type silicon. The p-side is the anode and the n-side is the cathode. It has asymmetric conductance, which means that it conducts mainly in one direction. It has very less resistance (ideally zero), to the flow of current in one direction. It has high resistance (ideally infinite), in the other direction.

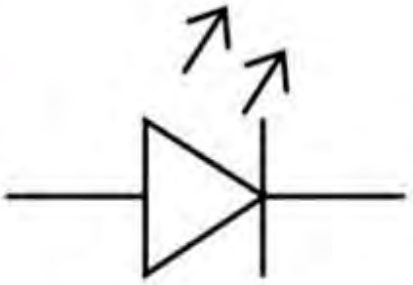
The diode is said to be forward biased when the potential at anode is more than the potential at cathode. The current is permitted to flow through the device in this type of diode. When the potential at anode is less than the potential at cathode, the diode is said to be reverse biased. The current is not allowed to flow in this type of diode.

Diodes are usually made up of semiconductor materials such as germanium, silicon or selenium.

1.1.9 Light Emitting Diode (LED)

A LED is a p-n junction diode which gives out light when it is activated. It is a two-lead semiconductor source of light. Energy is released as photons when a suitable voltage is applied to the leads. It gives a visual feedback for the circuit. LEDs can be seen on laptops, mobile phones, cameras, and in cars. Nowadays, LEDs are even used for general lighting.





1.1.10 Transistors

A transistor is an electronic device, made up of semiconductor material. Usually, it has at least three terminals to connect to an external circuit. It is used to amplify or switch electrical power and electronic signals. It can be seen as a switch controlled by an electrical signal, but unlike a switch which has just two states (on and off), it can be "a bit on" by regulating the current that passes through its base. A little amount of voltage/current applied at the control lead controls a larger amount of current flow through the other two leads.

The different types of transistors are as follows:

- Bipolar Junction Transistor (BJT) – It is utilized in LED Driver for current control
  –NPN and PNP
- Junction Field Effect Transistor (JFET) – It is utilized in LED Driver for voltage control
  –N-channel and P-channel
- Metal Oxide Semiconductor FET (MOSFET) – It is also utilized to control the voltage in LED Driver
  –Depletion type (n- and p-channel) and enhancement type (n- and p-channel)

1.1.11 Integrated Circuit(IC)

An IC, also known as a microchip, is a semiconductor wafer on which a number of small resistors, capacitors and transistors are fabricated. It can work as an oscillator, an amplifier, a timer, a counter, a microprocessor or as computer memory.

The two main advantages of ICs over discrete circuits are cost and performance. The cost of ICs is low because photolithography is used to print the chips along with all their components as a unit instead of each transistor being constructed at a time. Also, packaged ICs utilize less material than discrete circuits. Their performance is high as their components switch quickly and use up less power than the components of a discrete circuit. This happens because of the small size and closeness of the components.

ICs are utilized in almost all electronic equipment nowadays and have brought a revolution in the world of electronics. It could be an amplifier or a microprocessor or a USB to serial converter. The low cost of ICs has made computers, mobile phones and other digital home appliances an essential and familiar part of modern society.

UNIT 1.2: Basic of Electricity

Unit Objectives

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

- Identify the use of current, voltage, power and energy in LED Lighting products
- Explain the difference between AC and DC

1.2.1 Introduction

On completion of the session, the trainee will be able to explain:

- What electricity is
- The basic terms used in electricity

Let us understand some important definitions:

When electrons inside any material move, flow of electricity takes place. This flow is called current.

Despite using electricity in our daily life, many of us do not understand its basics terms and people find it difficult to learn about electricity. The main terms associated with electricity are as follows:

- Current
- Voltage
- Power
- Energy
- AC and DC power

In an electrical circuit, the current flows only when there is a voltage source.

1.2.2 Current

Electricity is a natural force that comes into existence whenever there is a flow of electric charge between any two components. The flow of electric charge is called current. Thus, electrical current is the amount of charge flowing past a fixed point. The unit of current is Ampere.

Voltage:

Voltage is the force pushing electrons through the wire.

Power:

The electrical energy transferred by an electrical circuit, per unit time is its power. The unit of power is watt. When electricity passes through an electrical circuit, it results in some work done. For example, when electricity flows through a fan, the blades of fan rotate, and

when the electricity flows through a refrigerator, it cools the items stored inside. Thus, when electricity flows through an appliance, it results in some work done.

Energy:

Electrical energy is the total amount of work done during a given time period. It is product of power of electrical appliance and duration of its usage.

There are standard formulas that describe the relationship between voltage, current, resistance, power, and energy.

1.2.3 Ohm's Law

On completion of the session, the trainee will be able to explain:

- What Ohm's law is
- How Ohm's law is applied in the conduction of electricity
- The relationship between voltage, current, and resistance
- The basic difference between power and energy
- The basic difference between AC and DC power and its uses

According to Ohm's law, current flowing through a conductor is directly proportional to the voltage across the conductor. The mathematical equation of Ohm's law is as follows:

$$I=V/R$$

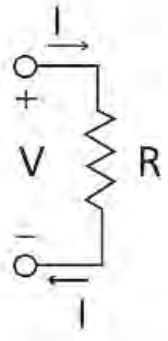
Where,

I is current flowing through the conductor,

V is the potential difference or voltage across the conductor, and

R is proportionality constant, known as the resistance of the conductor.

Resistance of the conductor is independent of current flowing through it as shown in the following figure:



1.2.4 Electric Power

Electric power can be defined as the rate at which electrical energy is transferred by an electric circuit. Its SI unit is watt, which is one joule per second.

Electric power is generally supplied by electric generators, but can also be produced by other sources such as electric batteries. Generally, the power industry supplies power to businesses and homes using a power grid. It is generally sold by kilowatt hour, which is the product of power in kilowatts multiplied by running time in hours. Electrical utilities measure the consumed power with the help of an electricity meter, which keeps track of the total electricity supplied to a customer.

Similar to mechanical power, electric power is the rate of doing work and is denoted by the letter P. The electric power in watts produced by an electric current I, consisting of a charge of Q coulombs every t seconds passing through an electric potential (voltage) difference of V is

$$\mathrm{P} = \text{work done per unit time} = \frac{\mathrm{VQ}}{\mathrm{t}} = \mathrm{VI}$$

1.2.5 Electrical Energy

Energy is another important terminology related to the use of electricity. If the electrical power represents the rate or speed of work done, then the term “electrical energy” represents the total amount of work done. Therefore, electrical energy can be denoted as:

Electrical Energy: Power x Duration of usage Energy (E) = Power (watt) x Time (hour)

E (Wh) = P (W) x T (h)

Power = Energy/Time

1.2.6 Electric Circuit

In the application of electricity, several components are required to be connected to get the desired function. The interconnection of various electrical components is an electrical circuit. In an electrical circuit, power flows in two forms. These forms are referred as follows:

1. Direct current or DC power
2. Alternating current or AC power

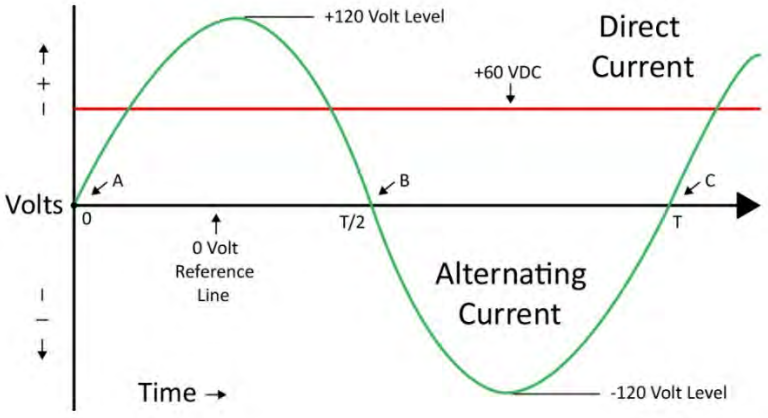
Let us now learn more about the AC power and DC power, their characteristics, the difference between them, and their measurements.

1.2.7 DC Power and AC Power

DC power flows in a DC circuit. A DC circuit is a circuit in which current flows in only one direction. The direction of current does not change with time.

In an AC circuit, current flows in both the directions; clockwise and counter clockwise. For the time period 0 to T/2, current flows in clockwise direction and for time period T/2 to T, charge flow reverses to counter clockwise direction as shown in the figure below. It is not only the direction but also the value of current that keeps changing with time.

The AC current changes its direction 50 times in one second (in this situation it is said that the current has a frequency of 50 Hertz). Most of our home appliances like light bulbs, TVs, and fans operate on AC power at 220 volts.



UNIT 1.3: Manual Soldering

Unit Objectives

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

- Explain the process of soldering
- Identify the types of solder and flux
- Describe the working of solder iron
- List the selection criteria of a suitable tip

1.3.1 Introduction

On completion of the session, the trainee will be able to explain:

- What soldering is and what the main components of manual solder are
- What the different types of solder are
- The differences between leaded solder and lead-free solder

Soldering is one of the most basic skills needed in electronics. With technology developing at a fast pace, people should possess the ability to build, modify and repair their devices. Soldering is one such skill that empowers everyone.

1.3.2 What is Solder?

Solder, as a word, can be interpreted in two ways. Solder as a noun refers to the alloy which is available as a long, thin wire coiled in a spool or tube. Solder, the verb, connotes joining together of two pieces of metal into a solder joint.

Solder in spool form

Solder in tube form

Types of Solder:

1. Tin-Lead Solder
2. Lead Free Solder

1.3.3 Leaded vs. Lead-free Solder

Earlier, solder was composed of mostly lead (Pb), in (Sn) along with a few other trace metals. This solder is known as leaded solder.

Lead is very convenient to use in soldering as it has a low melting point and creates good solder joints. However, due to its harmful effects, several countries decided to discontinue the use of leaded solder. Lead-free solder is now being used in electronics manufacturing.

Lead-free solder is made up of metals such as silver and copper. This solder typically has the RoHS symbol to assure potential buyers that it has been made as per the standard.

1.3.4 Soldering Irons

On completion of the session, the trainee will be able to explain:

- part of manual soldering station
- function of each component of solder station

Soldering irons are available in various form factors and range from simple tools to complex ones. But they all function almost in a similar manner.

Basic parts of a soldering iron

Solder Iron Tips

The tip is the end portion of the iron that gets heated and enables the solder to flow down and surround the two components which have to be joined. The tip transfers heat to the metal components increasing their temperature to the melting point of the solder, and the solder melts accordingly. The tips can be replaced with a new one or one with a different style. They come in different sizes and shapes and can be chosen according to the component.

In the images, various types of tips have been shown:

From left to right, the bevel tip, two conical tips with different widths, and the chisel tip.

The tip can be changed by an easy process that involves either unscrewing the wand or applying pressure inwards and pulling out the tip.

Wand

The wand which holds the iron tip is generally made of insulating materials (especially rubber). Wands prevent burns by preventing the transfer of heat of the iron tip to the outside. They facilitate transferring of heat from the base to the tip.

The irons consisting of only a wand to be plugged into a wall outlet, do not offer any control for varying temperature and the wands have heating element, directly built into it.

Base

The base, comprised of several control electronics and a transformer allows adjusting the heat and temperatures of the tip. The base can be of two types:

- Analog base (Right): It contains a dial for temperature control
- Digital bases (Left): It contains a digital display and buttons for setting and displaying the temperature.

Some bases offer heat profiles features that allow changing the amount of heat of the tip for facilitating soldering of different components.

Stand (Cradle)

The iron stand, also known as a cradle is used to hold the iron when it is idle. The stand sometimes offers an auto-shutoff feature which allows a gradual reduction in the tip's temperature when the wand is kept in it. This also helps in preventing the wearing of the tip over time.

A cradle may contain a regular sponge or a brass sponge.

Brass Sponge

While soldering the tip turns black and cannot accept solder due to oxidization caused by impurities in the solder. Hence, building up the impurities on the tip needs to be wiped off. But, using a wet sponge for cleaning the tip causes wearing of it as this leads to expansion and contraction of the tip due to the temperature variation. Brass sponge extracts the excess solder from the iron tip and also allows the tip to maintain the level of heat. If brass sponge is not available, a regular sponge is used.

1.3.5 Tip Selection

On completion of the session, the trainee will be able to explain:

- the importance of the shape and size of the tip of a soldering iron
- wattage (operating power) of a solder iron
- how to maintain a solder tip in good condition

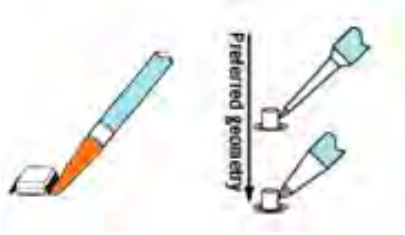
Choice of the correct tip is very important for the application. A correct fit of the tip in the joint will result in increased power delivery (as per the thermal requirement of the joint) and tip life and higher efficiency.

- Using a too small tip does not pass power to the load efficiently and it make the process slow.

- A large tip may damage the PCB, and also cause a hole at the tip.
- Short, blunt tips suitable for heavy loads, cannot be used for fine pitch rework.
- For fine terminals and hard-to-reach applications, long and fine tips are suitable. But, these are unable to deliver power efficiently, due to the distance between the heater and the solder joint.
- Heat transfer is considerably slowed down in long tips.

- Larger tips are more robust under coarse conditions since they contain more iron plating.

For a specific surface mount technology (SMT) application, such as pad cleaning or multi-lead soldering, an iron tip designed to accommodate those types application must be used. It requires the tip to last longer, and less stress on the board.



1.3.6 Flux Selection

On completion of the session, the trainee will be able to explain:

- the function of flux in solder process
- types of fluxes
- effect of flux on solder quality

Flux, usually an acidic material, acts as a reducing agent that facilitates the process of soldering by that preventing oxidisation and cleaning the impurities from the solder joint. It thus helps in transferring heat to the solder joint and keeps it robust under abrasive conditions.

Flux can already be present in the solder core wire, or it can be added in the form of liquid or paste to the solder joint. The process engineer must be able to understand:

- the purpose and function of flux
- how they differ in performance
- how they affect the quality of the PCB quality and the life of the solder tip.

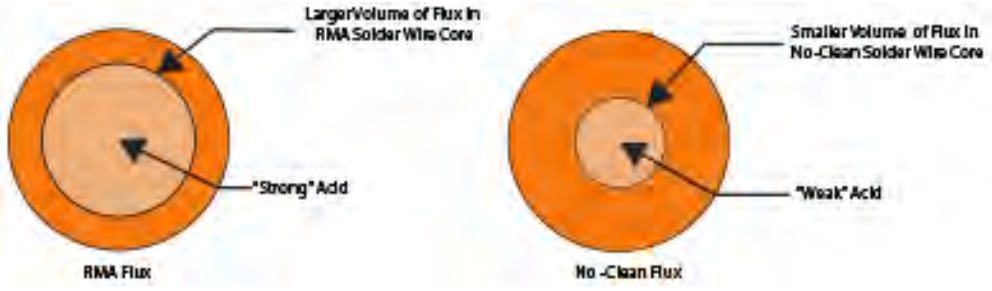
In general, flux can be classified in three groups:

1. Clean (Rosin Mildly Activated or RMA): It has more acidic content and while soldering a heavy residue is left on the PCB that needs to be wiped off. It is a good choice for the solder tip as the core solder wire protects the tip from oxidation by covering it while soldering.
2. No-Clean: It has weaker acid than the clean flux. It requires the temperature of the tip to be low. It is popular as it omit the process of cleaning after the work. It is not suitable for solder tip as burns off quickly leaving a less of it and thus leads to faster oxidization of the tip.
3. OA (Aqueous): It contains inorganic acid that is more active than the one in RMA flux.

For through-hole soldering, there is no need to add extra flux as there remains sufficient flux in the wire core solder.

More flux makes the process of soldering easier, but for using too much flux:

- The board may be contaminated



- The tip gets affected because when flux activates, it attacks oxides as well as the iron plating on the tip.

This figure represents why solder with No-Clean flux works as well as the solder with RMA one.

1.3.7 How to Solder

Soldering is a process of joining two or more objects that are usually metal by melting and pouring a filler metal, called solder, into the joint. The solder component has a lower melting point than the other two metals that are to be joined. A strong mechanical as well electrical connection is formed when the joint cools.

The steps of soldering technique are as follows:

Step 1: Heat up the soldering iron sufficiently.

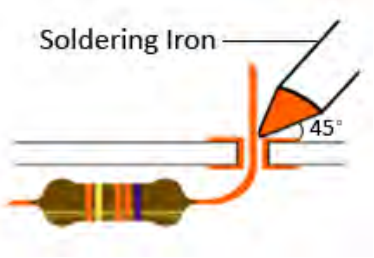
Step 2: Clean the soldering iron with a damp sponge, if it is dirty. If a soldering station is used, adjust its temperature.

Step 3: Apply suitable flux to remove any type of oxide when soldering.

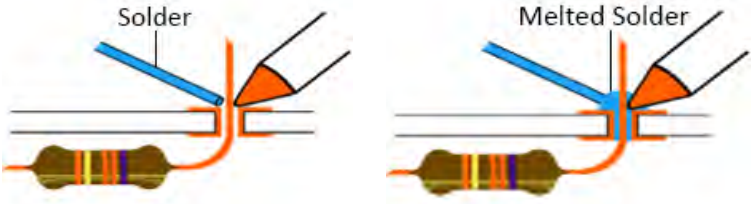
Step 4: Coat the soldering iron's tip with a thin layer of solder. This process of tinning helps in transferring heat between tip and the component to be soldered.

Step 5: Use pliers for bending the lead of the component being soldered so that it can easily be embedded on the board, as shown in the following image:

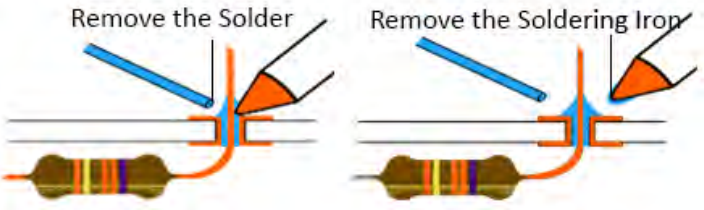
Step 6: Hold the soldering iron and place the iron tip in such a way that it touches both the surface and the lead of the component. The following figure shows how to hold the soldering iron:



Step 7: Touch the solder to the iron tip and move that around the joint by keeping the iron tip fixed. Let the solder melt and flow till the joint is covered, as shown in the following figure:



Step 8: Remove the iron after removing the solder and make sure the joint is kept stationary till it cools down.



Tips

- When the soldering iron gets hot, it becomes dirty because of oxidization. Clean the tip with a wet sponge until the tip shines.
- While soldering, iron tip should not be touched.
- Soldering iron should be placed at an angle of 45 degree.
- Clean the tip using a damp, clean and sulphur-free sponge or de-ionized water.

UNIT 1.4: LED Basics

Unit Objectives

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

- Explain the evolution of High Power LED.
- Demonstrate LED working principle.
- List the parameter which affect the overall life of LED.
- Identify various types of LED.
- List the advantages of LED light product.

1.4.1 LED Basics

On completion of the session, the trainee will be able to explain:

- What light emitting diode(LED) is and what its characteristics are
- the history of LED

Introduction

An LED is a light emitting semiconductor electronic component. LEDs serve as a suitable replacement for halogen or standard light because they consume less energy, have longer life, are more bright, are smaller in size, are capable of faster switching and are more durable and reliable.

History of LED

LEDs have been used for many years in various areas of application which includes industrial systems, advertising fields, light devices and car lights. LED technical development continues to stride ahead. In recent years, the luminous efficacy of white LEDs has risen to 130 lumens per watt and even more. The technical development of LEDs will continue in the future.

A short glance at the history of LED:

In 1907, Englishman Henry Joseph Round found out that inorganic materials can light up when an electric current is applied. In 1921, Russian physicist Oleg observed the "Round effect" of light emission. In 1935, French physicist, Georges Destriau discovered emission of light in zinc sulfide. He is the inventor of electroluminescence. American Nick Holonyak, developed the first red luminescence diode (type GaAsP). This first LED in the visible wavelength area was the beginning of the ndustrially -produced LED. With development of new semiconductor materials, LEDs began to be produced in new colours such as green, orange, and yellow. In 1993, Shuji Nakamura developed the first brilliant blue LED and later the white LED. The first light-emitting diodes with 100 lumens per watt were manufactured in 2006.

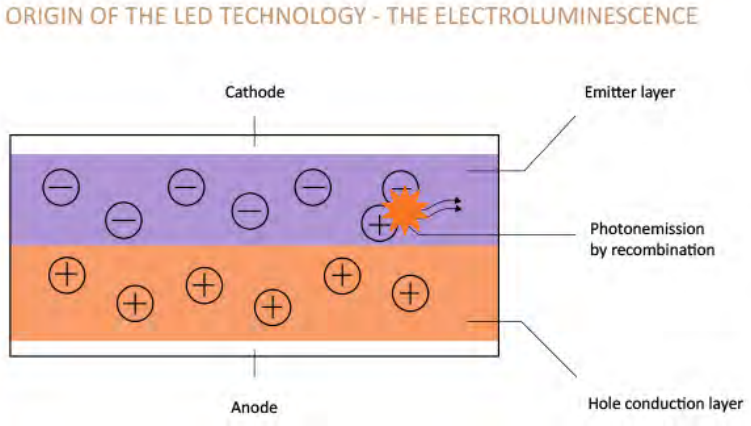
Since 2010, LEDs with a luminous efficacy of 250 lumens per watt, are being produced under laboratory conditions. OLED (organic light-emitting diode) is seen as the future technology.

1.4.2 Working of LED

On completion of the session, the trainee will be able to explain:

- the working principle of LED
- the advantage of LED in lighting

An LED comprises of several layers of semi-conducting material. When the diode is being utilized with DC, the active layer produces light. The light is decoupled directly or through reflections. The LED emits light in a particular colour and this colour is dependent on the type of semiconductor material used in it. LEDs with a high degree of brightness, in all colours, can be produced by two material systems. Different voltages are needed to use the diode in forward bias.



In LED chips, on application of certain voltage, electromagnetic radiation in the form of light is given out.

LEDs are made of semiconductor crystals and when current flows through them, they emit light in the colours of red, green, yellow, or blue, depending on the composition of the crystal compounds. Blue LEDs also emit white light by using a yellowish fluorescent layer or by creating a mix of red, green, and blue LEDs (RGB). The latter method is used for giving a decorative effects to lighting.

1.4.3 Advantages of LED technology

LEDs have many advantages over other lighting technologies. The consumers' profit from various possibilities of design due to a wide choice of colour and dimensions. They have high economic benefits due to consumption of less energy, long life and better service intervals. LEDs are reliable even in adverse environmental conditions. Its advantages are as follows:

1. Involves low consumption of power
2. Exhibits high level of efficiency
3. Has long life
4. Shows continuous dimming along with an ECG

5. Has small dimensions
6. Shows High resistance to switching cycles
7. Provides immediate light when switched on
8. Has a wide range of operating temperature
9. Exhibits high resistance to impact and vibration
10. Gives out no UV or IR radiation
11. Possesses high colour saturation level without filtering
12. Has no mercury

1.4.4 Types of LEDs

On completion of the session, the trainee will be able to explain:

- types of LED

There are basically three type of LED's.

- Indicator Type or Low Power LED's, also called PTH LED
- Illuminator Type LED or Power LED's also called SMD LED
- Chip on Board (COB) LED

Indicator type: These LEDs are generally available in 5 mm size, but also come in 3 mm and 8 mm sizes. They typically possess two “legs” and a narrow beam spread of 15˚ to 30˚. These LEDs have low power and function on currents from 20 mA to 100 mA. The heat produced is dissipated within the LEDs.

Illuminator type: These LEDs were first available in the market as effective packages of 1W and operated at 350 mA. Later, 3W and 5W high power LEDs were manufactured. These LEDs are soldered on a PCB directly. They provide a path which is thermally conductive for extracting heat and benefit from much better heat extraction. High power LEDs are available in various shapes and sizes.

Chip on board (COB): These LEDs are utilized for closely packed high-power LED modules. COB technology is used to place the LED chips directly onto the PCB. The beam spread can be narrow- or wide angle.

1.4.5 Factors affecting life of LED

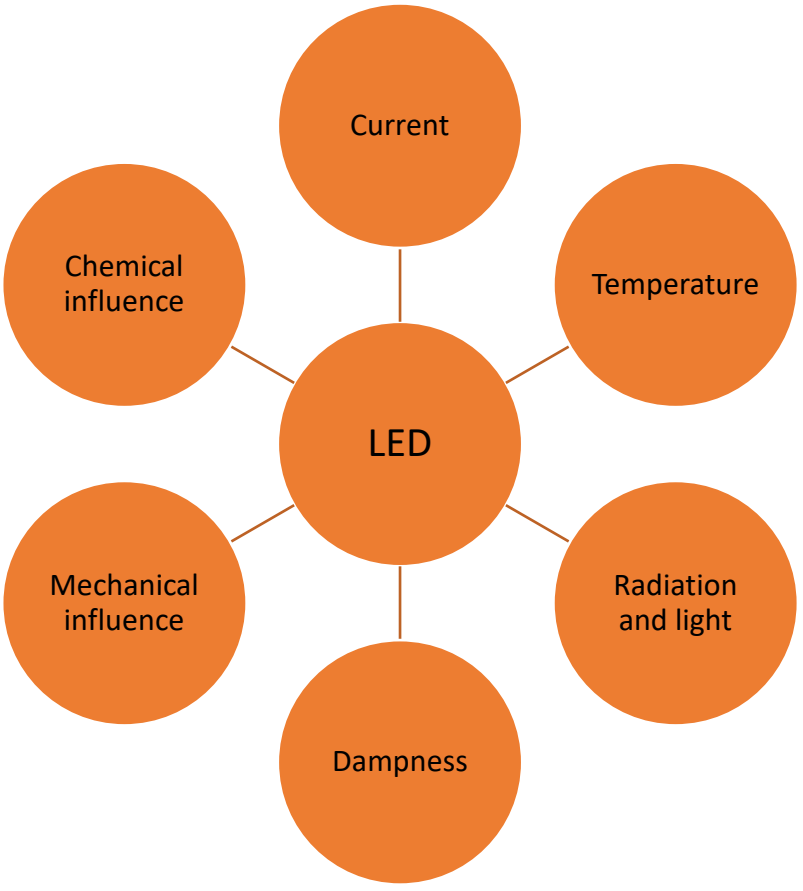
On completion of the session, the trainee will be able to explain:

- the factor affecting the life of LED
- the basic definition of current, voltage, power, and energy

LEDs can have an operating life of more than 50,000 hours. As compared to other light sources, LEDs seldom fail and are generally service free. The exception is the luminous flux

whose life slightly decreases over the operating period. The following are the factors that can affect the entire LED module.

1.4.6 Factors influencing an LED module: in detail



Temperature

When light is produced, heat too will be generated. This affects both the life cycle of an LED and its luminous flux and is applicable to an individual LED as well as the entire LED module. Thus, installation methods or suitable heat sinks should be used to diffuse the heat. The lower the temperature at which an LED works, the better will be its performance and life.

Mechanical influence

Mechanical forces can influence an LED at various stages. This can happen when the LED is being manufactured, assembled or handled otherwise. It can also occur due to the use of certain materials which develop these forces during big temperature fluctuations. These forces can have a negative effect on the operating life of an LED or even damage it.

Current

There is a specific current range within which an LED module should be operated. Even within the range, the lower the current is, lesser will be the energy released and lower will be the heat produced. The current, thus, has a direct effect on the operating life of an LED.

Radiation and Light

An LED's housing design plays a vital role in the aging process of the components, which are influenced by the light given out by the chip. The built-in reflector ages faster within the first few hundred operating hours in some housing designs due to the high intensity and luminance of the light given out by the chip.

Dampness

An LED by itself is strong and non-sensitive. It is unaffected by vibrations and is unbreakable. However, many metal components, connections and electronic parts inside it are sensitive and may get corroded due to dampness, thus, causing the module to fail. An appropriate choice of materials for the LED protects it from corrosion. If high operating life of the LED modules is desired than protection from dampness is a must.

Chemical influences

Chemical influences can have varying influences on an LED, depending on the location of the application. Hence, while setting up an LED lighting system, the environmental conditions must be kept in mind.

The following conditions of the environment have a negative effect on the operating life of an LED:

- If the atmosphere is corrosive (the air has high sulphur dioxide content)
- If the climate is coastal with medium salt content
- If there is a chemical industry nearby
- If it is in a swimming pool with medium chloride content

UNIT 1.5: Basic Parameter of LED

Unit Objectives

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

- List the basic parameters of LEDs
- Describe the importance of CCT and CRI in LED products

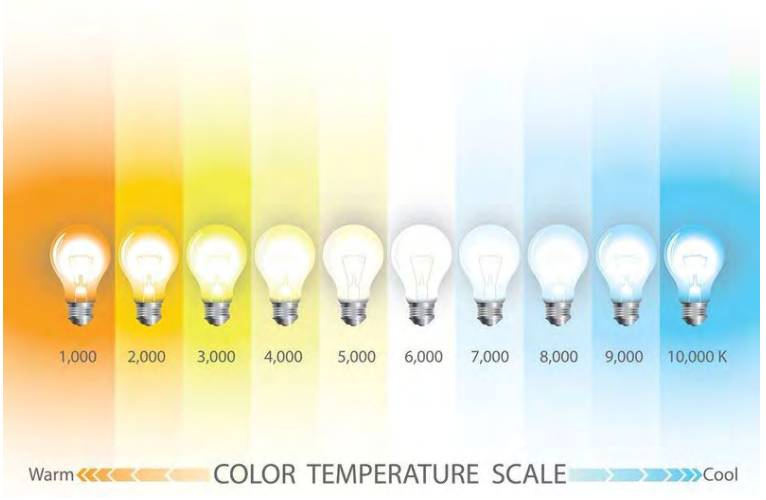
1.5.1 Colour Rendering Index

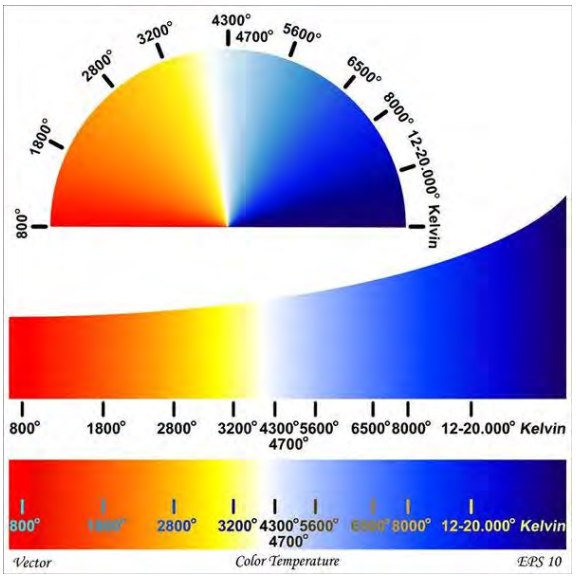
On completion of the session, the trainee will be able to explain:

- What CRI is
- The importance of CRI in an LED lighting product

Colour Rendering Index (CRI) is used to know how well the colours of the objects are rendered by the light sources. The CRI has a scale from 0 to 100. It has a reference light source with which the light source rendering colour is compared and its performance is judged. Incandescent lamp, having a CRI of 100, is taken as the reference light source. The more the CRI, the better will be the colour rendering ability of the LED. CRI is, therefore, an important parameter to evaluate the quality of light.

However, the CRI measure of light sources can only be compared if they have the same colour temperature (CCT).





LED products with CRI greater than 80 are considered best for indoor application. Products with a CRI less than 80 are suitable for outdoor application.

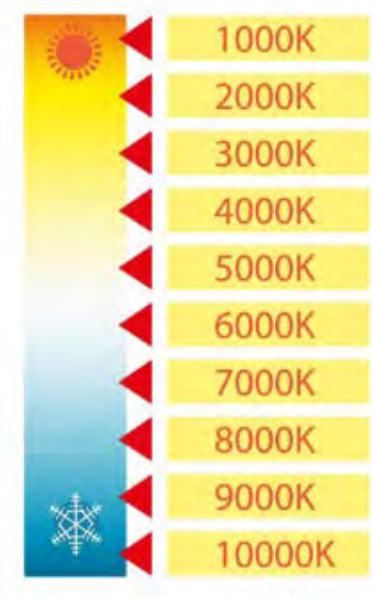
1.5.2 Correlated Colour Temperature (CCT)

On completion of the session, the trainee will be able to explain:

- What CCT is
- The importance of CCT in general lighting

The colour characteristics of light warm (yellowish) or cool (bluish) can be described by determining its colour temperature. It is measured in degrees of Kelvin (°K).

In case of an LED light, there are primarily three types of white colours: warm white, natural white and cool white. The colours below 3000°K will seem yellow or orange, while those at 4000°K will appear almost neutral. When the colour temperature falls, the light seems warmer, and as it rises, it is cooler. Generally, most LED lights make CCT from 2700°K–6700°K. The exceptions are a few special applications, such as decorative lights, aquarium lights or glow lighting.



Different colour temperature LED lighting for different places:

Public applications: People mostly use warm white LEDs of 2800–3500°K to promote relaxation.

Hotel LED lighting: Hotel lobbies go for cool white LEDs of 5500–6500°K, while rooms generally have warm white lights of 2700–3200°K.

Office lighting: Offices usually have natural white LED of 4000–5000°K to cool white with CCT of 5500-6500°K to enhance concentration.

Warehouse lighting: Warehouse mostly use natural white light of 4000–5000°K or cool white light of 5500–6500°K.

Shopping mall LED lighting: Malls generally go for warm white lights with CCT OF 2700–3200°K. Within the mall, different areas use different lighting—natural white with 4000–5000°K and cool white with 5000–6500°K.

UNIT 1.6: LED Power Sources

Unit Objectives

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

- Identify the LED power sources
- List components used in power supply
- Describe series and parallel connection of LED

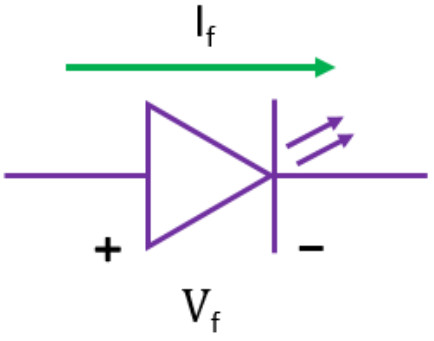
1.6.1 Introduction

On completion of the session, the trainee will be able to explain:

- how LED are powered
- the importance of Voltage and current in LED operation
- the basic parameters of LED

The difference between powering an LED and other electronics product lies in the source of power since a constant current source is required by an LED while most others need a constant voltage source. Hence, a dedicated power supply requires to be implemented to power the LEDs in a circuit.

The power supply must be able to provide a high voltage known as the forward voltage (V_f) that is enough to illuminate the LED and must also provide controlled constant current known as forward current (I_f). Current above the value of I_f may damage the LED and the light output depends on the forward current.



LEDs can be categorised as:

- LEDs used as indicators: These use low power and are used to light a small indicator such as the one on a laptop that shines when the hard drive is on. The I_f requirements are generally 10 mA to 20 mA.
- LEDs used for lighting: The power required for these is greater than that used for the indicator ones. Inefficient methods for powering LEDs result in huge power losses that

are counterproductive, because LEDs are chosen to maximize the efficiency of lighting systems over others. LEDs in may require hundreds of mAs (typically 350mA) to provide the light output that they are able to produce.

The light output is measured in:

- Candelas: It is the power of a light source that is emitted in a particular direction.
- Lumens: It is the amount of light that is produced from a source of 1 Candela in a solid angle of 1 steradian (SI unit of solid angle).

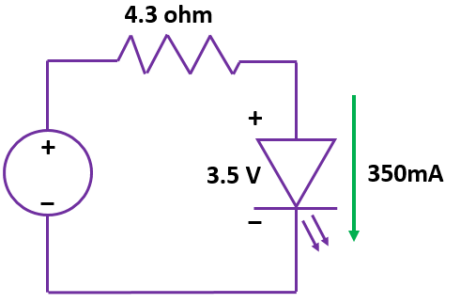
The LED applications specify high luminous intensity and therefore, the supply of power should be efficient, and output current must be controlled with accuracy.

1.6.2 LED Power Sources

On completion of the session, the trainee will be able to explain:

- How LED drivers works
- The types of LED drivers
- The main characteristics of LED drivers

The easiest method of supplying power to an LED is to utilize a DC constant voltage source that is already giving power to the other electronics within the circuit. Current can be typically regulated using a series resistor. This method proves to be cost-effective and useful, especially if other components already have power.



Indicator LEDs are generally powered by this method. For lighting applications, there are some drawbacks of this method and one of them is inefficiency. There is loss of power across the resistor in the form of heat. For example, if a 10V source is used to provide power

to an LED with a Vf of 4.5V and an If of 450 mA, it results in a 1V drop across the resistor. This will lead to power wastage.

P = VI

P = (1V) (0.45A) = 0.450W

That means that there is 450 mW wastage in powering just one LED. One more drawback of this method is lack of control over the current. Vf can vary from one LED to another and, consequently, the voltage drop across the resistor too can vary. As a result, the current can vary across the various LEDs and so will the light output. In the case of multiple LEDs being powered, these drawbacks become even more prominent. If there is a 10V supply, the LEDs would have to be supplied power in parallel. Power would be dissipated across many resistors and the light output could vary from one LED to another. Thus, instead of using a current limiting resistor having a constant voltage source, it would be more suitable to arrange a constant current power supply. Many simple linear constant current supplies exist but the most efficient is a switching mode power supply (SMPS).

This can be explained with the help of the following example:

There is power loss in the linear supply due to voltage conversion. If a linear regulator is being utilized for the conversion of 12V to 3.5V and the load is 350 mA, the total power consumed can be given as:

P (total) = (12V) (0.350A) = 4.2W

The power utilized by the LED is: PLED = (3.5V) (0.35A) = 1.23W

The power wasted in the regulator is: PLINEAR = P (total) – PLED = 2.98W

Most SMPs are around 90 percent efficient. In the above example, the power consumption is: Ptot = (Vout) (Iout)/90%

P (total) = (3.5V) (0.35A)/ (0.90) = 1.36W PLED = (3.5V) (0.35) = 1.23W PSMPS = P (total) – PLED = 0.13W

Thus, if a switching regulator is being used, 0.13W is lost in power conversion. On the other hand, 2.98W is lost if a linear regulator is being used.

The designs of switching power supply controllers are complex as compared to those of linear regulators. They have the following components:

1. A controller IC
2. A high side MOSFET
3. A low side MOSFET/ catch diode
4. An Inductor
5. Resistors and capacitors

The choice of a low side MOSFET or a catch diode depends on the kind of SMPS.

1.6.3 Series or Parallel

On completion of the session, the trainee will be able to explain:

- how LEDs are connected in a circuit
- the purpose of LED connection in series
- the purpose of LED connection in parallel
- LED is connected in both series and parallel

It is very important to figure out whether to power the LEDs in applications having multiple LEDs in series or in parallel. The available supply voltage is often too low that it cannot meet the V_f of multiple LEDs. It may seem that powering the LEDs in parallel configuration would be the preferred method. A few disadvantages of parallel configuration of the LEDs include:

1. There is a variation of light output from one LED to the other.

The variation of forward voltage from LED to LED results in varying I_f, which causes the light output to vary. Because of negative temperature coefficient, the hotter the LED gets, the more current it uses and thus gets even hotter. However, grouping of the LEDs considering the light output characteristics, is performed by the manufacturers of LED.

2. The LEDs may be damaged if there is failure in opening an LED.

More current could also flow to the other LEDs, which could possibly burn them out. If there is a short, too little current would flow to the other LEDs. Faults would have to be monitored and the available current would have to be adjusted to other LEDs. Additional circuitry would be required to operate under these circumstances.

3. The required amount of current increases with each LED.

If multiple LEDs are powered in parallel, it could affect the power supply design. If N is the number of LEDs, it needs N* amount of current output. This implies that the inductor, catch diode and MOSFET need to be rated at a greater current. This would make them more expensive and larger in size.

If multiple LEDs are powered in series, these issues are eliminated, but some other problems come up. In series, the total Vf of the LEDs is cumulative. For example, if a series of five LEDs with a Vf max of 4V has to be turned on, the power supply voltage would require an output voltage of 20V. Instead of needing a larger maximum current rating, the output capacitors would need a larger voltage rating. The increase in the size and expense of a capacitor with a voltage rating of 6V verses 50V is less as compared to a 500 mA inductor verses a 5A inductor.

For example, for lower current, the difference in the size of the inductor could be 5 mm^2 in comparison with 12 mm^2 for higher current. The package size of a high voltage rated capacitor and a low voltage rated one could be same. The other drawback in series configuration is that if one LED fails, all other LEDs connected in the series are turned off.

If the LEDs are secured with appropriate mechanical design for being protected and a thermal design for preventing it from being overheated, they have a greater lifespan. The

advantage of LEDs connected in series is that each of them receives the same current which results in same output light of each LED.

Summary

Designing efficient power supplies is very important for the LED assemblies since they require high power. SMPS provide efficiencies more than 90 percent. Connecting LEDs in series configuration removes the current variations from one LED to the other. It also eliminates the need for high current components and minimizes the requirement of fault-monitoring individual LEDs. For high power LED lighting applications, connecting the LEDs in series in conjunction with an efficient constant current SMPS must be the first consideration.

UNIT 1.7: Thermal Management of LEDs

Unit Objectives

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

- Explain the heat transfer procedure in an LED
- Describe the passive thermal design
- Identify the use of heat sink

1.7.1 Introduction

On completion of the session, the trainee will be able to explain:

- How heat is transferred from LED to atmosphere
- What junction temperature is and why junction temperature should be kept low

Heat transfer procedure in a LED Luminary

For better performance of LED it is required to keep the junction temperature low. Heat is transferred by three means:

- Conduction
- Convection
- Radiation

The encapsulation of LEDs is typically made up of transparent resin, a poor thermal conductor. The electrical energy that was not converted in to light, generated heat and is conducted via back of the chip. The conduction of heat to outside ambience takes a long path:

junction →solder point→ board→ the heat sink -→atmosphere.

If the thermal impedance is low, the temperature of the junction will be lower and hence, lower will be the temperature of the ambience. Hence, the thermal resistance within the path of heat conduction must be minimized in order to maximize the range of ambient temperature for a specific power dissipation.

The thermal resistance values vary depending on the manufacturer of the LED. For example, it ranges from 2.6 °C/W to 18 °C/W. The thermal resistance of the thermal interface material (commonly thermal grease, solder and pressure-sensitive adhesive) also varies according to the type of material. Power LEDs are mounted on MCPCB, which will be then attached to a heat sink. In the package design, the important parameters are:

- flatness of the surface and contact area
- quality of each component
- applied mounting pressure
- the type of interface material and its thickness

1.7.2 Passive Thermal Designs

On completion of the session, the trainee will be able to explain:

- how to maintain low junction temperature
- heat transfer medium used for better heat transfer
- what heat sink is and its purpose
- metal Core PCB versus FR4 PCB

Adhesive and heat sinks are considered for passive thermal designs for ensuring efficient thermal management of high power LED application.

Adhesive

Adhesive is used to attach LED to board, and board to the heat sinks. Thermal performance can be optimized by using a thermal conducive adhesive.

Heat Sink

Heat sinks play as medium for the travelling of heat from a LED source to outside. Power can be dissipated by the heat sinks in three ways:

- Conduction: It is the mechanism of heat transfer from one solid to another
- Convection: It is the mechanism of heat transfer from a solid to a moving fluid (air, for most LED application)
- Radiation: It is the mechanism of heat transfer through thermal radiation from two bodies having different surface temperatures.

Material — The efficiency of dissipation through conduction is affected by the thermal conductivity of the heat sink material (usually aluminium, but copper is also used). The new materials of a heat sink may include thermoplastics to be used for the applications with lower heat dissipation requirements. The heat sink made up of natural graphite solutions offer thermal transfer better than copper but it has a high production cost. Heat pipes can be used with aluminium or copper heat sinks for reducing the spreading resistance.

Shape — Heat sinks should have a large surface area as the heat transfer takes place at the surface. For this, the size of the heat sink can be increased or many fine fins can be used.

Surface Finish — Thermal radiation of heat sinks depends on its surface finish. For example, a painted surface offers emissivity greater than the unpainted one. About one-third of the heat, in flat-plate heat sinks is dissipated by radiation. A perfectly flat surface area allows reducing the thermal resistance between the LED source and the heat sink by using a thinner layer of thermal compound. Anodizing the surface of a heat sink also helps in decreasing the thermal resistance.

Method of Mounting— Heat-sink mountings using screws and springs provide better performance than thermal conducive glue, clips or sticky tape.

1.7.3 Heat Pipes and Vapour Chambers

They are passive devices used in LED thermal management, and offer effective thermal conductivity in the range of 10,000 to 100,000 W/m K. The benefits are as follow:

- They transfer heat to a heat sink that is in a remote location offering minimum drop in temperature
- A natural convection heat sink can be isothermalized, by reducing size and increasing the efficiency. For example, adding five heat pipes may reduce the mass of the heat sink from 4.4 kg to 2.9 kg that is by 34%.
- They directly transform the high heat flux under an LED to a lower one efficiently that can easily be removed.

1.7.4 PCB (Printed Circuit Board)

MCPCBs (Metal Core PCB) are the circuit boards which have a base metal (aluminium alloy) to dissipate heat. To lower the thermal resistance, MCPCBs have dielectric polymer layer. One advantage of PCBs is the reduction in errors of routing and assembly.

To prevent raising of the temperature of the LED junction by the heat produced by the driver, the LED drive circuitry must be separated from the LED board.

UNIT 1.8: LED Configurations

Unit Objectives

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

- Describe constant current of LED Driver
- Identify the needs of LED Driver parameters

The number of customers who use LEDs increases with the increase in cost efficiency and brightness of the LEDS and decrease in their costs. Some common applications of LEDs, such as traffic lights, car lamps, LCD back lighting, and architectural lighting, prove to be advantageous considering the high efficiency and long operational lifetime of LEDs.

1.8.1 Constant Current LED Driver

On completion of the session, the trainee will be able to explain:

- Working of constant current LED Driver

Colour and brightness of an LED can be controlled using a constant current driver. It continuously maintains the level of current through the LED, regardless of the operating conditions and the external factors, such as power supply drift and variations in V_f. There is an internal feedback network which keeps track of the flow of current in a string of LEDs and regulates the output in order to maintain the desired level of current.

The driver offers a flexible power solution for a wide range of LED products. The same current driver may be used for the super-bright LEDs that require forward voltage in the range of 3 V to 3.5 V and.

1.8.2 LED Configuration Options

On completion of the session, the trainee will be able to explain:

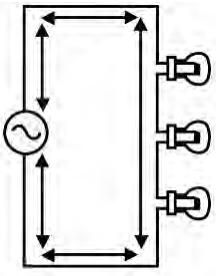
- the type of LED connection on LED light engine
- how to connect LED in series and its advantage and disadvantages

LED lighting applications generally utilize many LEDs operating in the range of 1W to 3W together.

Multiple LEDs can be connected either in parallel or in series. Both configuration have advantages regarding:

- efficiency
- brightness matching
- LED failure immunity.

Another option of configuration known as a matrix is hybrid of the series and parallel connection.



The total string voltage is a function of the number of LEDs in the string, and the forward voltage (Vf) of each LED. If 30 LEDs with a Vf of 4.5VDC are used, the total string voltage would be 135VDC. One constant current driver provides power the LEDs and hence, in this configuration all LEDs receive the same current.

Advantages

- The configuration is simple consisting of only a single circuit.
- Since each LED gets the same amount of current, there is no current imbalance.
- Since there is no resistor to limit the current, the efficiency of this configuration is high.

If an LED fails to work then the remaining LEDs continue to operate normally and the string voltage will decrease by the Vf of the failed LED and consequently the power consumption will also decrease. The overall brightness of the string will dim by only one LED.

Disadvantages

- This configuration poses a safety risk as the output voltage may become high if large numbers of LEDs are used.

For instance, to calculate the maximum number of LEDs that can be safely connected in a series configuration, to a constant current LED driver use the maximum output voltage of the driver divided by the forward voltage of each LED.

If Vout max = 40VDC, and the Vforward = 3.5V, then the maximum number of LEDs is 40/3.5=11.43. A total of 11 LEDs can be connected in series with the constant current LED driver. To select the required output current of the driver, refer to the specification sheet for the LED used for the optimal current and then select an LED driver with the same optimum.

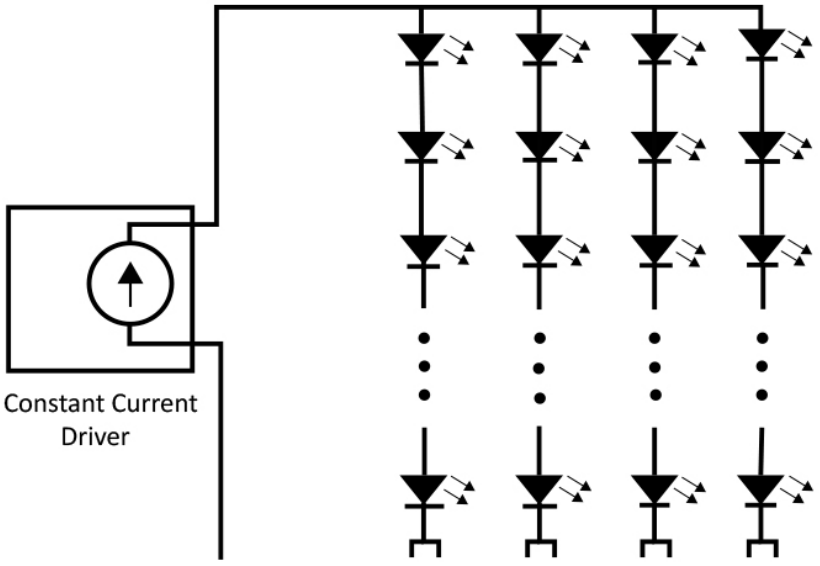
1.8.3 Parallel String Configuration

On completion of the session, the trainee will be able to explain:

- how to connect LED in parallel and its advantages and disadvantages.

Joining LED strings in parallel will decrease the maximum string voltage and also add to the fault immunity.

Consider the following example where 10 LEDs are being used to light a lamp. The LEDs could be organised in 2 strings parallel to each other, with 5 LEDs in each.



The combined string voltage of the entire setup decreases as compared to the series connection of the same by a factor. This factor is equal to the number of strings of the bulbs laid parallel to each other. There is division of the current between the strings, depending upon how perfectly the limiting resistor of each string has been matched. The Vf of the LEDs could also vary and result in major imbalances in the current of the various strings. Generally, a resistor is used in each string to balance the current.

Advantages: -

- A parallel configuration needs only a single driver.
- The combined output voltage is comparably low.
- An approximate equal sharing of current can be obtained amidst the various LED strings by selecting the resistance value properly.

Disadvantages: -

- Although there is improvement in current sharing in this type of configuration, the power consumption rises and the system efficiency decreases.
- In a situation where one of the LEDs fail short, the rest of the LEDs face a higher level of stress since they are compelled to handle a larger amount of current. This might result in

other LED failures in the string. The LEDs in the rest of the strings will become dimmer as the total current is decided by the driver's current rating.

- In a situation where one of the LEDs fails open, all the LEDs in that string will stop working. The current in the rest of the strings will rise as per the number of strings. The effect of the open failed LED can be reduced by connecting a by-pass circuit in parallel with each LED This measure will short out the failed LED.

Calculating the maximum output voltage of an LED Driver

In a parallel connection, the product of V forward and the number of LEDs in each string is the total forward voltage. If the value of V forward is 3.5V and there are 2 strings of LEDs connected in parallel, the total forward voltage will be 5 x 3.5 = 17.5Vdc.

The output of a constant current LED driver is calculated by multiplying the optimal current for the LED being used with the number of strings. If there are 2 strings of LEDs and 350mA is the optimal current for the LEDs, then the LED drive must have a current rating of 350 x 2 = 700Ma.

1.8.4 Matrix Configuration

On completion of the session, the trainee will be able to explain:

- how to connect LED's series and parallel and its advantages and disadvantages

The matrix configuration tries to eradicate a few of the issues linked with parallel configuration by including more connections between the LEDs. Both matrix and parallel configuration have similar topology with the difference in there being a connection between each of the strings in the matrix configuration. The first LED of each string has a parallel connection with the first LEDs of all the rest of the strings. Thus successive LEDs are in parallel with their neighbouring LEDs. Thus the LEDs are organised in a matrix of rows and columns.

Advantages

- A single output driver is required in this configuration. The output voltage as compared to a parallel configuration is relatively low
- Usually, this configuration possesses greater fault-tolerance.
- The efficiency is more as current sharing resistors are generally not utilized.

Disadvantages

- Current imbalances are a problem. Including resistors to help in current sharing is the simple solution as in the case of a parallel configuration.
- Unequal current sharing results in irregular light and thermal distribution.
- In a situation where an LED fails short, the rest of the LEDs of the same row will also stop functioning. The LEDs of the other rows will function normally except that the lamps will become less bright.
- In a situation where an LED fails open, the rest of the LEDs of the same row will have to face higher current. This raises the chance of another LED of that row also failing. The rest of the LEDs will function normally.

  The effect of the open failed LED can be reduced by connecting a by-pass circuit in parallel with each LED. This measure will short out the failed LED.

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2. LED Luminary Assembly

Unit 2.1 – LED Luminary Assembly

Unit 2.2 – Selection of LED Drivers

Unit 2.3 – Diagnose and Repair LED Light

Key learning Outcomes

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

- Demonstrate basic knowledge of product assembly
- Identify the tools required for LED product assembly
- Explain different types of drivers
- Demonstrate driver selection according to the LED

UNIT 2.1: LED luminary Assembly

Unit Objectives

At the end of the session, the participant will be able to:

- Demonstrate basic knowledge of product assembly.
- Identify the tools required for LED product assembly.
- List the materials used in LED product assembly.

2.1.1 LED Luminary Assembly

Led luminary assembly means to assemble light, engine, and driver into the mechanical.

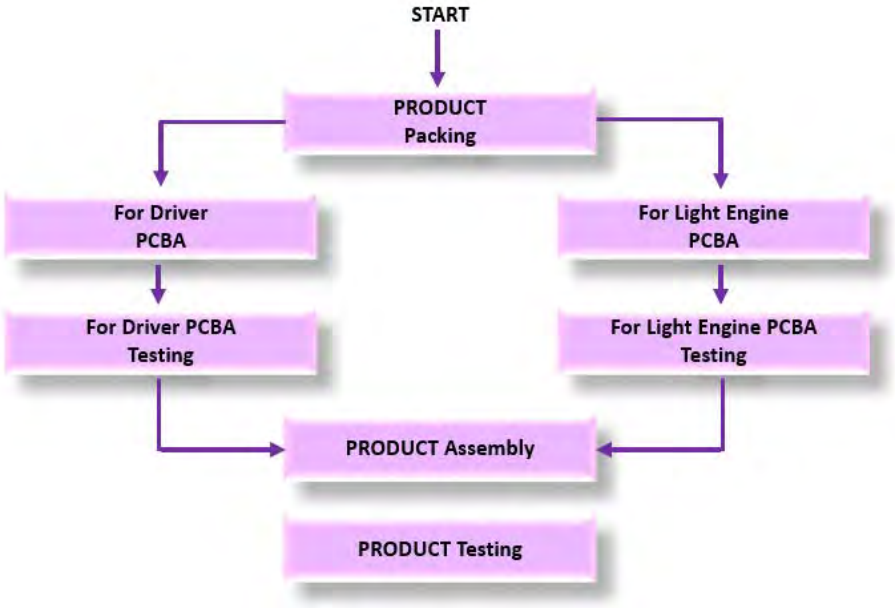
Mainly three things are required for production of LED lights.

1. Name of the product.
2. Quantity of the product.
3. The target date of production.

Learning Outcome:

- Understanding of the process of LED product assembly.
- Identification of the production requirement and the target date.

Process Flow Chart for LED Luminary Assembly



2.1.2 Components of an LED Luminary

On completion of the session, the trainee will be able to explain:

- The Major Components of LED Products:
    - Led Light Engines
    - LED Drives
    - LED Heat Sinks

An LED Luminary has the following major components/ parts:

1. An LED Light Engine
2. An LED Driver
3. An LED Heat Sink
4. An LED Luminaire Diffuser / Lens
5. Mechanical Housing
6. Thermal Compounds/ Thermal Tapes/ Thermal Pads
7. Connecting Wires

LED Light Engine: It is the source of light of a luminaire. A light engine is simply, a PC board mounted with LEDs. The following images are some examples of LED light engines/modules:

COB based light engine module

LED based light engine module

Flexible based light engine module

2.1.3 Heat Sink

On completion of the session, the trainee will be able to explain:

- What a heat sink is and its purpose in an LED luminary.

Heat sink of a thermal system allows conduction of heat away from various sensitive components.

2.1.4 Thermal Interface Materials

The types of thermal interface materials used for LED products:

- Thermal Grease.
- Thermal Pad
- Thermal Tape

Thermal Grease:

Thermal Tapes:

Thermal Pads:

2.1.5 Tools Used in a Luminaire Assembly

On completion of the session, the trainee will be able to explain:

- How to use different mechanical tools in an assembly of LED products.
- The types of mechanical tools used in an LED light assembly.

The following tools are commonly used in an LED luminary assembly:

1. An Automatic Screw Driver.
2. A Manual Screw Driver.
3. A Wire Cutter.
4. A Wire Stripper.
5. Nose pliers.
6. An Allen Key Set.
7. A Spanner Set.

2.1.6 LED Product Assembly

In LED light production there are basically three steps:

- Base assembly
- Assembly of heat sink
  - Joining of base assembly and heat sink assembly.
  - In a base assembly, we place the driver into the enclosure. There are various options available in a base assembly such as shrinking the driver by a PVC tube and inserting the driver inside the cavity.
  - In a heat sink assembly, we place the LED module onto the heat sink either by using a thermal tape or a heat sink compound, according to our requirement.
  - Joining the base assembly with the heat sink assembly means connecting the LED driver to the LED module by a manual solder or a connector.

2.1. 7 MR-16/Spot Light Assembly

On completion of the session, the trainee will be able to explain:

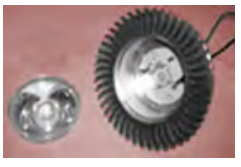
1. The assembly of an LED spot light

MR16 Assembly Parts:

Driver PCBA:

2.1.8 Product Assembly Instruction

1. Place double sided adhesive thermal tape on the bottom side of the light engine printed circuit board assembly (PCBA) and ensure that there are no wrinkles while pasting the tape.
2. Place the taped light engine PCBA on the aluminium profile. Ensure that there are no dust or foreign particles on the profile surface.



3. Press the PCBA gently to get proper bonding between the light engine PCBA & the aluminium profile. Ensure that there are no gaps in between.

4. Take the required driver PCBA and place it into the plastic enclosure. Ensure that there are no damages to the input and output end wires of the driver.

5. Later, place the lens on the mechanical.

6. Fit the LENS placed with the spring ring.

7. Then, draw the wires of the spotlight out of the plastic.

8. Connect the spotlight output wires to the input wires by soldering.

9. Apply 220V AC and observe that the LED should be lit and the required wattage should be achieved.
10. Keep the spot light in ON position for minimum 4 hrs for burn-in test.
11. Power -up and ensure that there is correct wattage and intensity.

2.1.9 LED Bulb Assembly

On completion of the session, the trainee will be able to explain:

1. The assembly of an LED bulb

Manufacturing Process of a 7W COB Bulb EMI/EMC PCBA:

Electromagnetic Interference (EMI)/Electromagnetic Compatibility (EMC) Driver PCB Assembly:

1. Place all the components required for an EMI/EMC board manually and solder them
2. Cut-off the leads, if extended
3. Solder input and output wires
4. Clean the boards.

2.1.10 Product Assembly Instructions

On completion of the session, the trainee will be able to explain:

The procedure of LED bulb assembly

1. Placement of the EMI/EMC driver assembly inside the fireproof plastic holder.
2. Draw out the input and output wires from the plastic holder and fix the EMI/EMC PCB to the plastic holder by tightening the screws.
3. Apply thermal paste on the back side of the COB module. Spread the thermal paste homogenously.


4. Place the COB module on the aluminium surface of the heat sink. Ensure, there are no dust or foreign particles on the aluminium surface.
5. Then, solder the output wires of the EMI assembly to the AC points on the COB module.
6. After soldering on the COB module, fix the COB module on the heat sink by tightening the screws.
7. Solder the input wire of the EMI assembly to the base B22/or E27 depending upon the type of bulb required. If a pin type bulb is required, use B22 base and if a screw type bulb is required, use E27 base. After soldering the AC input wire, crimp the base to the heat sink.
8. Later, place the PC diffuser on the heat sink and lock it.

Product Testing

Driver PCBA Testing:

1. Apply 200Vac to 260Vac, 50Hz to the Input wires for testing.
2. Observe that LED lumens are according to those mentioned in the datasheet.
3. Power Factor is >0.95 and the Efficiency>80%.
4. Keep the COB light bulb in ON position for 4hrs-BURN-IN TEST.
5. Lastly, after testing is done and the product is given as PASS, pack the bulb in the required packing

2.1.11 LED Tube Light Assembly

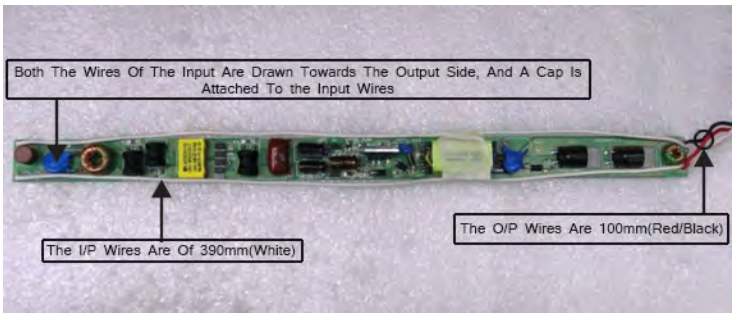
On completion of the session, the trainee will be able to explain:

- The assembly of LED tube light

Follow the given process for the assembly of a 4 feet LED tube light:

1. For 4 feet, we have to solder two light engines with jumper wire.

2. For a custom designed heat sink, apply thermal compound over the heat sink surface for heat transfer prior to fitting the light engine PCBA in the aluminium heat sink.
3. Place the light engine PCB after applying the thermal compound on the aluminium heat sink.
4. Ensure that there are no gaps between the profile and the PCBA.
5. Place the tube light driver into the oven with the sleeve for protection.



6. Take the tested driver and insert into the sleeve. Pass the sleeved driver through the reflow oven at conveyor speed 0.70 m/min, for heat shrinking of heat sink sleeve at reflow temperature of 110 degree C.

7. Place the sleeved driver inside the aluminium extrusion, and solder the input wires to the end caps and the output wires to the light engine input points.

The wire colours: input-White, output- Red (+) / Black (-)
The input points of the light engine are connected to the output of the driver, while the inputs points on the other side of the light engine are shorted.

8. Mount the end caps over the LED tube light profile as shown above and tighten it with screws on tested and passed lights.

9. Apply the required voltages and current and ensure that all LEDs must be lit with the same intensity.
10. Solder the Inputs wires on the end caps and the output wires on the light engine PCBA. Ensure that no solder splashes and balls remain during manual soldering.
11. Apply 90-265Vac and ensure that all LEDs must be lit and the required wattage is achieved.
12. Insert the required printed PC covers onto the aluminium profile; ensure that there are no scratches and the lamination sheets must be on the cover.
13. Keep the tube light in ON position at least for 4 hours on Burn-In Test aging line.

14. Tested and passed lights must be screwed with end caps.
15. Power up and ensure correct wattage and intensity.
16. Pack the light in their covers.

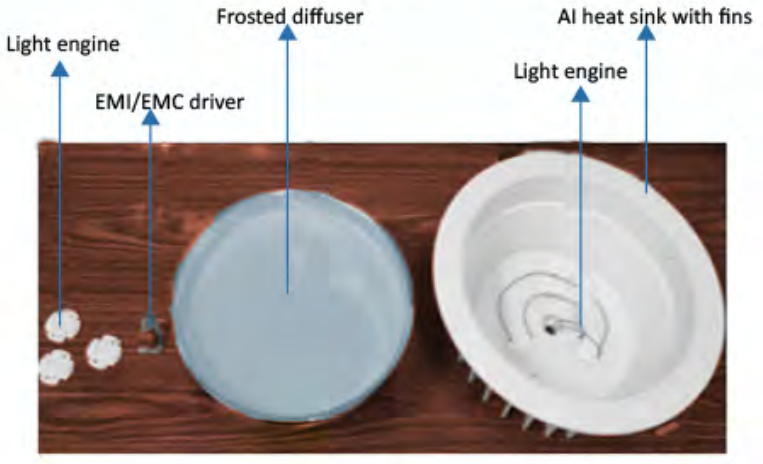
The thermocol box shown above is used for packing a set of 5 LED tube lights.

2.1.12 LED Down Light Assembly

On completion of the session, the trainee will be able to explain:

- The assembly of an LED Down light

Down lighter assembly parts:



Product assembly instructions:

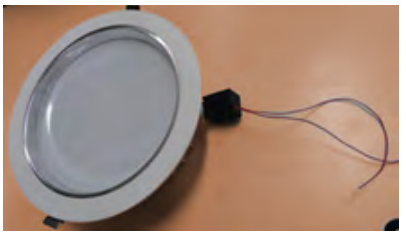
1. Ensure that there is correct PCB usage per production order, which means size and number of the LEDs' board.
2. Clean the surface at the bottom of the COB with IPA (Isopropyl alcohol), and then place the thermal adhesive tape.
3. Place the COB on the aluminium profile. Ensure that no dust or foreign particles are there on the profile surface. Press it against the aluminium heat sink for proper contact.

4. Place these light engines in an orientation of 120 degree (if 3 COB's are used for 18W), and 90 degree with each other (if 4 COB's are used for 24W).
5. After placing the light engines, connect the COB with the output wires of the EMI/EMC PCB.
6. Ensure that there is no continuity between the input wires.
7. Apply 220Vac, 50Hz to the Input wires.
8. Observe. The LED's must be illuminated with the same intensity.
9. Measure the PF and the efficiency. The PF must be >0.9 and the efficiency must be >80%. When P1 represents input power and P2 represents output power

   Efficiency (Ƞ) = P2/P1

10. Solder the AC supply points with wires
11. While soldering does not place more than the required solder on the pads otherwise the wires may get disconnected or the pads may come out.
12. Solder the EMI/EMC PCB with the output wires of the COB.
13. Later place the reflector and the frosted cover over the heat sink.
14. Lock the product with screws.

15. Apply 220VAC, 50Hz and check whether the COB's are having correct illumination.
16. The following image is a testing report on a power analyser at 220VAC of 18W Down lighter.
17. Keep the COB light in ON position for minimum 4 hrs.
18. Ensure that there is correct wattage and intensity.
19. Pack the light.



EMI/EMC PCB inside an enclosure

20. Keep the colour of wires as:
21. Input=Red (Both line and neutral)
22. Output=Red (Line), Black (Neutral)

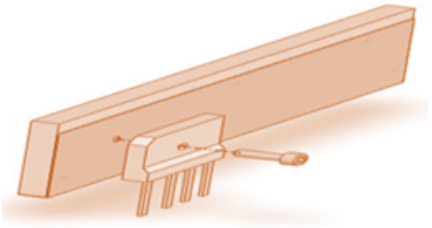
2.1.13 LED Street Light Assembly

On completion of the session, the trainee will be able to explain:

- The assembly of an LED street light

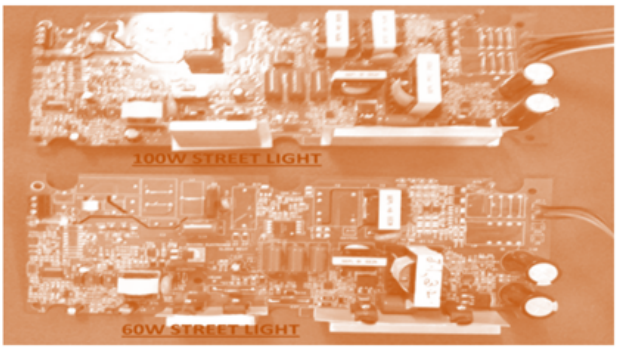
Before starting the LED street light assembly, first complete the heat sink assembly.

Heat Sink Assembly Insulation Sheet:

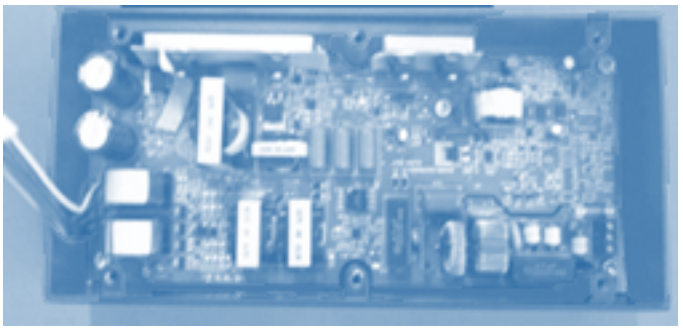


Note:

This heat sink is made of Aluminium (Al) and covered with thermal tape. It is used to mount on a metal–oxide–semiconductor field-effect transistor (MOSFET) for heat management. The MOSFET after being mounted is screw fitted. Also, ensure there is no air bubble in between the insulation sheet and the heat sink.



1. The driver PCB is placed properly inside the PSU cover and its screw is tightened with the help of washers.



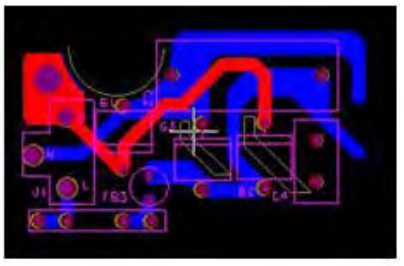
2. The thermal tape is used for heat management through LEDs. It is made in such a way that it has two window openings to fit the lens and the light engine PCBs.

1. It is placed below the metal sheet.
2. Later, the wires are drawn through the holes and the connectors. LEDs are placed, and then rapid repair(RR) powder is added to fill the holes.
3. Gasket is used for air tight fittings.
4. For 60W we will use a 24 LED light engine.
5. This is used for 100W, 48 LED light engine.

The flexible arm is later screwed to the street light fixture to enable it to move to an angle.

Burn in Test:

	WIRE COLOR
Phase/Live (L)	Red
Neutral (N)	White
Earth (E)	Green with yellow tracer



- Each and every assembled PSU must power up on resistive loads at least for 8 hrs.
- Ensure that the wire colour combination and polarity is according to the given table.
- The same polarity has to be followed in a light engine, while connecting with a wire.

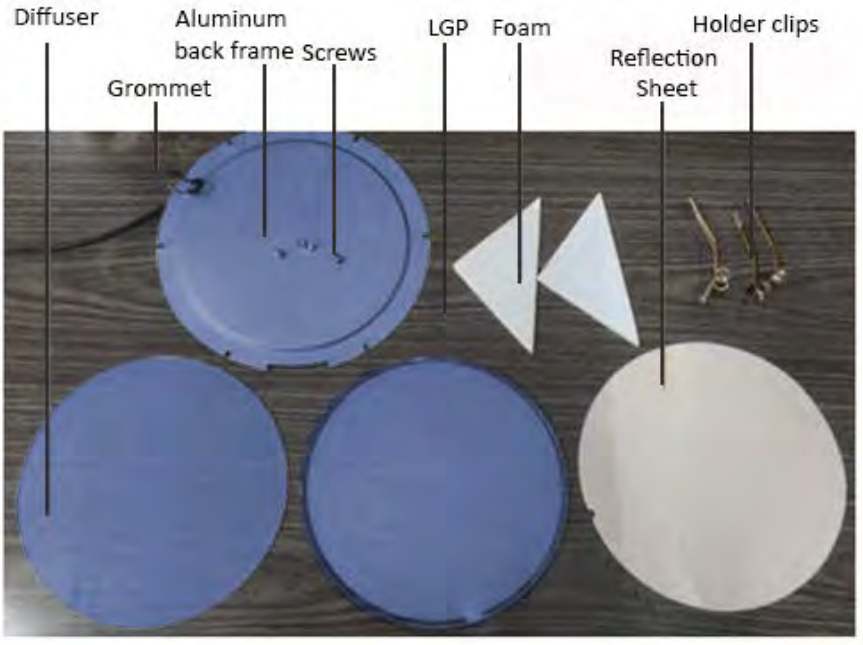
2.1.14 LED Round Panel Light Assembly

On completion of the session, the trainee will be able to explain:

- Assembly of a 6” Round panel light

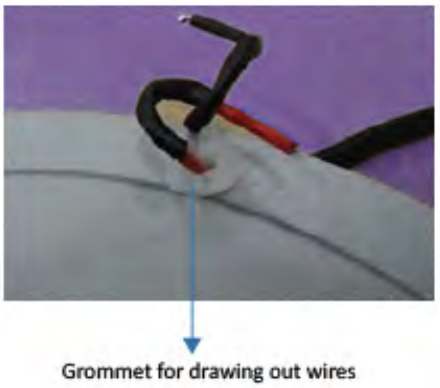
6” Round Panel Light Assembly

6 inches Round panel light parts are shown in the following image:



Product Assembly:

1. Clean the aluminium die cast and the LED light engine with IPA.
2. Take the LED strip and paste the double sided thermal tape behind it.
3. Paste the thermal tape around the die cast.
4. Draw out the wires.
5. Now place the diffuser.
6. Place the LGP over the diffuser.
7. Then, place the reflection sheet.
8. Place the foam sheet before covering it with the aluminium back plate.
9. Finally, place the screws and tighten up, drawing the output wires out of the hole in the aluminium back panel.
10. A grommet is placed in the aluminium back plate to keep the wires stiff.
11. A connector is placed in the output wires.



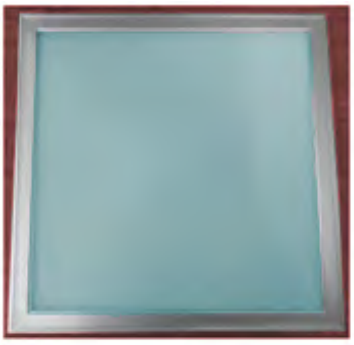
Grommet for drawing out wires

6 inches round panel light

2.1.15 1x1 and 2x2 Square Panel Light

On completion of the session, the trainee will be able to explain:

- Assembly of a 1x1 and 2x2 Square panel light

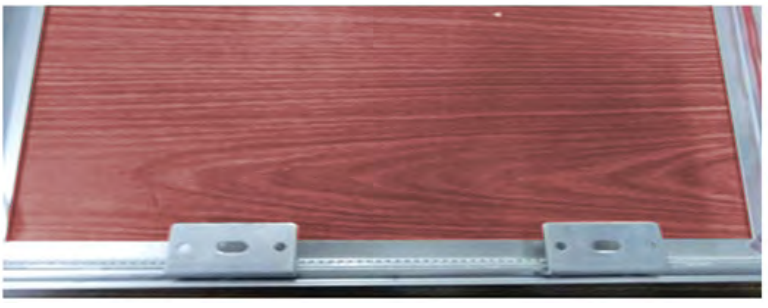


1x1 LED Panel Light

2x2 Panel Light Assembly Steps:

1. The four aluminium extrusions are taken and cleaned with IPA.

2. The extrusions are placed together to form a frame.
3. Then, the LED strips are pasted behind them with the thermal tape
4. The diffuser is placed initially on the thermal tape over frame.
5. Then, the LGP is placed over the diffuser.
6. he LGP has a reflection sheet below it.
7. Lastly, the foam sheet is provided and covered by an aluminium sheet and screwed tight.
8. The reflector sheet has an aluminium reflection tape pasted on the two sides to cover the light coming out from the LED strip to prevent losses.
9. Grooves are made in the extrusion and the reflection sheet to provide for holding of clips and to fasten them with screws.



10. A grommet is provided to draw out the output wires through the aluminium back panel.

Product Assembly:

A panel light has many parts included in its mechanicals:

- Extrusion/Die Cast
- Diffuser
- Light Guide Plate
- Reflection Sheet
- Foam Sheet
- Aluminum Back Plate
- Thermal Tape, Reflection Tape

Steps for Product Assembly:

1. For 2x2 and 1x1 panel light, use a 599mmx599mm and 299mmx299mm aluminium frame
2. Use two light engines at opposite sides in a 2x2 and 1x1 Panel light.
3. The output wires (Red, Black) are soldered onto the light engine polarities.
4. Clean the light engine and the Al extrusion with IPA to remove the dust particles and to place the thermal tape properly without any gap.
5. Then, for 2x2 panel light, the thermal tape of 570mm length and 8mm width is used beneath the light engine and for1x1 panel light, 282mmx8mm thermal tape is used.
6. The frame with a light engine is ready.
7. Place the diffuser inside the frame and the LGP on top of it.
8. Then, place the reflection sheet on top of the LGP and cover from all sides using an aluminium reflection tape to avoid any light dissipation or losses.
9. Lastly, place the foam sheet to provide stability to the mechanicals of the panel light.
10. Finally, place the aluminium back plate.
11. Driver PCBA +Light Engine Testing:
12. Connect the driver output with the light engine.
13. Place the driver into its enclosure and draw out its input and output wires. Ensure that there is no continuity between the input wires.
14. Connect the light engine at the output wires.
15. Apply 220Vac, 50Hz to the input wires; take extreme care against electric shock. Observe that all LEDs must be illuminated with the same intensity.
16. Measure the PF and the efficiency. PF must be > 80 % and the efficiency must be >.

$$\eta = P2/P1$$

P1= Input Power and P2= Output Power

17. Power up the driver and ensure that it is working.

18. Check that there is no damage to the driver and its input and output wires are not shorted or torn out while closing in the enclosure.

For Panel Light	No. of Screws	No. of Screws for V Angle	No. of Screws for Hanging Clips
2 Feet by 2 Feet	18 pcs (As per sample)	16 pcs as per sample	8 pcs as per sample
1 Feet by 1 Feet	13 pcs (As per sample)	16 pcs as per sample	4 pcs as per sample
6 Inches round	6 pcs (As per sample)	NA	NA

2.1.16 Burn in Test for LED Luminaire

On completion of the session, the trainee will be able to explain:

- Burn in test of LED Luminary

Burn-in is the process of exercising the components of a system before they are placed in service.

The purpose is to detect the components that may fail due to the initial, high- failure rate of the reliability of the component. Longer and stressful burn-in period ensures that the system is free from further early failures after the process is complete.

One of the efficient and reliable ways is to do burn in test of the product on an aging line with a conveyer having different voltage zones and a high temperature zone.

Inspection of the Completed Assembly

After the burn in test, the next step is visual inspection. In visual inspection, check for the following:

- Assembly faults
- Soldering faults
- Wire color incompatibility

2.1.17 IP (Ingress Protection) Rating

On completion of the session, the trainee will be able to explain:

- What IP testing is
- Importance of IP rating in Led products
- IP rating requirement for different products based on the product area of use

The Ingress Protection Marking referred to as IP Code, is also known as International Protection Marking. It falls under IEC standard 60529, published by International Electromechanical Commission (IEC) and defines the ratings and categorization of the degree of protection provided against the followings:

- accidental contact by electrical enclosures and mechanical casings
- intrusion by hands and fingers
- water
- dust

The rating is denoted as IP (characteristic numerals). For example, an electrical socket of rating IP22. The first and second digits denote protection against solid particles and liquid ingress respectively.

The digits indicate the conformity of the component with some specified conditions. The numerals are replaced with 'X' such as IPX7 when there is no protection rating available with regard to any one of the criteria. Level of protection against solid particles are listed in the following table:

Level	Object size protected against	Effective against
0	—	No protection provided against contact and entrance of objects.
1	>50 mm	Protection provided against any large surface of the body part (back of hand). No protection provided against intentional contact with body.
2	>12.5 mm	Protection provided against fingers or objects of the same type.
3	>2.5 mm	Protection provided against thick wires and tools.
4	>1 mm	Protection against screws, wires and so on
5	Dust protected	Complete protection provided against dust contact. It can be said as dust proof. Entry of dust is not totally prevented, however, it is restricted to a tolerable level that it does not limit the operation.
6	Dust tight	Provides complete protection from dust (it is considered to be tightly packed to allow dust.)

UNIT 2.2: Selection of LED Drivers

Unit Objectives

At the end of the session, the participant will be able to:

- Explain different types of drivers.
- Demonstrate driver selection according to the LED.

2.2.1 LED Drivers

On completion of the session, the trainee will be able to explain:

- The purpose of a driver in an LED product
- Types of LED drivers
- How a constant current driver operates an LED product

An LED driver is the source of power for LEDs. Whenever you are building LED luminaries, you will always need a driver or possibly even multiple drivers. There are different types of LED drivers, as there are different types of LEDs.
LED drivers can be categorized into:

- constant current (CC)
- constant voltage (CV) drivers.

LED driver is usually an AC/DC converter. In another words, it converts AC voltage from main 220V, 230V or 240V power supply to DC supply, suitable for the LED component.

2.2.2 Selection of an LED Driver

On completion of the session, the trainee will be able to explain:

- How to select power rating of an LED driver for a given light engine
- Decide specification of an LED driver for an LED product

2.2.2.1 Steps

Step 1: What forward current does your LED need?
We should find the forward current your LED needs, from the datasheet. If your LED needs a current of 350mA, you should try to find a driver with 350mA output current.

Step 2: How powerful should your driver be?
The power consumption of the LED can also be found from the datasheet or at least it can be calculated with the data in the datasheet. The power consumption can be calculated by multiplying the typical driving current value with the typical forward voltage value. Both are present in the LED data sheet. Sometimes you can even find the power consumption directly from the datasheet. If you are using multiple LED components, you have to find a driver that can feed all the LED components in the luminaires.

Step 3: What output voltage range do you need from the driver?

Take a look at the datasheet and check the voltage of the LED. If you have multiple LEDs, you should add the voltages together. Then, you should find a driver with a voltage range that your LEDs fit into.

Step 4: Do you need dimming? If you do, then what type of dimming do you need?

A need for dimming is mainly dependent on the specification of your luminaire. If you do not need dimming, a normal on/off driver is enough for you. If you need dimming, there are many different types available.

Step 5: What are the physical dimensions within which the driver has to fit in?

You should also consider whether there are some limitations for the physical dimensions of the driver. These will obviously have an impact on your driver selection. You will generally find the physical dimensions of the driver from its datasheet.

Step 6: What kind of environment is the luminaire used in?

Where is your luminaire designed to be used? If it is designed for indoor use, then you probably would not need to think about IP-classification much. If the luminaire is used in a room with a lot of dust or moisture, this has to be taken into account. IP20 class drivers can be used in indoor lighting applications but hardly stand harsh conditions in outdoor lighting, unless the luminaire itself is waterproof, thus protecting the driver.

When a luminaire is designed for outdoor use, then you should check that the driver has good IP-class. Usually IP67 drivers are heavier in weight, the driver electronics is molded with plastic (such as potted) and the electrical throughputs of the wires, both on the primary voltage and the secondary voltage side, are sealed with the required protection against moisture.

Step 7: Is the driver suited for European standards or American standards?

Does the driver have any approvals? Are the approvals for Europe (ENEC) or America (UL). This can generally be found from the datasheet of the driver. With these steps you should be able to find a suitable LED driver for the application.

2.2.3 Constant Current LED Driver

Constant current drivers always feed relatively constant current. Voltage range may vary. Many times the output voltage range is related to the physical dimensions of the driver. This restriction may set some selection challenge, if the luminaries are compact and there is limited space for the driver. One of the important functions of a constant current driver is the capability to maintain constant current. The characteristics of a constant current LED driver are:

- efficiency: It indicates what part of the input power can actually be used by the driver to power the LED
- power factor: The power factor indicates how much load the driver puts on the electrical network. The maximum value of power factor can be 1.

2.2.4 Constant Voltage LED Driver

A constant voltage driver keeps the voltage constant. The feeding current varies according to the load. The higher the load is, the bigger the current is. Constant voltage drivers are usually used in applications where all LED components are in series. These with high powers can be used as electrical energy suppliers for many smaller power constant current drivers. In larger lighting systems, they are storages that feed stable current into the LED loads they have .In some cases, constant voltage drivers are the only suitable solution, such as when replacing halogen lamps. Replacements require 12V or 24V voltage. If used in a parallel mode, electrical load variation can result into brightness variation due to current variation.

UNIT 2.3: Diagnose and Repair LED Light

Unit Objectives

At the end of the session, the participant will be able to:

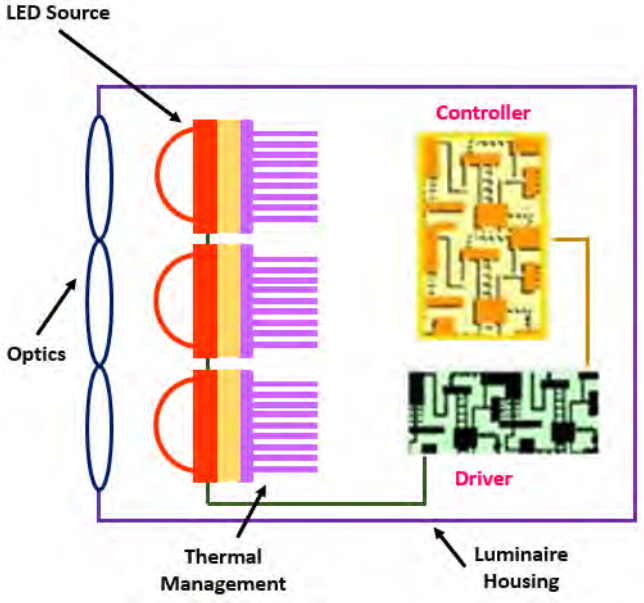
- Explain different types of drivers.

On completion of the session, the trainee will be able to explain:

- How to find component level fault and repair it
- How to find Led strip level fault and repair it
- How to achieve productivity and maintain quality standards.

Major Components of an LED Light:

1. Every component is critical in the functioning of an LED luminaire
2. Failure of any one of them would cause the entire system to stop functioning.



2.3.1 Reasons for LED Failure

LED Lighting, one of the efficient sources of lighting available in the market, offers several benefits, including lifespan up to 50,000 hours. However, there may be failure of LED lights before their lifetime, if they are not properly maintained. For preventing the premature failure of LEDs, one must be aware of the reasons behind the failure of LEDs.

Different reasons for LED failure are as follows:

1. Hot Environment:

The light emitted by LEDs reduces exponentially, depending on time and temperature. The higher the temperature of the environment, the earlier the degradation of the LED light,

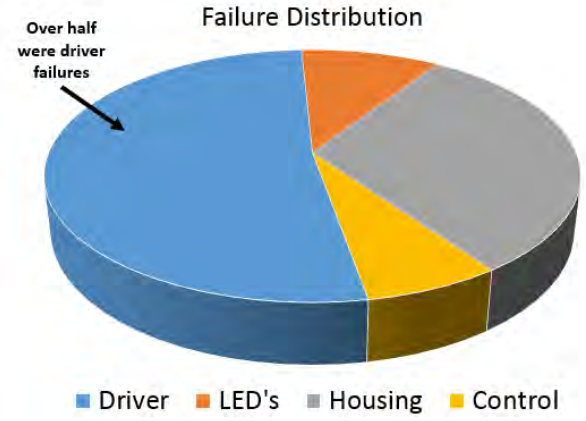
leading to a shorter lifespan. Hence, thermal management is vital for ensuring longer duration for the LEDs lifetime.

2. Incorrect LED Driver:
LED must be powered from a DC source, while incandescent lighting can be operated by using either AC or DC. LEDs can be driven by an AC power supply by using LED power supply or an LED driver. High voltage or current from the driver or the power supply results in failure of an LED, as it will suffer overdrive.

3. Incorrect Polarity:
LEDs must be connected according to their polarity; as being diodes, they are polar sensitive. Hence, the positive terminal (anode) and the negative terminal (cathode) are connected to the positive and negative terminal of the supply respectively. If LED terminals are connected in reverse, there may be catastrophic failure, leading to open-circuit failure along with no light emanation.

2.3.2 LED Luminaire Failure Analysis

90% of the luminaire failures are due to something other than the LEDs.



LED Luminaire Failure Types:

1. LED Failure Modes
2. Secondary Optics Failure Modes
3. Thermal Management System Failure
4. LED Driver Failure

LED Failure Modes:

Different LED failure modes are listed as follows:

1.1 Packaging Related Failure

Epoxy degradation: Some components of the plastic package material turn yellow when they are subjected to heat. It causes partial absorption of the affected wavelengths and thus results in loss of efficiency.

Thermal stress: Epoxy resin package starts expanding rapidly when the glass transition temperature is reached. The expansion causes mechanical stresses on the bonded contacts and the semiconductor, leading to the weakening of the bonded contacts and even tearing off. Very low temperatures also can lead to cracking of the packaging.

Degeneration of differentiated phosphor: The degradation of different phosphors in white LEDs at different rates due to heat and age causes changes in the light color produced by the LEDs. For example, organic phosphor formulation is used in purple and pink LEDs, that may degrade after a few hours of lighting and it may lead to a major shift in the light color.

1.2 Metal and Semiconductor Related Failure

A common mechanism for degradation of the location of radiative recombination (known as active region) is nucleation and growth of dislocations. This is caused due to the presence of a defect in the crystal and the rate is accelerated by high current density, heat and the light emitted from the LED. Elements such as aluminum gallium arsenide are more vulnerable to it. Metal atoms are moved to the active region from the electrodes as a result of metal diffusion, which happens due to high voltage or currents at elevated temperatures.

1.3 Stress-related

- Thermal runaway: This is caused by loss of thermal conductivity due to presence of non-homogeneities in the substrate. In this case, damage caused by heat results in more heat generation. Most common voids are the ones which are caused by incomplete soldering.
- Electrostatic discharge: It may cause:
  - a permanent shift of the parameters of the semiconductor junction
  - immediate failure
  - latent damage that leads to enhanced rate of degradation.

Secondary Optics Failure Modes

Secondary optics ensures that the output beam of the LED lamp meets the photometric specifications by modifying it.

Secondary optics in LED may be any of the following:

- Diffuser
- Lens
- Specular or diffused reflector
- Lens and reflector combination; for example, total internal reflection lens or TIR

Smooth diffusing

Small detailed texture features on the lens surface

Diffusing on TIR lens

The secondary optic, in case of outdoor applications, is exposed to ionizing radiation emitted from the sun.

Thermal Management System Failure

These include the following:

- Heat sink failure
- Thermally conductive adhesives wear
- Thermally conductive gap filling materials degradation
- Thermal tape wear
- Thermal grease dry up

Driver Failure

Most of the high-power LED drivers, especially using power greater than 15W, use electrolytic capacitors. There can be two cases. The capacitors can be placed either on the input AC stage for allowing noise filtering or on the driver's output DC stage.

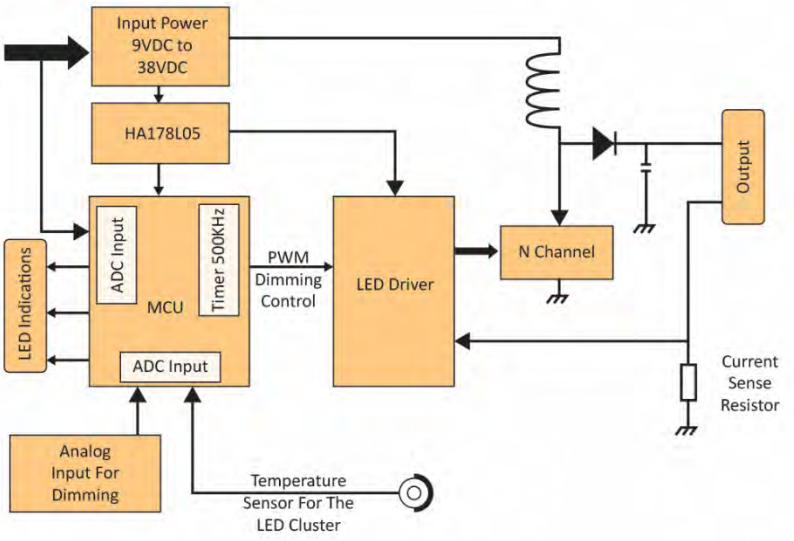
In a driver circuit, the electrolytic capacitors are weak elements and fail frequently at high temperatures.

Other prominent components that can fail:

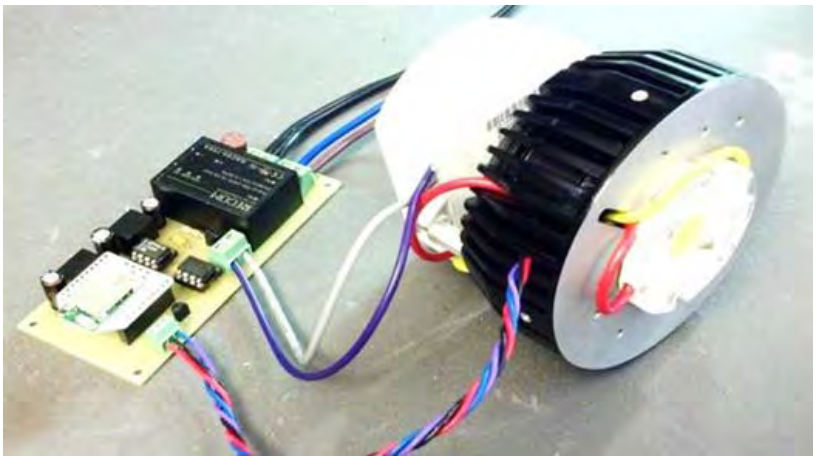
- Isolated-
  - Input- fuse/ MOV
  - Output- transistor/ transformer/ IC

2.3.3 LED Driver

The main function of an LED driver is to restrict the current, regardless of various operating conditions.



2.3.4 Diagnose and Repair Fault in LED Light



Types of LED faults:

- Finding and repairing component level faults
- Connection/soldering faults

2.3.4.1 Steps for Diagnosing LED Fault

Step 1: Connect the LED light that is not functioning with the AC source.
Step 2: If the light does not switch on, look for loose or de-soldered wires and connections.
Step 3: Solder the wire and check for any loose connections so that the light can be operational again.

Light Engine Fault:

Step 1: Disassemble the parts of the LED light, if there are no faults in the connections.

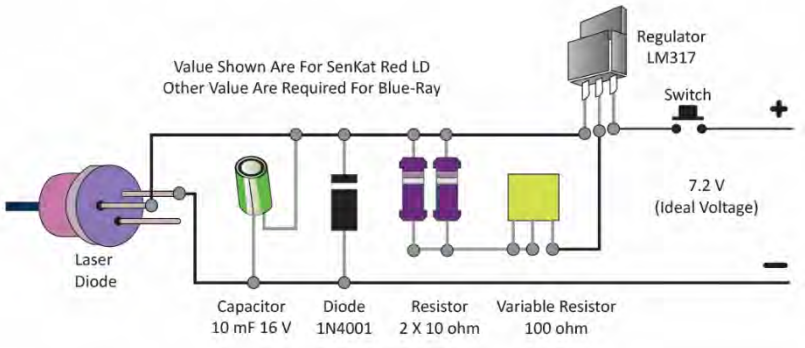
Step 2: Ensure that the light engine as well as the DC supply complies with the voltage/current requirements of the LED product.

Step 3: If the LED light engine is found to be faulty, replace it.

LED Driver Fault:

Step 1: Check the driver with an AC supply or a multi meter to measure the voltage and the current output, in case the LED light engine is functioning properly.
Step 2: Measure the output voltage and the current of each section of the supply unit to identify the faulty section.
Step 3: Check every component of the section that either shows no output or has output voltage less than the desired one, by using a multi meter.
Step 4: Repair /replace the damaged component, primarily the electrolytic capacitors.
Step 5: Check the output voltage/current again with the multimeter and reassemble, if the repaired driver is found okay.

Components of a Typical LED Driver:



LED Strip Level Fault:

Step 1: Connect the LED light that is not functional with the AC supply.
Step 2: Look for the damaged or non-functional LED strips or LEDs from the LED strips array in the light.
Step 3: Replace the damaged LED strips by removing the glass shell.
Step 4: Connect the LED array with the AC source and check it.
Step 5: Replace the glass shell if all the LED strips are working.

Achieving Productivity and Quality Standard:

- Identify the root cause for the non-functionality of an LED light correctly and repair it effectively as soon as possible.
- Document the steps of fault diagnosis and process of repairing as per standard operating procedures (SOP).
- Effectively communicate with the colleagues and the supervisor about the fault diagnosing and the repairing method.
- Report faults found in the LED lights.

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ESSCI

3. Safety Standards

Unit 3.1 – Electro Static Discharge (ESD)

Unit 3.2 – Safety Standards

Unit 3.3 – Importance of 5S on Productivity & Management

Key learning Outcomes

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

- Interpret basic knowledge of ESD
- How to prevent ESD Damage
- Balancing an ESD Control Plan

UNIT 3.1: Electro Static Discharge (ESD)

Unit Objectives

At the end of the session, the participant will be able:

- Interpret basic knowledge of ESD
- Explain how to prevent ESD Damage
- Describe balancing of an ESD Control Plan

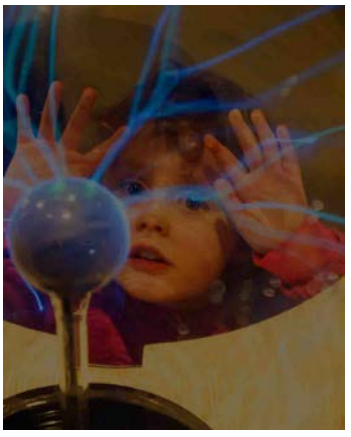
3.1.1 ESD Prevention

On completion of the session, the trainee will be able to explain:

- What ESD is
- The importance of ESD safety in LED product assembly

3.1.2 Introduction

1. ESD occurs every day, everywhere
2. Humans are usually the biggest cause of ESD
3. Bare LEDs are sensitive to ESD from a certain discharge level
4. In lighting industry, no standards are known for level 2 LED light engines
5. Take ESD seriously; total cost of latent ESD damage in product life cycle experiencing ESD is very high.



3.1.3 What is ESD?

ESD is the sudden flow of static electricity when two objects come into contact and one gets positively charged while the other gets negatively charged. ESD can build up on humans, tools and various other non-conductors or semiconductors. These ESD events can pose serious problems in industrial environments as they can damage electronic devices and components. There can be a latent effect on the devices where they continue to function but their life is shortened.

Some electrostatic-sensitive devices are as follows:

- MOSFET transistors, used to manufacture ICs
- Complementary metal–oxide–semiconductor (CMOS), ICs made with MOSFETs; such as computer CPUs, graphics ICs.
- Expansion cards
- Transistor-transistor logic(TTL) chips
- Laser diodes
- Blue LEDs
- Resistors with high accuracy

3.1.4 ESD Safe Working

ESD protection is essential for sensitive components such as microchips, during and after production, while shipping, during assembly of the device and in the finished device. Grounding is imperative for ESD prevention. An ESD Simulator having special output circuit called human body model (HBM), is generally utilized to test the vulnerability of electronic devices to ESD from human contact. Generally, an ESD-safe foam or an ESD-safe bag is needed for carrying ESD sensitive components. A technician should use a grounding mat or some other grounding equipment to safeguard the equipment from ESD. The person may also use safety gear such as a wrist strap, safety clothes or rubber gloves.

There are many types of ESD protective materials:

- Conductive: Materials having a resistance ranging from 1kΩ and 1MΩ

- Dissipative: Materials having a resistance ranging from 1MΩ and 1TΩ
- Shielding: Materials that abate current and electrical fields

Anti-static materials: These materials control the build-up of charge by hampering triboelectric effects. This can be done by physical separation or by choosing materials that resist charge build-up. Humans have electrical sources in their body by nature and hence if they touch an ESD sensitive device unequipped with a safety gear, they can damage the device.

3.1.5 ESD Sensation Level for Human Beings

- ~3.5 kV = feeling
- ~4.5 kV = hearing
- ~5 kV = seeing
- Often these sparks are so small that we cannot experience them, but they still damage electronic components like LEDs
- ESD is a natural phenomenon. Normal movement of a person around a work bench can generate up to 6 kV
- An exceptionally high 15 kV was measured on an assembly-line personnel in a factory on a dry winters day

3.1.6 ESD in Our Daily Lives

- Most clothing causes charging due to friction and rubbing
- Tearing foils like tape or packaging also causes charging

Key parameters for charge level are:

- Material (charging/insulating)
- Relative air humidity (circumstance)

Control Variables to Limit ESD Levels:

- Avoid charge build-up / slow discharge
- Monitor and/or regulate humidity

3.1.7 ESD Damage

- ESD is a form of electrical overstress
- Most exposed electronic devices, like LEDs, can be damaged or ruined by ESD sparks

ESD damage failure modes of lighting products are:

1. Catastrophic: device is non-functional
2. Parametric: device functions and works but not according to specifications
3. Latent: device performs within tolerance limits but fails prematurely. Where are OEMs (Original Equipment Manufacturer) confronted with ESD risk?

Three Main Categories of ESD Sensitivity:

1. ESD sensitive LED products (up to 100V HBM); typically Level 0 & level 1 standards for ESD process control are IEC 61340-5-1 & ANSI/ESD S20.20
2. ESD moderately robust LED products; typically Level 2 for ESD control in lighting industry. No standards are known for moderately ESD-robust modules. Nowadays, lighting component manufacturers bring exposed LEDs into the OEM factory
3. ESD robust LED products; typically Level 3 & Level 4

For these products, generally, no ESD control measures are required

Note: discharge test level for luminaires (IEC61547) is 4kv contact and 8kv air.

ESD needs to be addressed early in the chain. Further down the chain, ESD damage will have a larger impact such as:

1. Catastrophic : visible in manufacturing environment
2. Parametric : visible in manufacturing environment

3.1.8 How to prevent ESD damage?

On completion of the session, the trainee will be able to explain:

1. How to minimize ESD risk.
2. How to control ESD in the work place

3.1.9 Find the Balance

ESD robustness can be increased by either the supplier at component level or the OEM in the assembly process.

3.1.10 Quality Approach for LED Modules

What measures to take to minimize ESD risk for OEMs?

- ESD is a crucial aspect of supplier selection, contracting and supplier quality management.
- This requires suppliers to manufacture and deliver ESD-safe components
- Verified via supplier ESD control plan tests, supplied products are tested on ESD performance
- LED products are characterized on ESD in the specification offer ranges, with high ESD resilient features built-in – such as Forimo LED Line with built-in Zener diode
- LED light engines are delivered to OEMs in appropriate packaging:
    - It provides adequate protection against mechanical damage and ESD
    - To warrant this the product can only be ordered at a minimum order quantity (MOQ)

3.1.11 Contact versus Air Discharge

How to specify contact versus air discharge

Complementary tests for Equipment under Test (EUT) are prescribed:

1. Contact discharge direct: Test electrode is kept in contact with the EUT indirect. Then test electrode is kept in contact with a metal plate, simulating ESD to adjacent objects
2. Air discharge; charged test electrode is moved towards the EUT until it touches the EUT

3.1.12 ESD Process Control in Assembly Environment

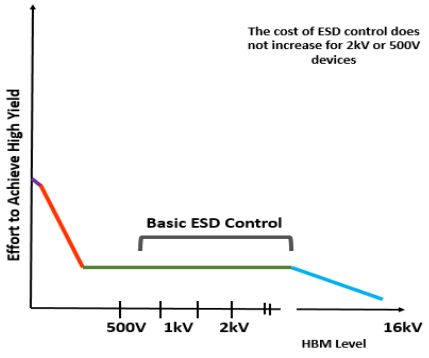
What should OEMs be considering?

- Avoid charging
- Careful selection of materials to be used
- Controlled continuous discharging (resistive conduction or ionic air flow)
- Careful selection of plastics and foils; besides humans, well known source of charge buildup are plastics and foils like optics used in lighting fixtures (lenses, diffuser plates)
- Protective foils which are removed during assembly
- Time for charges to decay to acceptable levels into the ambient atmosphere may take hours
- Air humidifiers and/or ionizers can reduce this decay time to less than minutes
- Cost due to ESD damage can be prevented with control actions and proper products

3.1.13 Balancing an ESD Control Plan

On completion of the session, the trainee will be able to explain:

1. ESD control plans
2. How to do an ESD audit



3.1.14 Requirement for an OEM

An OEM to consult an ESD expert for audit and equipment to ensure the requirement is met.

An ESD control plan could contain:

1. An ESD Way of working, auditing, sensitivity analysis, ESD control plan, work instructions and personnel training
2. Access control ionizers while handling high risk insulators and humidity monitors
3. If lower specified (4 kV/8 kV) products are used, extra measures could involve protective clothing, anti-static or low-charging static-dissipative bags, sensitivity marking seats, ESD- safe storage requirements and work mats

3.1.15 Conclusion: Commitment is Key

1. Check the specification (the requirement)
2. Verify if the assembly and the installation process meet the spec (such as by asking the ESD consultant)
3. Incorporate the proposed working order and tools (and commit to these) in an ESD control plan
4. Ensure management commitment to provide safe and ESD friendly facilities and prevention tools
5. Ensure effective implementation plan that reflects measurable and realistic requirements
6. Maintain consistent and frequent communication about the importance of ESD prevention
7. Perform regular audits of ESD testing and control processes

The indicated preventative measures are easy to implement, do not restrict worker activity and will quickly pay for themselves through higher yield. Committing to these strategies will increase the success of an ESD program.

UNIT 3.2: Safety Standards

Unit Objectives

At the end of the session, the participant will be able to:

- Identify ESD causes and safety gear
- Identify company rules on PPE
- Explain precautions for ESD product testing

3.2.1 ESD Safety

On completion of the session, the trainee will be able to explain:

- ESD causes
- ESD safety gear

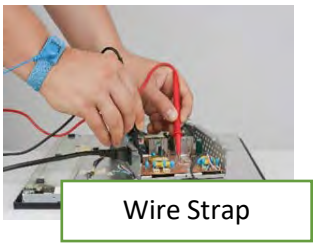
Causes of ESD:

- Static electricity.
- Electrostatic induction

Safety gear for ESD:

- Apron: An apron is used to protect the assembly from static charge generated in our clothes.
- ESD Shoe: ESD shoes are used to ground our body's static charge.
- Wrist Band: ESD wrist bands are used to ground our body's static charge

Some safety gear are shown in the following images:



Wire Strap

Rubbern Gloves

Safety Clothes

3.2.2 PPE Company Policy

On completion of the session, the trainee will be able to explain:

1. Safety rules at workplace
2. The company policy on the use of PPE

Personal Protective Equipment (PPE) is essential to avoid any electrical, heat or physical hazard. A PPE may not eliminate a particular hazard from occurring but it avoids the situation of an employee getting exposed to it. All attire and accessories used to protect against workplace hazards can be considered as PPE. Sometimes, the only close at hand protection for employees might be the use of PPE and usually in emergencies, PPE will be needed for worker's safety.

Safety Rules:

- Injuries must be done reported immediately.
- There should be no horseplay, alcohol or drugs within the premises.
- There should be no usage of alcohol during lunch break.
- PPE must be worn as directed by the management.
- There should be good maintenance of all tools/equipment.
- Care should be taken that appropriate tools are used for specific jobs.
- All guards should be in right place.
- Spliced electrical cords/wiring should not be used.
- Forklift vehicles should be operated by only authorized personnel.

Company Policy & Rules:

1. Workers to be provided with a safe work place
2. Routine/regular workplace inspections to be done
3. PPE to be provided
4. Safe work procedures and rules to be formed and implemented
5. On-going safety training to be given
6. Safety rules and discipline to be enforced
7. Property conservation practices to be given

3.2.3 PPE

On completion of the session, the trainee will be able to explain:

1. What precautions should be taken while doing ESD product testing

Environment

The work environment should not have static more than 100V. A humidifier should be used to avoid low levels of humidity. Materials that produce static should not be used. There should be a periodic review of the effects of measures taken to decrease static.

Working

In the work area, conductive materials should replace insulating materials as much as possible. Materials such as synthetic fibers and plastics are susceptible to charge build-up. Use of work clothes for controlling static and air ionizers should be encouraged.

Equipment

To keep static at bay, earthing must be done for all equipment. This includes the various instruments and testing devices, conveyors, mats, tools, workbenches, soldering irons and solder baths. A conductive mat should be used to cover the workbench and one should be spread on the floor. Both of them should be earthed.

Human body

Workers must wear wrist straps or ankle straps to earth their body. They should also wear gloves to avoid direct contact with the devices. They should not wear nylon gloves or work clothes, which are prone to building up a charge. They must wear footwear with a resistance between 100kΩ to 100MΩ. Dirt and humidity could, however, change the resistance.

Methods of working

A soldering iron made especially for use with semiconductors (with low voltage of 12V to 24V) should be utilized. Earthing of the tip should be done. Handling of the device should be kept to the minimum while mounting the device.

UNIT 3.3: Importance of 5S on Productivity & Management

Unit Objectives

At the end of the session, the participant will be able to:

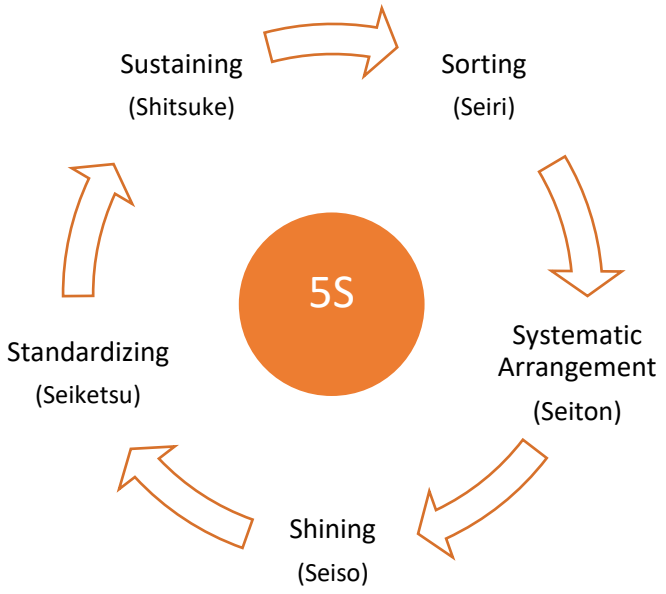
- Recognize 5S work standards

3.3.1 5S

A work standard describes the right way of doing a task. It documents the existing best practice and ensures that it is implemented in every sphere of the organization to improve the work process. 5S is a workplace organization method which ensures or enables improvement of the work process.

5S

5S describes how to efficiently and effectively organize a workplace by maintaining the area, identifying the items used and storing them in their proper place, ensuring sustainability to the order. 5S uses a list of Japanese words that start with "S". The following figure represents the elements of 5S:



3.3.2 Seiri (Sort)

- Keep all the items, necessary for the work, in the work area.
- Dispose off or keep the items which are not frequently used, in a distant storage place.
- Discard the extra and unneeded items.

3.3.3 Seiton (Set in Order)

- Also means "set in order" or "streamline"
- Arrange all items systematically as it promotes efficient workflow and easy retrieval
- Prevent loss and waste of time
- Facilitate picking up necessary items
- Ensure first-come-first-served basis
- There must be a clearly labelled place for each item and every item should be in its place.

3.3.4 Seiso (shine)

- Also means "sweep" or "sanitize"
- Keep the workplace and equipment clean
- Make cleaning a part of inspection
- Prevent deterioration of machinery and equipment
- Make workplace comfortable and safe to work

3.3.5 Seiketsu (Standardize)

- Maintain high standards at workplace for housekeeping and organization
- Maintain high level of cleanliness and orderliness
- Keep all equipment and tools in their proper place
- Display a picture or a diagram illustrating the right layout of the working area
- Arrange identical workstation for a particular job so that the employees can work in any station with the tools kept at the identical location in that station

3.3.6 Shitsuke (Sustain)

- Also means "do without being told"
- To keep everything in working order
- Carry out regular audits
- Sustaining involves maintaining focus on a new way of operation and gradual improvement. The impact of continuous improvement leads to: less waste, better quality and faster lead times.

3.3.7 Additional 5s

Sometimes, additional phases are included such as safety, security, and satisfaction. These are not traditional "phases" but just extra steps to clarify the advantages of 5S.

3.3.8 Safety

The phase "Safety" is sometimes included. It is debatable whether including this sixth "S" promotes safety. A comprehensive safety program could lose its value when it is dealt as a single item in an business methodology focused on efficiency.

3.3.9 Security

The phase "Security" can be included in the 5s. The seventh "S" points out risks to main business categories, such as fixed assets and information technology, to leverage security as an investment and not an expense.

3.3.10 Improving Workplace

An organization is supposed to provide protection to its employees. The primary responsibility of an organization is to ensure health and safety of the employees. However, it cannot guarantee an accident free arena to work in. Hence, it is the responsibility of both the employer and the employee to follow the safety norms. The following figure explains how an employee must contribute towards maintaining health and safety in an organization:

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI

4. Soft Skill

Unit 4.1 – Interaction with Superior, Company Policies and Safety Procedures

Key learning Outcomes

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

- Interact with supervisor
- Interact with colleagues
- Know safety procedures and safety measures of an organization
- Know reporting structure of an organization
- Understand organizational safety policies
- Understand organizational work policies

UNIT 4.1: Interaction with Superior, Company Policies and Safety Procedures

Unit Objectives

At the end of the session, the participant will be able to perform the following:

- Interact with supervisor
- Interact with colleagues
- Know safety procedures and safety measures of an organization
- Know reporting structure of an organization
- Understand organizational safety policies
- Understand organizational work policies

4.1.1 Interact with Superior

On completion of the session, the trainee will be able to explain:

1. Understanding Work Requirement
2. Standard Operating Procedure
3. Problem Reporting
4. How to resolve personal issues

Understanding Work Requirement

- Job priorities / schedule
- Special instruction related to a particular job about quality, delivery, material change, safety and so on
- Material handling
- Raw material issue
- Work station cleaning requirement
- Daily maintenance
- Preventive maintenance
- Calibration
- Corrective / prevention action
- Traceability
- Failure Mode /defects reporting
- Company objectives related to productivity, quality, safety, environmental pollution, organizational culture
- Behavior, work place ethics

Standard Operating Procedure

1. Work Instructions
2. Formats
3. Company procedures on
    - Productivity
    - Delivery
    - Quality
    - Safety
    - Environmental Safety
    - Corrective / Preventive Action
    - Product / Service Conformities
    - Rejection Control
    - Machine Operating Procedure
    - Process Control
    - Process Flow
    - Calibration

4.1.2 Interact with Superior

On completion of the session, the trainee will be able to explain:

- Internal communication
- Archiving Information

Internal Communications

- It is important for information to be shared openly in the organization
- People must be informed about the ongoing things in organization
- Appropriate and accurate information is essential for people to enable productivity in work
- Lack of internal communication brings the organization to a halt

Archiving Information

Have an efficient filing system for:

- Hard copy of documents
- Soft copy

Provide following documents to the web admin for updating the website:

- Documents open for the public (everyone)
- Documents confidential and strictly not to be shared

Email and the Internet:

- Impart computer knowledge/skills to the employees
- Provide internet access to employees

- Encourage using internet and emails
- Encourage the use of organizational email address

How to encourage internal communication?

- Sharing information is an integral part of employee's job description
- Defining responsibilities related to reporting and sharing information
- Avoiding procedures that are rigid
- Holding regular meetings keeping them short and effective
- Providing physical bulletin boards
- Communicating actively

4.1.3 Organizational Work Policies and Its Processes

On completion of the session, the trainee will be able to explain:

1. How to work in an organization
2. Different types of policies of an organization

Work Policies: -

1. Setting up the equipment and supplies before carrying out the job orders.
2. Operating equipment safely and effectively.
3. Ensuring that the tools and equipment are maintained.
4. Inspecting the equipment to identify any replacements, malfunctions and repairs required.
5. Performing timely equipment maintenance for better production capacity and quality.
6. Helping junior technicians with their assigned responsibilities.
7. Repairing and cleaning the tools and equipment when needed.
8. Working under the guidance of the superiors to perform and complete task timely and efficiently.
9. Evaluating tools and equipment and recommend improvements.
10. Operating required industrial vehicles to transfer the equipment between warehouse and working area.
11. Following safety procedures, guidelines and company policies for equipment operation.
12. Recommending process improvements for enhancing operational efficiency and safety.
13. Contributing to waste management programs.
14. Identifying and reporting risks and unsafe operations to the Supervisor immediately.
15. Maintaining clean and safe work area clean.

4.1.4 Core Skills- Team Work and Multi-Tasking

On completion of the session, the trainee will be able to explain:

- How to work in a team
- How to handle different types of work at a time

1. Be Liberal with Praise

People like others to recognize them for a job well done. Pay attention to what other people are doing and congratulate them on hard work and successes. Simple politeness goes a long way too. People appreciate smiling, saying please and thank you, and even saying hello and goodbye. These things are particularly important if you have people to manage. Employees expect politeness and praise from their boss or superior, and they will like you a lot better for it.

2. Pick Your Moments

When you work in a shared office space, it is important to recognize when people are available to talk. Be aware of what others are doing, and you will avoid interjecting when they're trying to get something done. They will not thank you for interrupting them when they are rushing around, trying to meet a deadline. Be careful with what you say, as well as when you say it.

3. Take an Interest Outside of Work

If you are thinking of starting to meet colleagues outside of work, first you should take an interest in their personal life at work. Ask about their families and hobbies, and discuss your weekends or evenings when you arrive in the morning. Pay attention to their moods while they are working and sympathize with them when they are said and share their joy when they are happy or sad. Make sure you balance what you ask them to reveal and what you are willing to talk to them about. It is strange if one of you is doing all the talking.

4. Be Willing to Socialize on Your Breaks

When its lunchtime, or time to go home, do not rush off immediately. Doing so will make it look like you cannot wait to get out of there and away from everyone else. Although, sometimes, it is perfectly acceptable to want time for yourself, make sure you do not go off on your own all the time. If other people spend their breaks together, you will look like the antisocial one if you do not want to join in.

5. Treat Your Co-workers as You Would Want Them to Treat You

When you leave school, you hope that you have left bullying behind. But, often, that is not the case, and many people find themselves feeling victimized at work. Treating your colleagues as you want them to treat you will get you far. Even if you do not like them and they do not like you, take the higher ground and be polite for the sake of your working relationship.

6. Do Not Gossip

One thing you probably do not want people to do is talk about you behind your back. It may be difficult not to join in, especially when you are dying to agree with someone about a colleague's behavior. But there is always a risk that gossip will get back to the person it is

about. If you do have a problem with someone, you can choose to keep silent or to confront them. Which one is most appropriate will depend on the situation, but if all you want to do is avoid it then wait until you get home. It is better that whoever you live with gets fed up with your work complaints rather than you create a bad atmosphere in the office.

7. Face Problems Head On

Sometimes when there is just no chance of getting along with a colleague, you need to do something about it. In particular, if a colleague is doing something that makes you feel uncomfortable or upset, you should follow the company procedure for reporting it. It can be difficult to work up the courage to do this, and you should weigh up the possibilities of where it might lead. It could end in the problem getting resolved or it could escalate and get worse. In the best case, your company has a supportive system that resolves these issues appropriately. You can also attempt to deal with problems informally, by approaching your colleague face-to-face. This may help to resolve the issue but you should remain calm and prepare yourself for them to be unresponsive.

8. Do not Push Too Hard to Make Friends

Never put making friends over being a professional. Remember that you are there to do your job first of all. By being nice at work and during breaks, you can increase your chances of socializing with your colleagues outside of work. However, people do not need to see everything of who you are while you are working. The worst case scenario, when you are polite and professional, is that you have not made good friends. If you get on with your work you are unlikely to clash with anyone or make any enemies.

9. Offer Help When It is Needed

Make yourself stand out as the friendly and helpful one by offering help when others need it. Do not be so enthusiastic that it gets annoying, but be willing to lend a hand when someone asks. Even when no one is asking, you might want to volunteer to help someone occasionally, if you have the time. However, do not slack off on your own work to help others.

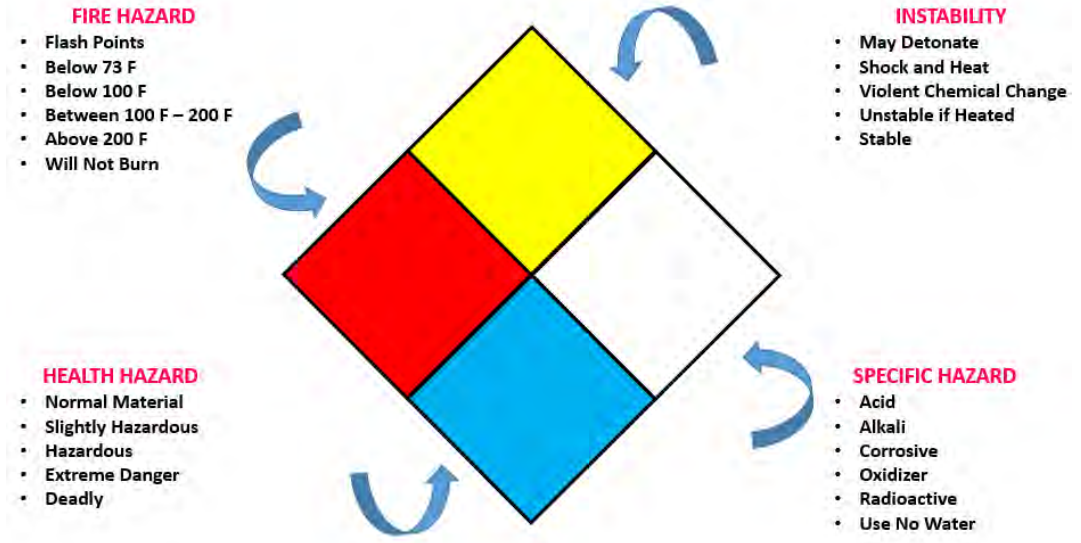
4.1.5 Professional Skill

On completion of the session, the trainee will be able to explain:

- Problem Reporting
- Potential Hazard

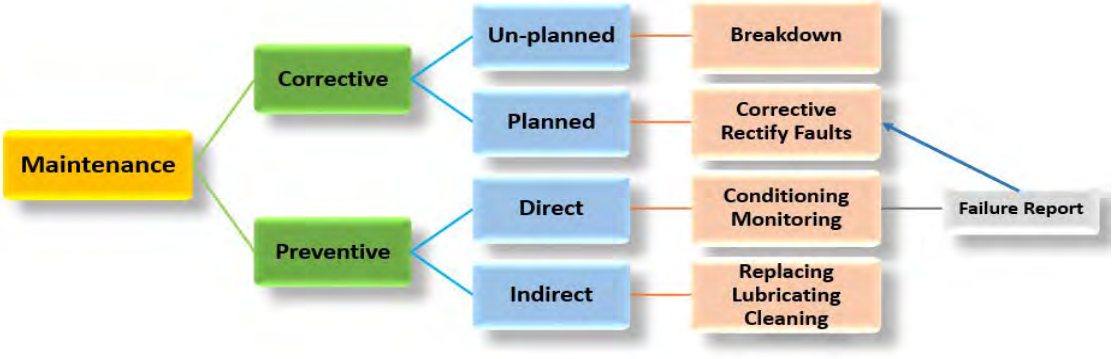
Problem Reporting:

1. Repetitive Defects
2. Machine Failure
3. Potential Hazards
4. Process Disruptions
5. Repair & Maintenance of Machine



PHYSICAL HAZARDS	CHEMICAL HAZARDS
• Slips/Falls/Trips • Falling Objects • Manual Handling	• Glues • Acids • Solvents
HEALTH HAZARDS	**BIOLOGICAL HAZARDS**
• Vibrations • Dusts/Fumes • Noise	• Hep B • Waste

Process Involved in Plant Maintenance:



4.1.6 Potential Source of Accident

On completion of the session, the trainee will be able to explain:

1. Types of Hazards

2. Emergency Response

Follow Procedures:

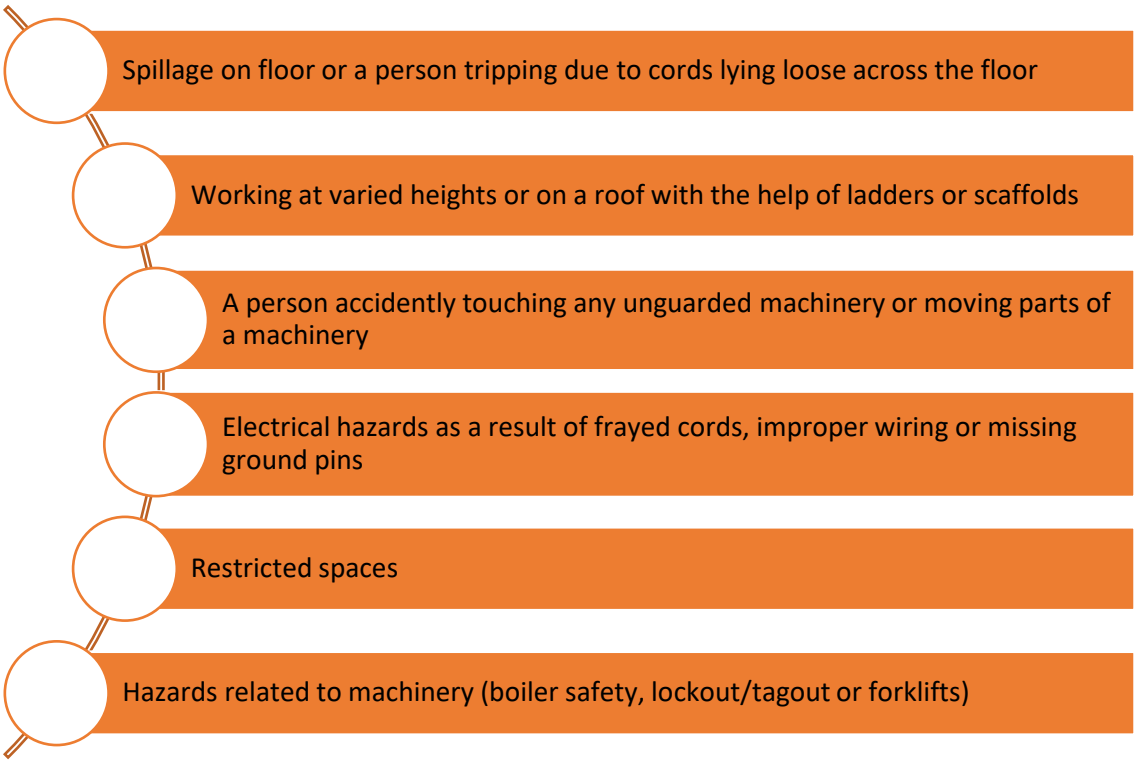
- Identifying and reporting potential hazards on time.
- Following company guidelines, policies and rules regarding hazard materials.
- Handling equipment and tools with care.
- Avoiding accidents while using dangerous chemicals, gases and sharp tools and hazards from machines involving exposure to possible injuries such as cuts, bites, stings, minor burns and so on.

Types of Hazards:

1. Safety Hazards
2. Biological Hazards
3. Physical Hazards
4. Ergonomics Hazards
5. Chemical Hazards

Safety Hazards

Death or any type of illness or injury caused due to unsafe conditions are categorized under safety hazards. The following figure lists some instances of safety hazards:



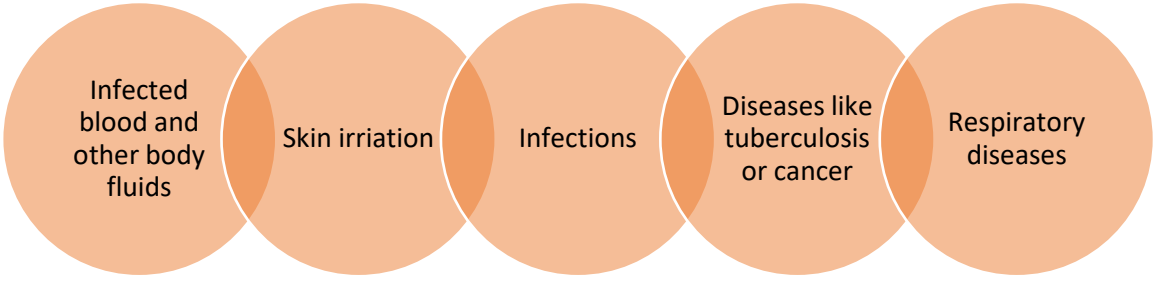
Biological Hazards

Any biological substance that may threaten health of humans as a result of toxins or viruses are known as biological hazards.

A person may be exposed to biological hazards in the following cases:

- Schools, colleges and universities
- Day care facilities,
- Hospitals, laboratories and nursing homes
- Outdoor occupations

The following figure lists the types of ill- health effects caused by biological hazards:



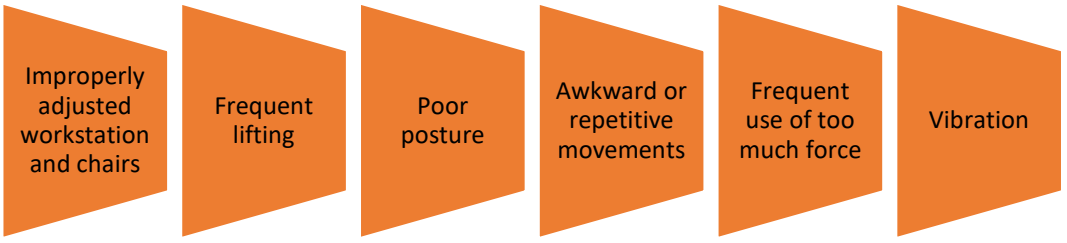
Physical Hazards

An occupational hazard caused by environmental factors is termed as a physical hazard. It includes hazards such as:

- Radiation caused by radio waves, microwaves or EMFs
- Sunlight/ultraviolet rays exposure
- Extreme temperatures, be it hot or cold
- Noise pollution

Ergonomic Hazards

Ergonomic hazards occur due to single/multiple factors within the working environment that pose a threat to the musculoskeletal system of an individual. An uncomfortable workstation leading to wrong sitting postures, repetitive movement of a body part causing sprain or strain, muscle sores, etc., are categorized under ergonomic hazards. The following figure lists some instances that may cause ergonomic hazards:

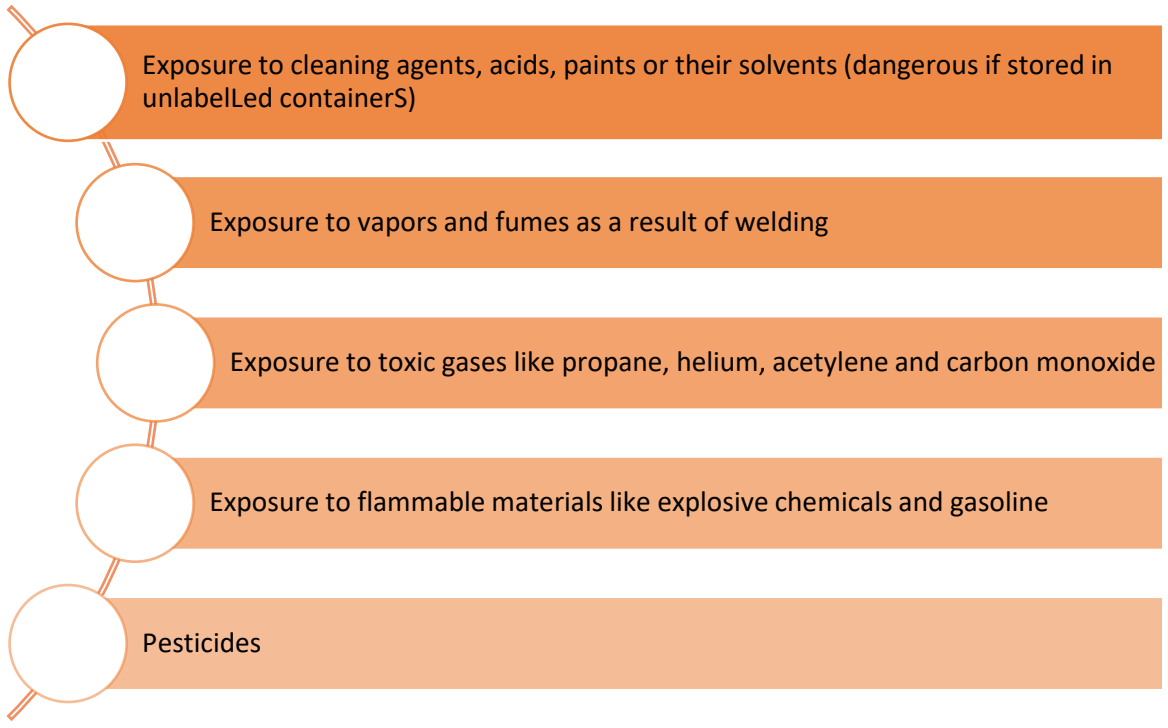


Chemical Hazards

Exposure to chemicals at a workplace is the main cause of chemical hazards. Exposure to chemicals can be due to working around items that involve chemical preparations in any

state solid, liquid or gas. Not all chemicals pose a threat, but there may be workers who are sensitive to even the mildest or non-toxic forms of chemical that is termed healthy. A person can be exposed to chemicals by inhalation of fumes, ingestion or poisoning.

The following figure lists some chemicals that one should be aware of:



4.1.7 Use of Safety Gears

On completion of the session, the trainee will be able to explain:

1. Safety Procedure
2. PPE

PPE are specially made to protect workers from:

- Injuries caused by impacts of electricity
- Electrical hazards
- Heat and chemicals
- Other occupational safety hazards

The following figure lists the PPE used at workplace:

PPE is the last measure of control when worker exposure to the safety hazards cannot be eliminated by feasible work practices or engineering control.

The following figure lists some responsibilities of employer and the employee regarding use of PPE:

Responsibilities of employer	Responsibilities of employee
• Assess hazards at the workplace • Provide PPE • Determine the use the PPE • Ensure protective helmet for employees at all times to avoid head injuries	• Use PPE as per the instructions received in the training • Inspect condition of PPE regularly • Maintain PPE and keep it in a clean/reliable condition

Protective clothes refer to clothing designed especially to protect workers from potential hazards. Lab coats and ballistic vests worn by electricians, scientists and law enforcement officials respectively fall under this category. The different items of the PPE can either be worn individually or in complete sets.

The following figure highlights different types of protections:

Skin protection

- The most common type of occupational diseases are related to skin and their treatment is expensive.
- Skin damage may be due to severe cuts, punctures, burns, abraisions or extreme temperatures.
- Any form of PPE acting as a barrier between the skin and agent of exposure is considered a skin protector.
- Gloves are an essential PPE for skin protection. For example: heat resistant gloves, cut-resistant gloves and chainsaw gloves.

Eye protection

- Example of eye injury is when solid particles such as wood chips, cement, metal slivers, or sand get into the eye.
- Smaller and larger particles in smoke, such as broken glass, also account for particulate matter causing eye injuries.
- Goggles provide better protection than safety glasses and are effective in preventing eye injury from a dusty environment, chemical splashes, and welding.

Hearing protection

- Industrial noise is an occupational hazard, though it is not visible to the eye.
- About 82% of occupational hearing loss cases occurred to workers in the manufacturing sector.
- Hearing protection must be used whenever an employee's noise exposure exceeds an 8-hour time-weighted average (TWA) sound level of 90 dBA. Noise levels above 115 dBA require control measures for any duration.
- PPE for hearing protection consists of earplugs and earmuffs.

Foot protection

- It may be due to exposure of foot to heavy objects such as barrels or tools that might roll onto or fall on employees' feet, sharp objects such as nails or spikes that might pierce ordinary shoes and molten metal that might splash on feet; it may be due to hot, wet or slippery surfaces.
- Safety shoes have impact-resistant toes and heat-resistant soles and may be electrically conductive for use in explosive atmosphere or nonconductive for protection from electrical hazards.

4.1.8 Safety Procedure

On completion of the session, the trainee will be able to explain:

- Safety Procedure
- Fire Safety
- Electrical Safety

Safety Policies

A health and safety policy is a written declaration made by an employer. It states the company's commitment for safeguarding the health and safety of the workers and also is an assurance to the public. It is a signed document made by the management related to the health and safety of the employees. A workplace requires a health and safety policy for the following reasons:

- To show complete commitment towards their health and safety of employees
- To prove to the employees that safety performance and work performance are in harmony with each other
- To give a clear statement of the company's objectives, principles, plans, ideas and procedures
- To increase buy-in through all divisions of the company
- To provide a definite outline of the accountability of the organization for the health and safety of the workers and also give a clear idea of the responsibility of the employer and the employees.
- To abide by the Occupational Health and Safety Act
- To define practices and processes to be adhered at the workplace to avoid injuries and diseases

Responsibilities towards Safety Policies

All the members in an organization have their own responsibilities to ensure workplace safety. There is a safety committee in an organization. All the workers and managers as well as the safety committee members need to carry out their responsibilities related to safety.

The following figure highlights the responsibilities towards safety policies:

Safety Committee Responsibilities	•Detect unsafe conditions and work practices by inspecting the facility regularly •Participate actively in health and safety training programmes and evaluate the programme's effectiveness •Plan improvements to existing procedures, health and safety rules, and plan safety promotions/incentives •Assessing personal protective equipment (PPE) needs •Overseeing emergency response preparedness and tests •Performing job safety analysis and serving as a resource for questions on safety •Immediately investigate workplace accidents
Responsibilities of Managers	•Familiarize employees with the OHS program, ensuring its effective implementation in the plant and enforce all company safety rules consistently and fairly •Beware of all safety considerations on introduction of a new process/procedure, machine/material to the workplace and providing safety training to employees before assigning duties •Give maximum support to programmes and committees that promote health and safety •Review and complete all reports related to an accident/incident, when required, to ensure fulfilment of all requirements so that appropriate action is taken to prevent recurrence •See that all injuries, even minor ones, are treated immediately and referred to a medical facility, if necessary •Inspect the work area regularly to look out for unsafe conditions and work practices and ensuring that unsafe or harmful conditions found in the course of inspections or incident investigations are remedied without delay •Conduct risk assessments for potential hazards from ergonomic hazards, violence at the workplace or emergencies to minimizing risks. •Conduct a safety orientation for all new employees, as well as for existing employees who are learning a new role and including the risks associated with the role •Ensure that all employees are healthy at work
Responsibilities of Workers	•Work with care and attention at all times and wear protective equipment as needed or required •Operate equipment/machinery after receiving the proper instructions •Report minor/major injuries/symptoms to the manager to enable action towards prevention and take possible remedy action to ensure that no one gets hurt •Encourge co-workers to work safely and assist them to have a safe working environment by suggesting actions to improve the effectiveness of the programme on health and safety •Maintain equipment in good, safe working order and check the usage of guards and safety devices on equipment as per the standards •Adhere to all safety rules and regulations •Take necessary steps to improve health and attendance as every employee has an obligation to meet the attendance requirements of the job; When an employee shows extraordinarily long absences, the rest of the team can be placed in a compromising position and conditions could become unsafe

Fire Safety

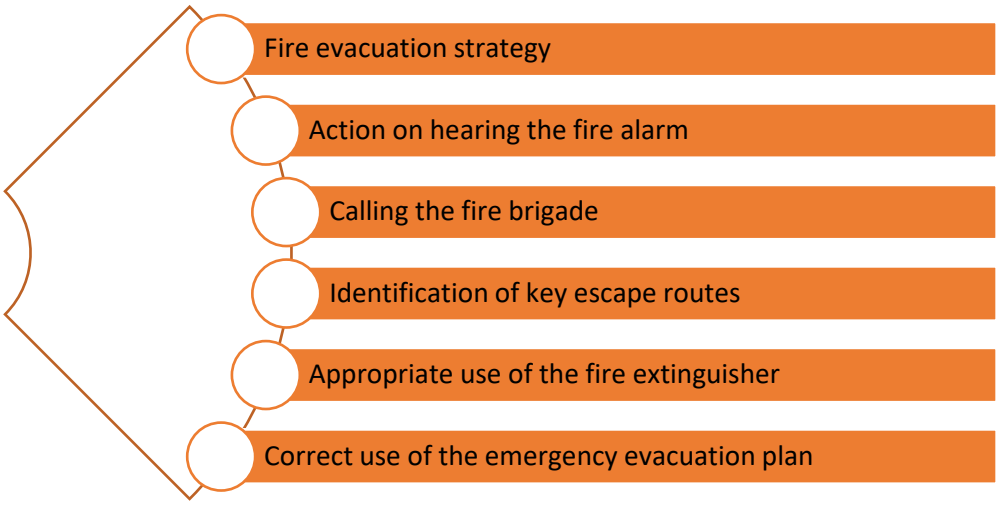
It is essential to ensure safety from fire whether a professional is working onsite or offsite.

To ensure fire safety, the panel installer should do the following:

- In case of fire, break the glass of the nearest manual call point and try to alert persons in the immediate area of danger.
- Dial the emergency phone number and inform other persons about the location of the fire and/or use the fire bell.
- Attempt to extinguish the fire using the nearest suitable fire fighting equipment, without exposing yourself to undue risk.
- If you are familiar with the plant machinery or equipment affected by fire, isolate it for containment and to avoid further spread of the fire.
- If the fire is from electrical power, do not use water until the main supply is switched off.
- Nobody is allowed to get water from hose reel and hydrants except to put off fire.
- Strictly obey "No Smoking" instructions.
- A fire drill is normally carried out every six months. Educate and expertise every person in fire fighting by nominating them in these drills.

A fire drill is a practice of the procedure of evacuating a building in case of an emergency.

The following points should be kept in focus while conducting a fire drill:



After completion of the drill, one should:

- Record the total evacuation time.
- Silence the alarms.
- Bring the fire alarm system back to its normal operating condition.
- Re-evaluate and discuss concerns arising during the fire drill.
- Keep records and notes of the fire drill and update the evacuation checklist report.

Electrical Safety:

This involves ensuring the following:

The wiring is adequate.	The electrical equipment is appropriate for the environment, with the correct capacity and labeling.	The equipment is in good condition and not damaged before installation.	The current will break at the listed rating for the circuit breaker.
Electrical parts are not exposed.	The overhead power-lines are not within contact range of the work area.	The wires do not have poor insulation.	Electrical systems and tools are grounded or double-insulated.
Circuits are not overloaded.	Damaged power tools and equipment are removed from the site.	Appropriate PPE is used by the employees.	Appropriate tools are used by the employees.
Chemicals are labeled and used correctly.	The ladders do not conduct electricity.	The area is dry with no standing water.	The equipment is installed securely.

4.1.9 Safety Measures

On completion of the session, the trainee will be able to explain:

1. Safety measures before starting of work
2. Safety measures during work
3. Safety measures after completion of work

Safety procedures and measures are dependent on the type of work. There may be a need for electrical safety, fire safety or mechanical safety for a panel installer. The following figure lists the general measures an employee should be aware of to ensure safety:

Daily safety instructions

- Take safety measures to prevent accidents.
- Ensure zero accidents while at work.
- Avoid damaging components caused by negligence in electrostatic discharge (ESD) procedure.
- Ensure no loss for company due to safety negligence.
- Ensure proper maintainance of machine and work process for achieving quality output as per the company standards.

Before starting work

- Plan and discuss requirement of work to be done.
- Consider potential hazards and measures to be taken.
- Confirm permission to isolate (use a permit system if relevant).
- Isolate the electrical equipment or circuit.
- Place a "DANGER, DO NOT OPERATE" tag.
- Put up safety barriers when required.
- Use the correct earthing equipment.
- Cover and insulate a nearby live apparatus.
- Check test instruments and get authorization to do the work.

When working

- Use safety observers when required.
- Always wear PPE.
- Never rely on memory.
- Connect the earth and neutral conductors first.
- Check the isolation points before resuming work after a break.
- Check and clean the tools that are used regularly.
- Use non-conducting tape measures.

After completion of work

- Check if tools are left after work completion.
- Remove own earthing equipment.
- Notify all personnel involved that the equipment will be energized.
- Hand in the work permit (if relevant).
- Remove "DANGER, DO NOT OPERATE" tags.
- Switch off all machineries.
- Remove and store all PPE properly.

4.1.10 Organizational Safety Policies

On completion of the session, the trainee will be able to explain:

1. Environmental Health and Safety(EHS)
2. Management System

EHS Policy

The following figure highlights some important points from EHS policy guidelines:

Provide a conducive work environment for all employees, ensuring their health and safety while taking all relevant steps to protect the environment.

Protect the environment by conserving natural resources through elimination of waste generation and prevention of environmental pollution.

Protect the health and safety of all employees, visitors, contractors or suppliers at the plant.

Comply with all applicable regulatory requirements legally that relate to occupational and environmental health and safety.

Make continual improvements in protecting environment and occupational health and safety performance by improving processes, introducing and investing in new technologies and upgrading competence and awareness of the employees.

EMS Policy

To minimize the risk of 'environmental impacts', some objectives and targets are set. The following points to the list of the primary objectives and goals set at ISO14001- certified plants.

- Minimization of wastes and enhancement of recycling rate
- Advancement of energy and resource conservation
- Adequate supervision of chemical substances
- Promotion of environmentally friendly products

The following table lists some other objectives and targets of EMS policy:

Aspect	Objectives	Targets
Use of paper	Reduction in use of paper	Reduction in use of paper by 25% within a year
Consumption of electricity	Reduction in the consumption of electricity	Reduction in the consumption of electricity by 20% within 1 year (based on current year consumption)
Use of cleaning material	Reduction in the use of hazardous cleaning material	Reduction in the usage of cleaning material by 25% within a year
Use of hazardous chemicals such as solder paste, epoxy potting and tin-lead solder	Increased use of environmental friendly alternative chemicals	Reduction in the usage of these chemicals by 5% within a year

H&S Policy

The following figure lists some of the objectives and key measures of health and safety policy:

Priority Actions	Measures/Key Performance Indicators
Make workplace free from injuries and illnesses	
• Improve workstation ergonomics • Reduce manual handling slips, trips and falls • Provide EHS training, safety audits and participation	• Number of incidents/accidents and near misses • First aid incidents • Number of days lost
Improve Occupational Health and Safety Assessment Series (OHSAS) knowledge throughout the organization	
• Provide EHS training, as per defined needs, of at least 6 hours to each employee • Improve OHSAS knowledge by employee participation	• Number of hours of training given to each employee in a year • Number of suggestions received from workers to improve workplace safety besides internal audit findings and safety audit findings

Health and Safety Objectives:

Priority actions	Measures / KPI(key performance indicator)
Make workplace free from injuries and illnesses	
1. Make workplace free from injuries and illnesses by: • Improving workstation ergonomics • Reducing manual handling • Reducing slips, trips and falls • EHS training, safety audits & participation	• Number of incidents/ accidents & near misses • First Aid incidents • No of days lost • Near misses
Improve OHSAS(Occupational Health and Safety Assessment Series) knowledge throughout the organization	
2. Provide EHS Training as per defined needs of at least 6 hour to each employee 3. Improve OHSAS knowledge by employee participation	• Number of hours training given to each employee in a year • Number of suggestion received from workers to improve work place safety besides internal audit finding and safety audits findings

Safety Committee Responsibilities:

Responsibilities of the committee shall include:

- Inspecting the facility at regular intervals to spot insecure conditions and unsafe work procedures.
- Participating earnestly in programs related to health and safety training and assessing the result of such programs.
- Planning enhancement of the existing health and safety norms, practices and regulations.
- Determining PPE requirements
- Supervising emergency response readiness and tests.
- Acting as a resource for answers to safety questions.
- Devising safety campaigns and incentives.
- Investigating promptly all workplace accidents and carrying out analysis of job safety.

EHS Responsibilities of Managers:

- Get acquainted with the OHS program and make certain that it is effectively implemented in the plant.
- Ensure awareness of all safety concerns when presenting a new method, process, gadget or material at workplace.
- Make provision for safety training of the employees prior to giving them duties. Ensure that the employees sign off during the training program.
- Implement all company safety rules and regulations consistently and justly.

- Give encouragement to programs and councils that work for the promotion of health and safety.
- Analyze all mishaps and the entire investigation reports of all the incidents/accidents to make certain that the documentation is complete and the required precaution has been taken to rule out recurrence.
- Ensure reporting of all important work related mishaps by filling up the Incident/ Accident Reporting Form # FMT-H&S-001-00 within 24 hours of the occurrence.
- Ensure that all injuries have been given prompt treatment and have been referred for medical care, if required.
- Examine the work place regularly to find out insecure conditions and unsafe work procedures.
- Make certain that if insecure and harmful conditions were detected during inspection or investigation process, they are corrected immediately.
- Carry out analysis of potential risks from violence in the work area.
- Plan a safety orientation program for new workers as well as the existing ones who are preparing themselves for a new role.
- Remove or reduce all conditions that endanger the employees by enforcing control measures, guiding and training the workers and assessing the effectiveness of the control measures.
- Make certain that all employees are physically fit and competent for the work they have been assigned. An employee must not be given a task where a disability, handicap or injury may pose a risk to own self or others.

EHS Responsibilities of Workers

- Refrain from deliberately putting oneself or others in danger.
- Take part in inspections and inquiries, whenever required.
- Perform jobs with utmost care and concentration
- Use protective gear whenever it is needed.
- Refrain from operating machines or tools in the absence of appropriate instructions.
- Ensure prompt reporting of all mishaps, injuries and illnesses to the manager for implementation of preventive measures
- Motivate the coworkers to do their duties cautiously.
- Report dangerous actions or situations to the manager and try to rectify the conditions so that no one gets injured.
- Ensure guards and safety gadgets on the equipment are utilized as per instructions.
- Keep the equipment in a sound and secure working condition.
- Follow all the safety norms and regulations.
- Ensure that if there is a mishap and one gets injured, the doctor's instructions must be followed and the management team's advice too should be heeded for a fast recovery.
- Adhere to the attendance specification of the job. If an employee is absent for a long duration, the rest of the team gets effected and unsafe conditions could arise. Hence, proper care of health is important to maintain the required attendance.

- Help in creating a secure work environment by suggesting measures that will facilitate the health and safety programs.

Housekeeping

Good housekeeping is an observable proof of management and their concerned for health and safety of an employee on a daily basis. A workplace well in order adds to the safe working environment and minimizes obstacles that are a threat to health and safety.

The following figure lists the purpose of housekeeping:

4.1.11 Communicational Skill

On completion of the session, the trainee will be able to explain:

- Effective communication at Workplace
- Skillful Learning
- Impact of Emotions

Introduction:

- The ability to effectively communicate with others is one of the most powerful tools for personal and/or professional success.
- Most people are challenged by the daily interactions with co-workers, family and friends.
- Emotion communication and conflict are present in all human interactions and affect each of us in different ways.
- Maximum number of problems at workplace are communication related.

- Effective communication helps employees influence others people.
- The capacity to communicate effectively is often an indicator of a person's capability and intelligence.

Past Experiences Shape the Communication Style:

- The cycle is perpetual. Your thoughts are influenced by your experiences. These thoughts shape your attitude. These attitudes act as a blueprint for fresh experiences that forms behavioral patterns.
- You should be aware of your personal style to be able to change your negative attitude into a positive one.
- This awareness will enable you to become personally responsible and accountable for all steps taken to change your behavior.

Acknowledgement:

- Listen carefully to the speaker and give your acknowledgement, even though you might disagree. Avoid expressing your view point at this juncture.
- Acknowledgement of the speaker's words and feelings does not imply that you agree with those viewpoints or acts.
- Your keen listening abilities and acknowledgement of the speaker's words assures the latter of being understood.

Reflecting Back:

- Before replying to the speaker, analyze and reflect on what you have heard.
- Pausing to reflect serves as encouragement and allows the speaker to explain the topic.
- The feedback determines how meaningful the exchanges between you and the speaker are going to be.
- You will be able give apt and precise feedbacks to a speaker's emotions and thoughts, if you are actively involved in the process of listening.
- You should try to put yourself in the speaker's place and try to experience what the latter is trying to convey. You must try to understand the speaker's feelings by using your own experience.

Communicating Long or Emotional Messages:

- Explain the motive of your conversation briefly.
- The listeners will pay more heed to your words if they realize the time and effort they be giving to the conversation.
- Make use of statements with "I" to communicate your emotions, expectations or incidents you have personally seen or heard.
- Refrain from involving yourself in verbal fights. If there is need for criticism, focus on the behavior and not the person.
- State the requirements or expectations in a positive tone.

Five Components of Your Message

Communication should comprise of five essential components as mentioned below:

- What is being seen- have seen earlier
- What is being heard- have heard earlier
- What is being felt-have felt regarding the issue
- What the positive effect will be after your request or expectation has been acted upon/received

Emotional Obstacles

Emotional obstacles to effective communication include:

- People may refrain from expressing their true feelings as they are hesitant to reveal themselves to others.
- People may evade expressing their thoughts because they are afraid of hurting the other person's feelings.
- The norms of the society, profession or culture may come in the way of the expression of certain feelings.
- People desire the support and acceptance of others. The fear of rejection might prohibit them from saying what they really mean.

Manage Your Emotions

- Identify your true feelings, whether you are annoyed, hurt or contrite.
- Describe your feelings in a simple and specific manner.
- Restrain yourself from taking an immediate action or a decision , based on your feelings. Avoid discussions or communication when angry or frustrated.
- Select a proper time and situation to communicate.
- Acknowledge that you are responsible for your feelings. While communicating use" I" statements. "I feel angry" should be said and not" You make me angry".

Managing a Conflict

- Try to be calm by regulating your breathing. Keep in mind that the present moment is only temporary and shall pass.
- Focus on what can be done to move ahead rather than thinking about the other person's errors.
- Sum up the main points of the other person's feelings to comprehend what they are trying to communicate.
- Obtain confirmation from the other person regarding their feelings.
- Never hesitate to accept and apologize for your mistakes.
- Concentrate on positive results and make all efforts which are required for the achievement of these targets.

4.1.12 Reporting Structure

On completion of the session, the trainee will be able to explain:

1. Organizational Structure

Importance of having a Structure

- All organizations need to organize what they do.
- A definite structure makes it easier to perceive the functions of the different parts of the business.
- A business can be structured in different ways.

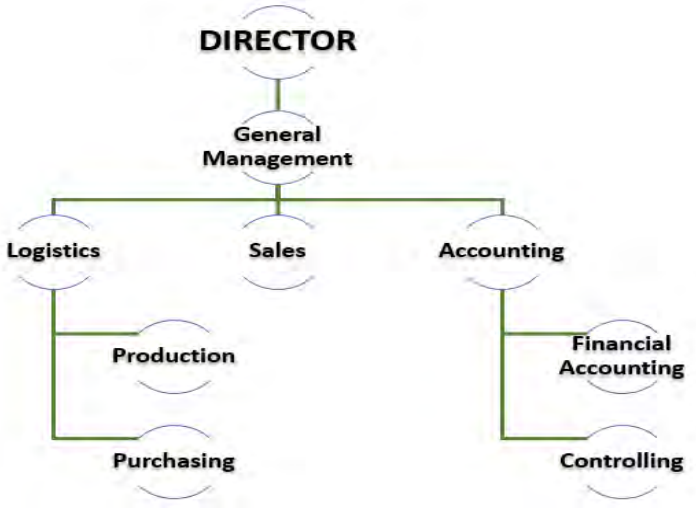
Ways to Structure a Business

- According to the function: The business is organized according to what is being done by each department or section.
- According to the product or activity: The business is arranged as per the product or activity.
- According to the area: The business is organized as per the geographical or regional area.
- According to the customer: The business is structured based on the fact that different customer categories have different requirements.
- According to the process: The business is organized as per the stages that the products have to go through as they are being made.

Pros and Cons of Different Structures

- There are certain merits/demerits of the various types of business structures.
- These depend on the type, size and structure of the business.

Let us look at a functional structure:



Functional Structure

Advantages

- A major advantage is that there is specialization. Each department concentrates on its own activities.
- There is accountability in this type of structure. Each section is managed by a responsible person.
- There is clarity as everyone knows their own roles as well as that of the others.

Disadvantages

- Since the communication is closed, it could decrease the focus.
- The departments could become averse to changes.
- Coordination could become a lengthy process.
- The top and bottom tier of the structure has a big gap in between them.

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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

ESSCI

5. Employability & Entrepreneurship Skills

Key Learning Outcomes

At the end of this module, you 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
32. Identify the basic parts of a computer
33. Identify the basic parts of a keyboard
34. Recall basic computer terminology
35. Recall the functions of basic computer keys
36. Discuss the main applications of MS Office
37. Discuss the benefits of Microsoft Outlook
38. Discuss the different types of e-commerce
39. List the benefits of e-commerce for retailers and customers
40. Discuss how the Digital India campaign will help boost e-commerce in India
41. Describe how you will sell a product or service on an e-commerce platform
42. Discuss the importance of saving money

43. Discuss the benefits of saving money
44. Discuss the main types of bank accounts
45. Describe the process of opening a bank account
46. Differentiate between fixed and variable costs
47. Describe the main types of investment options
48. Describe the different types of insurance products
49. Describe the different types of taxes
50. Discuss the uses of online banking
51. Discuss the main types of electronic funds transfers
52. Discuss the steps to prepare for an interview
53. Discuss the steps to create an effective Resume
54. Discuss the most frequently asked interview questions
55. Discuss how to answer the most frequently asked interview questions
56. Discuss basic workplace terminology
57. Discuss the concept of entrepreneurship
58. Discuss the importance of entrepreneurship
59. Describe the characteristics of an entrepreneur
60. Describe the different types of enterprises
61. List the qualities of an effective leader
62. Discuss the benefits of effective leadership
63. List the traits of an effective team
64. Discuss the importance of listening effectively
65. Discuss how to listen effectively
66. Discuss the importance of speaking effectively
67. Discuss how to speak effectively
68. Discuss how to solve problems
69. List important problem solving traits
70. Discuss ways to assess problem solving skills
71. Discuss the importance of negotiation
72. Discuss how to negotiate
73. Discuss how to identify new business opportunities
74. Discuss how to identify business opportunities within your business
75. Explain the meaning of entrepreneur
76. Describe the different types of entrepreneurs
77. List the characteristics of entrepreneurs
78. Recall entrepreneur success stories
79. Discuss the entrepreneurial process
80. Describe the entrepreneurship ecosystem
81. Discuss the purpose of the Make in India campaign
82. Discuss key schemes to promote entrepreneurs
83. Discuss the relationship between entrepreneurship and risk appetite
84. Discuss the relationship between entrepreneurship and resilience
85. Describe the characteristics of a resilient entrepreneur
86. Discuss how to deal with failure

87. Discuss how market research is carried out
88. Describe the 4 Ps of marketing
89. Discuss the importance of idea generation
90. Recall basic business terminology
91. Discuss the need for CRM
92. Discuss the benefits of CRM
93. Discuss the need for networking
94. Discuss the benefits of networking
95. Discuss the importance of setting goals
96. Differentiate between short-term, medium-term and long-term goals
97. Discuss how to write a business plan
98. Explain the financial planning process
99. Discuss ways to manage your risk
100. Describe the procedure and formalities for applying for bank finance
101. Discuss how to manage your own enterprise
102. List important questions that every entrepreneur should ask before starting an enterprise

UNIT 5.1: Personal Strengths & Value Systems

Unit Objectives

At the end of this unit, participant 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
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28. Discuss tips for anger management
29. Discuss the causes of stress
30. Discuss the symptoms of stress
31. Discuss tips for stress management

5.1.1 Health, Habits, Hygiene: What is Health?

As per the World Health Organization (WHO), health is a "State of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity." This means being healthy does not simply mean not being unhealthy – it also means you need to be at peace emotionally, and feel fit physically. For example, you cannot say you are healthy simply because you do not have any physical ailments like a cold or cough.

You also need to think about whether you are feeling calm, relaxed and happy.

Common Health Issues

Some common health issues are:

- Allergies
- Asthma
- Skin Disorders
- Depression and Anxiety
- Diabetes
- Cough, Cold, Sore Throat
- Difficulty Sleeping
- Obesity

Prevent Health Issues

Taking measures to prevent ill health is always better than curing a disease or sickness. You can stay healthy by:

- Eating healthy foods like fruits, vegetables and nuts
- Cutting back on unhealthy and sugary foods
- Drinking enough water everyday
- Not smoking or drinking alcohol
- Exercising for at least 30 minutes a day, 4-5 times a week
- Taking vaccinations when required
- Practicing yoga exercises and meditation

How many of these health standards do you follow? Tick the ones that apply to you.

1. Get minimum 7-8 hours of sleep every night. ☐
2. Avoid checking email first thing in the morning and right before you go to bed at night. ☐
3. Don't skip meals – eat regular meals at correct meal times. ☐
4. Read a little bit every single day. ☐
5. Eat more home cooked food than junk food. ☐
6. Stand more than you sit. ☐
7. Drink a glass of water first thing in the morning and have at least 8 glasses of water through the day. ☐
8. Go to the doctor and dentist for regular check-ups. ☐
9. Exercise for 30 minutes at least 5 days a week.

10. Avoid consuming lots of aerated beverages. ☐

What is Hygiene?

As per the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases." In other words, hygiene means ensuring that you do whatever is required to keep your surroundings clean, so that you reduce the chances of spreading germs and diseases.

For instance, think about the kitchen in your home. Good hygiene means ensuring that the kitchen is always spick and span, the food is put away, dishes are washed and dustbins are not overflowing with garbage. Doing all this will reduce the chances of attracting pests like rats or cockroaches, and prevent the growth of fungus and other bacteria, which could spread disease.

How many of these health standards do you follow? Tick the ones that apply to you.

1. Have a bath or shower every day with soap – and wash your hair with shampoo 2-3 times a week. ☐
2. Wear a fresh pair of clean undergarments every day. ☐
3. Brush your teeth in the morning and before going to bed. ☐
4. Cut your fingernails and toenails regularly. ☐
5. Wash your hands with soap after going to the toilet. ☐
6. Use an anti-perspirant deodorant on your underarms if you sweat a lot. ☐
7. Wash your hands with soap before cooking or eating. ☐
8. Stay home when you are sick, so other people don't catch what you have. ☐
9. Wash dirty clothes with laundry soap before wearing them again. ☐
10. Cover your nose with a tissue/your hand when coughing or sneezing. ☐

See how healthy and hygienic you are, by giving yourself 1 point for every ticked statement! Then take a look at what your score means.

Your Score

0-7/20: You need to work a lot harder to stay fit and fine! Make it a point to practice good habits daily and see how much better you feel!

7-14/20: Not bad, but there is scope for improvement! Try and add a few more good habits to your daily routine.

14-20/20: Great job! Keep up the good work! Your body and mind thank you!

We have already discussed the importance of following good hygiene and health practices for ourselves. But, it is not enough for us to be healthy and hygienic. We must also extend this standard to our homes, our immediate surroundings and to our country as a whole.

Swachh Bharat Abhiyan

The 'Swachh Bharat Abhiyan' (Clean India Mission) launched by Prime Minister Shri Narendra Modi on 2nd October 2014, believes in doing exactly this. The aim of this mission is to clean the streets and roads of India and raise the overall level of cleanliness. Currently this mission covers 4,041 cities and towns across the country. Millions of our people have taken the pledge for a clean India. You should take the pledge too, and do everything possible to keep our country clean!

What are Habits?

A habit is a behaviour that is repeated frequently. All of us have good habits and bad habits. Keep in mind the phrase by John Dryden: "We first make our habits, and then our habits make us." This is why it is so important that you make good habits a way of life, and consciously avoid practicing bad habits.

Some good habits that you should make part of your daily routine are:

- Always having a positive attitude
- Smiling! Make it a habit to smile as often as possible
- Making exercise a part of your daily routine
- Making time for family and friends
- Reading motivational and inspirational stories
- Going to bed early and waking up early

Some bad habits that you should quit immediately are:

- Skipping breakfast
- Smoking, drinking alcohol and doing drugs
- Snacking frequently even when you are not hungry
- Spending more money than you can afford
- Eating too much fattening and sugary food
- Worrying about unimportant issues
- Staying up late and waking up late

Tips

- Following healthy and hygienic practices every day will make you feel good mentally and physically.
- Hygiene is two-thirds of health – so good hygiene will help you stay strong and healthy

5.1.2: Safety: Tips to Design a Safe Workplace

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Use ergonomically designed furniture and equipment to avoid stooping and twisting
- Provide mechanical aids to avoid lifting or carrying heavy objects
- Have protective equipment on hand for hazardous jobs
- Designate emergency exits and ensure they are easily accessible
- Set down health codes and ensure they are implemented
- Follow the practice of regular safety inspections in and around the workplace
- Ensure regular building inspections are conducted
- Get expert advice on workplace safety and follow it

Non-Negotiable Employee Safety Habits

Every employer is obligated to ensure that his workplace follows the highest possible safety protocol. When setting up a business, owners must make it a point to:

- Immediately report unsafe conditions to a supervisor
- Recognize and report safety hazards that could lead to slips, trips and falls
- Report all injuries and accidents to a supervisor
- Wear the correct protective equipment when required
- Learn how to correctly use equipment provided for safety purposes
- Be aware of and avoid actions that could endanger other people
- Take rest breaks during the day and some time off from work during the week

Tips

- Be aware of what emergency number to call at the time of a workplace emergency
- Practice evacuation drills regularly to avoid chaotic evacuati

5.1.3 Self-Analysis – Attitude, Achievement Motivation

To truly achieve your full potential, you need to take a deep look inside yourself and find out what kind of person you really are. This attempt to understand your personality is known as self-analysis. Assessing yourself in this manner will help you grow, and will also help you to identify areas within yourself that need to be further developed, changed or eliminated. You can better understand yourself by taking a deep look at what motivates you, what your attitude is like, and what your strengths and weaknesses are.

What is Motivation?

Very simply put, motivation is your reason for acting or behaving in a certain manner. It is important to understand that not everyone is motivated by the same desires – people are

motivated by many, many different things. We can understand this better by looking at Maslow's Hierarchy of Needs.

Maslow's Hierarchy of Needs

Famous American psychologist Abraham Maslow wanted to understand what motivates people. He believed that people have five types of needs, ranging from very basic needs (called physiological needs) to more important needs that are required for self-growth (called self-actualization needs). Between the physiological and self-actualization needs are three other needs – safety needs, belongingness and love needs, and esteem needs. These needs are usually shown as a pyramid with five levels and are known as Maslow's Hierarchy of Needs.

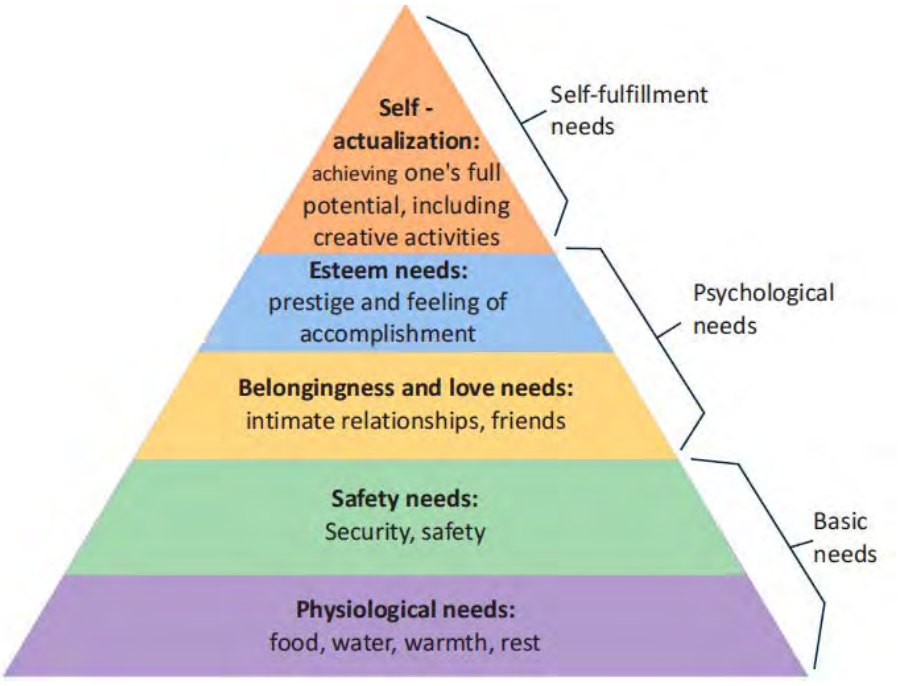

Fig. 7.1.1: Maslow's Hierarchy of Needs

As you can see from the pyramid, the lowest level depicts the most basic needs. Maslow believed that our behaviour is motivated by our basic needs, until those needs are met. Once they are fulfilled, we move to the next level and are motived by the next level of needs. Let's understand this better with an example.

Rupa comes from a very poor family. She never has enough food, water, warmth or rest. According to Maslow, until Rupa is sure that she will get these basic needs, she will not even think about the next level of needs – her safety needs. But, once Rupa is confident that her basic needs will be met, she will move to the next level, and her behaviour will then be motivated by her need for security and safety. Once these new needs are met, Rupa will once again move to the next level, and be motivated by her need for relationships and friends. Once this need is satisfied, Rupa will then focus on the fourth level of needs – her

esteem needs, after which she will move up to the fifth and last level of needs – the desire to achieve her full potential.

Understanding Achievement Motivation

We now know that people are motivated by basic, psychological and self-fulfilment needs. However, certain people are also motivated by the achievement of highly challenging accomplishments. This is known as Achievement Motivation, or 'need for achievement'. The level of motivation achievement in a person differs from individual to individual. It is important that entrepreneurs have a high level of achievement motivation – a deep desire to accomplish something important and unique. It is equally important that they hire people who are also highly motivated by challenges and success.

What Motivates You?

What are the things that really motivate you? List down five things that really motivate you. Remember to answer honestly!

I am motivated by:

_____

_____

_____

_____

Characteristics of Entrepreneurs with Achievement Motivation

Entrepreneurs with achievement motivation can be described as follows:

- Unafraid to take risks for personal accomplishment
- Love being challenged
- Future-oriented
- Flexible and adaptive
- Value negative feedback more than positive feedback
- Very persistent when it comes to achieving goals
- Extremely courageous
- Highly creative and innovative
- Restless - constantly looking to achieve more
- Feel personally responsible for solving problems

Think about it:

- How many of these traits do you have?
- Can you think of entrepreneurs who display these traits?

What is Attitude?

Now that we understand why motivation is so important for self-analysis, let's look at the role our attitude plays in better understanding ourselves. Attitude can be described as your tendency (positive or negative), to think and feel about someone or something. Attitude is

the foundation for success in every aspect of life. Our attitude can be our best friend or our worst enemy. In other words:

Now that we understand why motivation is so important for self-analysis, let's look at the role our attitude plays in better understanding ourselves. Attitude can be described as your

tendency (positive or negative), to think and feel about someone or something. Attitude is the foundation for success in every aspect of life. Our attitude can be our best friend or our worst enemy. In other words:

"The only disability in life is a bad attitude."

When you start a business, you are sure to encounter a wide variety of emotions, from difficult times and failures to good times and successes. Your attitude is what will see you through the tough times and guide you towards success. Attitude is also infectious. It affects everyone around you, from your customers to your employees to your investors. A positive attitude helps build confidence in the workplace while a negative attitude is likely to result in the demotivation of your people.

How to Cultivate a Positive Attitude?

The good news is attitude is a choice. So, it is possible to improve, control and change our attitude, if we decide we want to!

The following tips help foster a positive mindset:

- Remember that you control your attitude, not the other way around
- Devote at least 15 minutes a day towards reading, watching or listening to something positive
- Avoid negative people who only complain and stop complaining yourself
- Expand your vocabulary with positive words and delete negative phrases from your mind
- Be appreciative and focus on what's good in yourself, in your life, and in others
- Stop thinking of yourself as a victim and start being proactive
- Imagine yourself succeeding and achieving your goals

What Are Your Strengths and Weaknesses?

Another way to analyse yourself is by honestly identifying your strengths and weaknesses. This will help you use your strengths to your best advantage and reduce your weaknesses.

Note down all your strengths and weaknesses in the two columns below. Remember to be honest with yourself!

Strengths	Weaknesses

Tips

- Achievement motivation can be learned.
- Don't be afraid to make mistakes.
- Train yourself to finish what you start.
- Dream big.

5.1.4 Honesty & Work Ethics: What is Honesty?

Honesty is the quality of being fair and truthful. It means speaking and acting in a manner that inspires trust. A person who is described as honest is seen as truthful and sincere, and as someone who isn't deceitful or devious and doesn't steal or cheat. There are two dimensions of honesty – one is honesty in communication and the other is honesty in conduct.

Honesty is an extremely important trait because it results in peace of mind and builds relationships that are based on trust. Being dishonest, on the other hand, results in anxiety and leads to relationships full of distrust and conflict.

Qualities of Honest People

Honest individuals have certain distinct characteristics. Some common qualities among honest people are:

1. They don't worry about what others think of them. They believe in being themselves – they don't bother about whether they are liked or disliked for their personalities.
2. They stand up for their beliefs. They won't think twice about giving their honest opinion, even if they are aware that their point of view lies with the minority.
3. They are think skinned. This means they are not affected by others judging them harshly for their honest opinions.
4. They forge trusting, meaningful and healthy friendships. Honest people usually surround themselves with honest friends. They have faith that their friends will be truthful and upfront with them at all times.
5. They are trusted by their peers. They are seen as people who can be counted on for truthful and objective feedback and advice.

Importance of Honesty in Entrepreneurs

One of the most important characteristics of entrepreneurs is honesty. When entrepreneurs are honest with their customers, employees and investors, it shows that they respect those that they work with. It is also important that entrepreneurs remain honest with themselves.

Let's look at how being honest would lead to great benefits for entrepreneurs.

- **Honesty and customers:** When entrepreneurs are honest with their customers it leads to stronger relationships, which in turn results in business growth and a stronger customer network.
- **Honesty and employees:** When entrepreneurs build honest relationships with their employees, it leads to more transparency in the workplace, which results in higher work performance and better results.
- **Honesty and investors:** For entrepreneurs, being honest with investors means not only sharing strengths but also candidly disclosing current and potential weaknesses, problem areas and solution strategies. Keep in mind that investors have a lot of experience with start-ups and are aware that all new companies have problems. Claiming that everything is perfectly fine and running smoothly is a red flag for most investors.
- **Honesty with oneself:** The consequences of being dishonest with oneself can lead to dire results, especially in the case of entrepreneurs. For entrepreneurs to succeed, it is critical that they remain realistic about their situation at all times, and accurately judge every aspect of their enterprise for what it truly is.

What are Work Ethics?

Being ethical in the workplace means displaying values like honesty, integrity and respect in all your decisions and communications. It means not displaying negative qualities like lying, eating and stealing.

Workplace ethics play a big role in the profitability of a company. It is as crucial to an enterprise as high morale and teamwork. This is why most companies lay down specific workplace ethic guidelines that must compulsorily be followed by their employees.

These guidelines are typically outlined in a company's employee handbook.

Elements of a Strong Work Ethic

An entrepreneur must display strong work ethics, as well as hire only those individuals who believe in and display the same level of ethical behaviour in the workplace. Some elements of a strong work ethic are:

- **Professionalism**: This involves everything from how you present yourself in a corporate setting to the manner in which you treat others in the workplace.
- **Respectfulness**: This means remaining poised and diplomatic regardless of how stressful or volatile a situation is.
- **Dependability**: This means always keeping your word, whether it's arriving on time for a meeting or delivering work on time.
- **Dedication**: This means refusing to quit until the designated work is done, and completing the work at the highest possible level of excellence.
- **Determination**: This means embracing obstacles as challenges rather than letting them stop you, and pushing ahead with purpose and resilience to get the desired results.
- **Accountability**: This means taking responsibility for your actions and the consequences of your actions, and not making excuses for your mistakes.
- **Humility**: This means acknowledging everyone's efforts and had work, and sharing the credit for accomplishments.

How to Foster a Good Work Ethic?

As an entrepreneur, it is important that you clearly define the kind of behaviour that you expect from each and every team member in the workplace. You should make it clear that you expect employees to display positive work ethics like:

- **Honesty**: All work assigned to a person should be done with complete honesty, without any deceit or lies.
- **Good attitude**: All team members should be optimistic, energetic, and positive.
- **Reliability**: Employees should show up where they are supposed to be, when they are supposed to be there.
- **Good work habits**: Employees should always be well groomed, never use inappropriate language, conduct themselves professionally at all times and so on.
- **Initiative**: Doing the bare minimum is not enough. Every team member needs to be proactive and show initiative.
- **Trustworthiness**: Trust is non-negotiable. If an employee cannot be trusted, it's time to let that employee go.
- **Respect**: Employees need to respect the company, the law, their work, their colleagues and themselves.
- **Integrity**: Each and every team member should be completely ethical and must display above board behaviour at all times.
- **Efficiency**: Efficient employees help a company grow while inefficient employees result in a waste of time and resources.

Tips

- Don't get angry when someone tells you the truth and you don't like what you hear.
- Always be willing to accept responsibility for your mistakes.

5.1.5 Creativity & Innovation: What is Creativity?

Creativity means thinking outside the box. It means viewing things in new ways or from different perspectives, and then converting these ideas into reality. Creativity involves two parts: thinking and producing. Simply having an idea makes you imaginative, not creative. However, having an idea and acting on it makes you creative.

Characteristics of Highly Creative People

Some characteristics of creative people are:

- They are imaginative and playful
- They see issues from different angles
- They notice small details
- They detest rules and routine
- They love to daydream
- They are very curious

- They have very little tolerance for boredom

What is Innovation?

There are many different definitions of innovation. In simple terms, innovation means turning an idea into a solution that adds value. It can also mean adding value by

implementing a new product, service or process, or significantly improving on an existing product, service or process.

Characteristics of Highly Innovative People

Some characteristics of highly innovative people are:

- They embrace doing things differently
- They don't believe in taking shortcuts
- They are not afraid to be unconventional
- They are highly proactive and persistent
- They are organized, cautious and risk-averse

Tips

- Take regular breaks from your creative work to recharge yourself and gain fresh perspective.
- Build prototypes frequently, test them out, get feedback, and make the required changes.

5.1.6 Time Management: What is Time Management?

Time management is the process organizing your time, and deciding how to allocate your time between different activities. Good time management is the difference between working smart (getting more done in less time) and working hard (working for more time to get more done).

Effective time management leads to an efficient work output, even when you are faced with tight deadlines and high pressure situations. On the other hand, not managing your time effectively results in inefficient output and increases stress and anxiety.

Benefits of Time Management

Time management can lead to huge benefits like:

- Greater productivity
- Higher efficiency
- Better professional reputation
- Reduced stress
- Higher chances for career advancement
- Greater opportunities to achieve goals

Not managing time effectively can result in undesirable consequences like:

- Missing deadlines
- Inefficient work output
- Substandard work quality
- Poor professional reputation
- Stalled career
- Increase in stress and anxiety

Traits of Effective Time Managers

Some traits of effective time managers are:

- They begin projects early
- They break tasks into steps with specific deadlines
- They set daily objectives
- They continually review long term goals
- They modify plans if required, to achieve better results
- They think of alternate solutions if and when required
- They are flexible and open-minded
- They ask for help when required
- They inform people in advance if their help will be required
- They create backup plans
- They know how to say no

Effective Time Management Techniques

You can manage your time better by putting into practice certain time management techniques. Some helpful tips are:

- Plan out your day as well as plan for interruptions. Give yourself at least 30 minutes to figure out your time plan. In your plan, schedule some time for interruptions.
- Put up a "Do Not Disturb" sign when you absolutely have to complete a certain amount of work.
- Close your mind to all distractions. Train yourself to ignore ringing phones, don't reply to chat messages and disconnect from social media sites.
- Delegate your work. This will not only help your work get done faster, but will also show you the unique skills and abilities of those around you.
- Stop procrastinating. Remind yourself that procrastination typically arises due to the fear of failure or the belief that you cannot do things as perfectly as you wish to do them.
- Prioritize. List each task to be completed in order of its urgency or importance level. Then focus on completing each task, one by one.
- Maintain a log of your work activities. Analyse the log to help you understand how efficient you are, and how much time is wasted every day.
- Create time management goals to reduce time wastage.

Tips

- Always complete the most important tasks first.
- Get at least 7 – 8 hours of sleep every day.
- Start your day early.
- Don't waste too much time on small, unimportant details.
- Set a time limit for every task that you will undertake.
- Give yourself some time to unwind between tasks.

5.1.7 Anger Management: What is Anger Management?

Anger management is the process of:

1. Learning to recognize the signs that you, or someone else, is becoming angry
2. Taking the best course of action to calm down the situation in a positive way

Anger management does not mean suppressing anger.

Importance of Anger Management

Anger is a perfectly normal human emotion. In fact, when managed the right way, anger can be considered a healthy emotion. However, if it is not kept in check, anger can make us act inappropriately and can lead to us saying or doing things that we will likely later regret. Extreme anger can:

- **Hurt you physically**: It leads to heart disease, diabetes, a weakened immune system, insomnia, and high blood pressure.
- **Hurt you mentally**: It can cloud your thinking and lead to stress, depression and mental health issues.
- **Hurt your career**: It can result in alienating your colleagues, bosses, clients and lead to the loss of respect.
- **Hurt your relationships**: It makes it hard for your family and friends to trust you, be honest with you and feel comfortable around you.

This is why anger management, or managing anger appropriately, is so important.

Anger Management Strategies

Here are some strategies that can help you control your anger:

Strategy 1: Relaxation

Something as simple as breathing deeply and looking at relaxing images works wonders in calming down angry feelings.

Try this simple breathing exercise:

1. Take a deep breath from your diaphragm (don't breathe from your chest)
2. Visualize your breath coming up from your stomach
3. Keep repeating a calming word like 'relax' or 'take it easy' (remember to keep breathing
4. deeply while repeating the word)
5. Picture a relaxing moment (this can be from your memory or your imagination)
6. Follow this relaxation technique daily, especially when you realize that you're starting to feel angry.

Strategy 2: Cognitive Restructuring

Cognitive restructuring means changing the manner in which you think. Anger can make you curse, swear, exaggerate and act very dramatically. When this happens, force yourself to replace your angry thoughts with more logical ones. For instance, instead of thinking 'Everything is ruined' change your mindset and tell yourself 'It's not the end of the world and getting angry won't solve this'.

Strategy 3: Problem Solving

Getting angry about a problem that you cannot control is a perfectly natural response. Sometimes, try as you may, there may not be a solution to the difficulty you are faced with. In such cases, stop focusing on solving the problem, and instead focus on handling and facing the problem. Remind yourself that you will do your best to deal with the situation, but that you will not blame yourself if you don't get the solution you desire.

Strategy 4: Better Communication

When you're angry, it is very easy to jump to inaccurate conclusions. In this case, you need to force yourself to stop reacting, and think carefully about what you want to say, before saying it. Avoid saying the first thing that enters your head. Force yourself to listen carefully to what the other person is saying. Then think about the conversation before responding.

Strategy 5: Changing Your Environment

If you find that your environment is the cause of your anger, try and give yourself a break from your surroundings. Make an active decision to schedule some personal time for yourself, especially on days that are very hectic and stressful. Having even a brief amount of quiet or alone time is sure to help calm you down.

Tips for Anger Management

The following tips will help you keep your anger in check:

- Take some time to collect your thoughts before you speak out in anger.
- Express the reason for your anger in an assertive, but non-confrontational manner once you have calmed down.
- Do some form of physical exercise like running or walking briskly when you feel yourself getting angry.
- Make short breaks part of your daily routine, especially during days that are stressful.
- Focus on how to solve a problem that's making you angry, rather than focusing on the fact that the problem is making you angry.

Tips

- Try to forgive those who anger you, rather than hold a grudge against them.
- Avoid using sarcasm and hurling insults. Instead, try and explain the reason for your frustration in a polite and mature manner.

5.1.8 Stress Management: What is Stress?

We say we are 'stressed' when we feel overloaded and unsure of our ability to deal with the pressures placed on us. Anything that challenges or threatens our well-being can be defined as a stress. It is important to note that stress can be good and bad. While good stress keeps us going, negative stress undermines our mental and physical health. This is why it is so important to manage negative stress effectively.

Causes of Stress

Stress can be caused by internal and external factors.

Internal causes of stress

- Constant worry
- Rigid thinking
- Unrealistic expectations
- Pessimism
- Negative self-talk
- All in or all out attitude

External causes of stress

- Major life changes
- Difficulties with relationships
- Having too much to do
- Difficulties at work or in school
- Financial difficulties
- Worrying about one's children and/or family

Symptoms of Stress

Stress can manifest itself in numerous ways. Take a look at the cognitive, emotional, physical and behavioural symptoms of stress.

Cognitive Symptoms

- Memory problems
- Concentration issues
- Lack of judgement
- Pessimism
- Anxiety
- Constant worrying

Emotional Symptoms

- Depression
- Agitation
- Irritability
- Loneliness
- Anxiety
- Anger

Physical Symptoms

- Aches and pain
- Diarrhoea or constipation
- Nausea
- Dizziness
- Chest pain and/or rapid heartbeat

Behavioural Symptoms

- Increase or decrease in appetite
- Over sleeping or not sleeping enough
- Withdrawing socially
- Ignoring responsibilities

- Frequent cold or flu like feelings
- Consumption of alcohol or cigarettes
- Nervous habits like nail biting and pacing

Tips to Manage Stress

The following tips can help you manage your stress better:

- Note down the different ways in which you can handle the various sources of your stress.
- Remember that you cannot control everything, but you can control how you respond.
- Discuss your feelings, opinions and beliefs rather than reacting angrily, defensively or passively.
- Practice relaxation techniques like meditation, yoga or tai chi when you start feeling stressed.
- Devote a part of your day towards exercise.
- Eat healthy foods like fruits and vegetables. Avoid unhealthy foods especially those containing large amounts of sugar.
- Plan your day so that you can manage your time better, with less stress.
- Say no to people and things when required.
- Schedule time to pursue your hobbies and interests.
- Ensure you get at least 7-8 hours of sleep.
- Reduce your caffeine intake.
- Increase the time spent with family and friends.

Tips

- Force yourself to smile even if you feel stressed. Smiling makes us feel relaxed and happy.
- Stop yourself from feeling and thinking like a victim. Change your attitude and focus on being proactive.

UNIT 5.2: Digital Literacy: A Recap

Unit Objectives

At the end of this unit, you 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. Discuss the different types of e-commerce
8. List the benefits of e-commerce for retailers and customers
9. Discuss how the Digital India campaign will help boost e-commerce in India

5.2.1 Computer and Internet basics: Basic Parts of a Computer

Fig.7.2.1. Parts of a Computer

- **Central Processing Unit (CPU)**: The brain of the computer. It interprets and carries out program instructions.
- **Hard Drive**: A device that stores large amounts of data.
- **Monitor**: The device that contains the computer screen where the information is visually displayed.
- **Mouse**: A hand-held device used to point to items on the monitor.
- **Speakers**: Devices that enable you to hear sound from the computer.
- **Printer**: A device that converts output from a computer into printed paper documents.

Basic Parts of a Keyboard

Fig.7.2.2. Parts of a Keyboard

- **Arrow Keys**: Press these keys to move your cursor.
- **Space bar**: Adds a space.
- **Enter/Return**: Moves your cursor to a new line.
- **Shift**: Press this key if you want to type a capital letter or the upper symbol of a key.
- **Caps Lock**: Press this key if you want all the letters you type to be capital letters. Press it again to revert back to typing lowercase letters.
- **Backspace**: Deletes everything to the left of your cursor.

Basic Internet Terms

- **The Internet:** A vast, international collection of computer networks that transfers information.
- **The World Wide Web:** A system that lets you access information on the Internet.
- **Website:** A location on the World Wide Web (and Internet) that contains information about a specific topic.
- **Homepage:** Provides information about a website and directs you to other pages on that website.
- **Link/Hyperlink:** A highlighted or underlined icon, graphic, or text that takes you to another file or object.
- **Web Address/URL:** The address for a website.
- **Address Box:** A box in the browser window where you can type in a web address.

Tips

- When visiting a .com address, there no need to type http:// or even www. Just type the name of the website and then press Ctrl + Enter. (Example: Type 'apple' and press Ctrl + Enter to go to www.apple.com)
- Press the Ctrl key and press the + or - to increase and decrease the size of text.
- Press F5 or Ctrl + R to refresh or reload a web page.

5.2.2 MS Office and Email: About MS Office

MS Office or Microsoft Office is a suite of computer programs developed by Microsoft. Although meant for all users, it offers different versions that cater specifically to students, home users and business users. All the programs are compatible with both, Windows and Macintosh.

Most Popular Office Products

Some of the most popular and universally used MS Office applications are:

- **Microsoft Word**: Allows users to type text and add images to a document.
- **Microsoft Excel**: Allows users to enter data into a spreadsheet and create calculations and graphs.
- **Microsoft PowerPoint**: Allows users to add text, pictures and media and create slideshows and presentations.
- **Microsoft Outlook**: Allows users to send and receive email.
- **Microsoft OneNote**: Allows users to make drawings and notes with the feel of a pen on paper.
- **Microsoft Access**: Allows users to store data over many tables.

Why Choose Microsoft Outlook?

A popular email management choice especially in the workplace, Microsoft Outlook also includes an address book, notebook, web browser and calendar. Some major benefits of this program are:

- **Integrated search function**: You can use keywords to search for data across all Outlook programs.
- **Enhanced security**: Your email is safe from hackers, junk mail and phishing website email.
- **Email syncing**: Sync your mail with your calendar, contact list, notes in One Note and…your phone!
- **Offline access to email:** No Internet? No problem! Write emails offline and send them when you're connected again.

Tips

- Press Ctrl+R as a shortcut method to reply to email.
- Set your desktop notifications only for very important emails.
- Flag messages quickly by selecting messages and hitting the Insert key.
- Save frequently sent emails as a template to reuse again and again.
- Conveniently save important emails as files.

5.2.3 E-Commerce: What is E-Commerce?

E-commerce is the buying or selling of goods and services, or the transmitting of money or data, electronically on the internet. E-Commerce is the short form for "electronic commerce."

Examples of E-Commerce

Some examples of e-commerce are:

- Online shopping
- Online auctions
- Online ticketing
- Electronic payments
- Internet banking

Types of E-Commerce

E-commerce can be classified based on the types of participants in the transaction. The main types of e-commerce are:

- **Business to Business (B2B)**: Both the transacting parties are businesses.
- **Business to Consumer (B2C)**: Businesses sell electronically to end-consumers.
- **Consumer to Consumer (C2C):** Consumers come together to buy, sell or trade items to other consumers.
- **Consumer-to-Business (C2B)**: Consumers make products or services available for purchase to companies looking for exactly those services or products.
- **Business-to-Administration (B2A)**: Online transactions conducted between companies and public administration.
- **Consumer-to-Administration (C2A)**: Online transactions conducted between individual and public administration.

Benefits of E-Commerce

The e-commerce business provides some benefits for retailers and customers.

Benefits for retailers

- Establishes an online presence
- Reduces operational costs by removing overhead costs
- Increases brand awareness through the use of good keywords
- Increases sales by removing geographical and time constraints

Benefits for customers

- Offers a wider range of choice than any physical store
- Enables goods and services to be purchased from remote locations
- Enables consumers to perform price comparisons

Digital India Campaign

Prime Minister Narendra Modi launched the Digital India campaign in 2015, with the objective of offering every citizen of India access to digital services, knowledge and information. The campaign aims to improve the country's online infrastructure and increase internet connectivity, thus boosting the e-commerce industry.
Currently, the majority of online transactions come from tier 2 and tier 3 cities. Once the Digital India campaign is in place, the government will deliver services through mobile connectivity, which will help deliver internet to remote corners of the country. This will help the e-commerce market to enter India's tier 4 towns and rural areas.

E-Commerce Activity

Choose a product or service that you want to sell online. Write a brief note explaining how you will use existing e-commerce platforms, or create a new e-commerce platform, to sell your product or service.

Tips

- Before launching your e-commerce platform, test everything.
- Pay close and personal attention to your social media.

UNIT 5.3: Money Matters

Unit Objectives

At the end of this unit, you 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 transfers

5.3.1 Personal Finance – Why to Save? Importance of Saving

We all know that the future is unpredictable. You never know what will happen tomorrow, next week or next year. That's why saving money steadily through the years is so important. Saving money will help improve your financial situation over time. But more importantly, knowing that you have money stashed away for an emergency will give you peace of mind. Saving money also opens the door to many more options and possibilities.

Benefits of Saving

Inculcating the habit of saving leads to a vast number of benefits. Saving helps you:

- **Become financially independent**: When you have enough money saved up to feel secure you can start making your choices, from taking a vacation whenever you want, to switching careers or starting your own business.
- **Invest in yourself through education**: Through saving, you can earn enough to pay up for courses that will add to your professional experience and ultimately result in higher paying jobs.
- **Get out of debt**: Once you have saved enough as a reserve fund, you can use your savings to pay off debts like loans or bills that have accumulated over time.
- **Be prepared for surprise expenses:** Having money saved enables you to pay for unforeseen expenses like sudden car or house repairs, without feeling financially stressed.
- **Pay for emergencies**: Saving helps you deal with emergencies like sudden health issues or emergency trips without feeling financially burdened.

- **Afford large purchases and achieve major goals**: Saving diligently makes it possible to place down payments towards major purchases and goals, like buying a home or a car.
- **Retire**: The money you have saved over the years will keep you comfortable when you no longer have the income you would get from your job.

Tips

- Break your spending habit. Try not spending on one expensive item per week, and put the money that you would have spent into your savings.
- Decide that you will not buy anything on certain days or weeks and stick to your word.

5.3.2 Types of Bank Accounts, Opening a Bank Account

Types of Bank Accounts

In India, banks offer four main types of bank accounts. These are:

- Current Accounts
- Savings Accounts
- Recurring Deposit Accounts
- Fixed Deposit Accounts

Current Accounts

Current accounts offer the most liquid deposits and thus, are best suited for businessmen and companies. As these accounts are not meant for investments and savings, there is no imposed limit on the number or amount of transactions that can be made on any given day. Current account holders are not paid any interest on the amounts held in their accounts. They are charged for certain services offered on such accounts.

Saving Accounts

Savings accounts are meant to promote savings, and are therefore the number one choice for salaried individuals, pensioners and students. While there is no restriction on the number and amount of deposits made, there are usually restrictions on the number and amount of withdrawals. Savings account holders are paid interest on their savings.

Recurring Deposit Accounts

Recurring Deposit accounts, also called RD accounts, are the accounts of choice for those who want to save an amount every month, but are unable to invest a large sum at one time. Such account holders deposit a small, fixed amount every month for a pre-determined period (minimum 6 months). Defaulting on a monthly payment results in the account holder being charged a penalty amount. The total amount is repaid with interest at the end of the specified period.

Fixed Deposit Accounts

Fixed Deposit accounts, also called FD accounts, are ideal for those who wish to deposit their savings for a long term in return for a high rate of interest. The rate of interest offered depends on the amount deposited and the time period, and also differs from bank to bank. In the case of an FD, a certain amount of money is deposited by the account holder for a fixed period of time. The money can be withdrawn when the period expires. If necessary, the depositor can break the fixed deposit prematurely. However, this usually attracts a penalty amount which also differs from bank to bank.

Opening a Bank Account 

Opening a bank account is quite a simple process. Take a look at the steps to open an account of your own:

Step 1: Fill in the Account Opening Form
This form requires you to provide the following information:

- Personal details (name, address, phone number, date of birth, gender, occupation, address)
- Method of receiving your account statement (hard copy/email)
- Details of your initial deposit (cash/cheque)
- Manner of operating your account (online/mobile banking/traditional via cheque, slip books)

Ensure that you sign wherever required on the form.

Step 2: Affix your Photograph

Stick a recent photograph of yourself in the allotted space on the form.

Step 3: Provide your Know Your Customer (KYC) Details

KYC is a process that helps banks verify the identity and address of their customers. To open an account, every individual need to submit certain approved documents with respect to photo identity (ID) and address proof. Some Officially Valid Documents (OVDs) are:

- Passport
- Driving License
- Voters' Identity Card
- PAN Card
- UIDAI (Aadhar) Card

Step 4: Submit All your Documents

Submit the completed Account Opening Form and KYC documents. Then wait until the forms are processed and your account has been opened!

Tips

- Select the right type of account.
- Fill in complete nomination details.
- Ask about fees.
- Understand the rules.
- Check for online banking – it's convenient!
- Keep an eye on your bank balance.

5.3.3 Costs: Fixed vs Variable: What are Fixed and Variable Costs?

Fixed costs and variable costs together make up a company's total cost. These are the two types of costs that companies have to bear when producing goods and services. A fixed cost does not change with the volume of goods or services a company produces. It always remains the same.

A variable cost, on the other hand, increases and decreases depending on the volume of goods and services produced. In other words, it varies with the amount produced.

Differences between Fixed and Variable Costs

Let's take a look at some of the main differences between fixed and variable costs:

Criteria	Fixed Costs	Variable Costs
Meaning	A cost that stays the same, regardless of the output produced.	A cost that changes when the
Nature	Time related.	Volume related.
Incurred	Incurred irrespective of units being produced.	Incurred only when units are produced
Unit cost	Inversely proportional to the number of units produced	Remains the same, per unit.
Examples	Depreciation, rent, salary, insurance and tax	Material consumed, wages, commission on sales and packing expenses

Tips

When trying to determine whether a cost is fixed or variable, simply ask the following question: Will the particular cost change if the company stopped its production activities? If the answer is no, then it is a fixed cost. If the answer is yes, then it is probably a variable cost.

5.3.4 Investment, Insurance and Taxes: Investment

Investment means that money is spent today with the aim of reaping financial gains at a future time. The main types of investment options are as follows:

- **Bonds:** Bonds are instruments used by public and private companies to raise large sums of money – too large to be borrowed from a bank. These bonds are then issued in the public market and are bought by lenders.
- **Stocks:** Stocks or equity are shares that are issued by companies and are bought by the general public.
- **Small Savings Schemes:** Small Savings Schemes are tools meant to save money in small amounts. Some popular schemes are the Employees Provident Fund, Sukanya Samriddhi Scheme and National Pension Scheme.
- **Mutual Funds:** Mutual Funds are professionally managed financial instruments that invest money in different securities on behalf of investors.
- **Fixed Deposits:** A fixed amount of money is kept aside with a financial institution for a fixed amount of time in return for interest on the money.
- **Real Estate:** Loans are taken from banks to purchase real estate, which is then leased or sold with the aim of making a profit on the appreciated property price.
- **Hedge Funds:** Hedge funds invest in both financial derivatives and/or publicly traded securities.
- **Private Equity:** Private Equity is trading in the shares of an operating company that is not publicly listed and whose shares are not available on the stock market.

Insurance

There are two types of insurance – Life Insurance and Non-Life or General Insurance.

Life Insurance

Life Insurance deals with all insurance covering human life.

Life Insurance Products

The main life insurance products are:

- **Term Insurance:** This is the simplest and cheapest form of insurance. It offers financial protection for a specified tenure, say 15 to 20 years. In the case of your death, your family is paid the sum assured. In the case of your surviving the term, the insurer pays nothing.

- **Endowment Policy:** This offers the dual benefit of insurance and investment. Part of the premium is allocated towards the sum assured, while the remaining premium gets invested in equity and debt. It pays a lump sum amount after the specified duration or on the death of the policyholder, whichever is earlier.
- **Unit-Linked Insurance Plan (ULIP):** Here part of the premium is spent on the life cover, while the remaining amount is invested in equity and debt. It helps develop a regular saving habit.
- **Money Back Life Insurance:** While the policyholder is alive, periodic payments of the partial survival benefits are made during the policy tenure. On the death of the insured, the insurance company pays the full sum assured along with survival benefits.
- **Whole Life Insurance:** It offers the dual benefit of insurance and investment. It offers insurance cover for the whole life of the person or up to 100 years whichever is earlier.

General Insurance

General Insurance deals with all insurance covering assets like animals, agricultural crops, goods, factories, cars and so on.

General Insurance Products

The main general insurance products are:

- **Motor Insurance:** This can be divided into Four-Wheeler Insurance and Two-Wheeler insurance.
- **Health Insurance:** The main types of health insurance are individual health insurance, family floater health insurance, comprehensive health insurance and critical illness insurance.
- **Travel Insurance:** This can be categorised into Individual Travel Policy, Family Travel Policy, Student Travel Insurance and Senior Citizen Health Insurance.
- **Home Insurance:** This protects the house and its contents from risk.
- **Marine Insurance:** This insurance covers goods, freight and cargo against loss or damage during transit by rail, road, sea and/or air.

Taxes

There are two types of taxes – Direct Taxes and Indirect Taxes.

Direct Tax

Direct taxes are levied directly on an entity or a person and are non-transferrable. Some examples of Direct Taxes are:

- **Income Tax:** This tax is levied on your earning in a financial year. It is applicable to both, individuals and companies.
- **Capital Gains Tax:** This tax is payable whenever you receive a sizable amount of money. It is usually of two types – short term capital gains from investments held for less than 36 months and long term capital gains from investments held for longer than 36 months.

- **Securities Transaction Tax:** This tax is added to the price of a share. It is levied every time you buy or sell shares.

- **Perquisite Tax:** This tax is levied is on perks that have been acquired by a company or used by an employee.
- **Corporate Tax:** Corporate tax is paid by companies from the revenue they earn.

Indirect Tax

Indirect taxes are levied on goods or services. Some examples of Indirect Taxes are:

- **Sales Tax:** Sales Tax is levied on the sale of a product.
- **Service Tax:** Service Tax is added to services provided in India.
- **Value Added Tax:** Value Added Tax is levied at the discretion of the state government. The tax is levied on goods sold in the state. The tax amount is decided by the state.
- **Customs Duty & Octroi:** Customs Duty is a charge that is applied on purchases that are imported from another country. Octroi is levied on goods that cross state borders within India.
- **Excise Duty:** Excise Duty is levied on all goods manufactured or produced in India

Tips

- Think about how quickly you need your money back and pick an investment option accordingly.
- Ensure that you are buying the right type of insurance policy for yourself.
- Remember, not paying taxes can result in penalties ranging from fines to imprisonment.

5.3.5 Online Banking, NEFT, RTGS etc.: What is Online Banking?

Internet or online banking allows account holders to access their account from a laptop at any location. In this way, instructions can be issued. To access an account, account holders simply

Internet banking can be used to:

- Find out an account balance
- Transfer amounts from one account to another
- Arrange for the issuance of cheques
- Instruct payments to be made
- Request for a cheque book
- Request for a statement of accounts
- Make a fixed deposit

Electronic Funds Transfers

Electronic funds transfer is a convenient way of transferring money from the comfort of one's own home, using integrated banking tools like internet and mobile banking.

Transferring funds via an electronic gateway is extremely convenient. With the help of online banking, you can choose to:

- Transfer funds into your own accounts of the same bank.
- Transfer funds into different accounts of the same bank.
- Transfer funds into accounts in different bank, using NEFT.
- Transfer funds into other bank accounts using RTGS.
- Transfer funds into various accounts using IMPS.

NEFT

NEFT stands for National Electronic Funds Transfer. This money transfer system allows you to electronically transfer funds from your respective bank accounts to any other account, either in the same bank or belonging to any other bank. NEFT can be used by individuals, firms and corporate organizations to transfer funds between accounts.

In order to transfer funds via NEFT, two things are required:

- A transferring bank
- A destination bank

Before you can transfer funds through NEFT, you will need to register the beneficiary who will be receiving the funds. In order to complete this registration, you will require the following information:

- Recipient's name
- Recipient's bank's name
- Recipient's account number
- Recipient's bank's IFSC code

RTGS

RTGS stands for Real Time Gross Settlement. This is a real-time fund transfer system which enables you to transfer funds from one bank to another, in real time or on a gross basis. Th e transferred amount is immediately deducted from the account of one bank, and instantly credited to the other bank's account. The RTGS payment gateway is maintained by the Reserve Bank of India. The transactions between banks are made electronically. RTGS can be used by individuals, companies and firms to transfer large sums of money. Before remitting funds through RTGS, you will need to add the beneficiary and his bank account details via your online banking account.

In order to complete this registration, you will require the

- Name of the beneficiary
- Beneficiary's account number
- Beneficiary's bank address
- Beneficiary's bank's IFSC code

IMPS

IMPS stands for Immediate Payment Service. This is a real-time, inter-bank, electronic funds transfer system used to transfer money instantly within banks across India. IMPS enables

users to make instant electronic transfer payments using mobile phones through both, Mobile Banking and SMS. It can also be used through ATMs and online banking. IMPS is available 24 hours a day and 7 days a week. The system features a secure transfer gateway and immediately confirms orders that have been fulfilled.

- Register for IMPS with your bank
- Receive a Mobile Money Identifier (MMID) from the bank
- Receive a MPIN from the bank

To transfer money through IMPS, the you need to:

Once you have both these, you can login or make a request through SMS to transfer a particular amount to a beneficiary.

For the beneficiary to receive the transferred money, he must:

1. Link his mobile number with his respective account

2. Receive the MMID from the bank

In order to initiate a money transfer through IMPS, you will need to enter the following information:

1. The beneficiary's mobile number
2. The beneficiary's MMID
3. The transfer amount
4. Your MPIN

As soon as money has been deducted from your account and credited into the beneficiary's account, you will be sent a confirmation SMS with a transaction reference number, for future reference.

Differences between NEFT, RTGS & IMPS

Criteria	NEFT	RTGS	IMPS
Settlement	Done in batches	Real-time	Real-time
Full form	National Electronic Fund Transfer	Real Time Gross Settlement	Immediate Payment Service
Timings on Monday – Friday	8:00 am – 6:30 pm	9:00 am – 4:30 pm	24x7
Timings on Saturday	8:00 am – 1:00 pm	9:00 am – 1:30 pm	24x7
Minimum amount of money transfer limit	₹1	₹2 lacs	₹1
Maximum amount of money transfer limit	₹10 lacs	₹10 lacs per day	₹2 lacs

Maximum charges as per RBI	Up to 10,000 – ₹2.5 above 10,000 – 1 lac - ₹5 above 1 – 2 lacs ₹15 above 2 – 5 lacs ₹25 above 5 – 10 lacs ₹25	above 2 – 5 lacs ₹25 above 5 – 10 lacs ₹50	Up to 10,000 – ₹5 above 10,000 – 1 lac – ₹5 above 1 – 2 lacs – ₹15

Tips

- Never click on any links in any e-mail message to access your online banking website.
- You will never be asked for your credit or debit card details while using online banking.
- Change your online banking password regularly.

UNIT 5.4: Preparing for Employment & Self-Employment

Unit Objectives

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

1. Discuss the steps 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. Discuss basic workplace terminology

5.4.1 Interview Preparation: How to Prepare for an Interview?

The success of your getting the job that you want depends largely on how well your interview for that job goes. Therefore, before you go in for your interview, it is important that you prepare for it with a fair amount of research and planning. Take a look at the steps to follow in order to be well prepared for an interview:

1. **Research the organization that you are having the interview with.**
   - Studying the company beforehand will help you be more prepared at the time of the interview. Your knowledge of the organization will help you answer questions at the time of the interview, and will leave you looking and feeling more confident. This is sure to make you stand out from other, not as well informed, candidates.
   - Look for background information on the company. Ty and find an overview of the company and its industry profile.
   - Visit the company website to get a good idea of what the company does. A company website offers a wealth of important information. Read and understand the company's mission statement. Pay attention to the company's products/services and client list. Read through any press releases to get an idea of the company's projected growth and stability.
   - Note down any questions that you have after your research has been completed.
2. **Think about whether your skills and qualifications match the job requirements.**
   - Carefully read through and analyse the job description.
   - Make a note of the knowledge, skills and abilities required to fulfil the job requirements.
   - Take a look at the organization hierarchy. Figure out where the position you are applying for fits into this hierarchy.
3. **Go through the most typical interview questions asked, and prepare your responses.**
   - Remember, in most interviews a mix of resume-based, behavioural and case study questions are asked.
   - Think about the kind of answers you would like to provide to typical questions asked in these three areas.
   - Practice these answers until you can express them confidently and clearly.

4. **Plan your attire for the interview.**
   - It is always safest to opt for formal business attire, unless expressly informed to dress in business casual (in which case you should use your best judgement)
   - Ensure that your clothes are clean and well-ironed. Pick neutral colours – nothing too bright or flashy.
   - The shoes you wear should match your clothes, and should be clean and suitable for a n interview.
   - Remember, your aim is to leave everyone you meet with the impression that you are a professional and highly efficient person.
5. **Ensure that you have packed everything that you may require during the interview.**
   - Carry a few copies of your resume. Use a good quality paper for your resume print outs.
   - Always take along a notepad and a pen.
   - Take along any information you may need to refer to, in order to fill out an application form.
   - Carry a few samples of your work, if relevant.
6. **Remember the importance of non-verbal communication.**
   - Practice projecting confidence. Remind yourself to smile and make eye contact. Practice giving a firm handshake.
   - Keep in mind the importance of posture. Practice sitting up straight. Train yourself to stop nervous gestures like fidgeting and foot-tapping.
   - Practice keeping your reactions in check. Remember, your facial expressions provide a good insight into your true feelings. Practice projecting a positive image.
7. **Make a list of questions to end the interview with.**
   - Most interviews will end with the interviewer(s) asking if you have any questions. This is your chance to show that you have done your research and are interested in learning more about the company.
   - If the interviewer does not ask you this question, you can inform him/her that you have some queries that you would like to discuss. This is the time for you to refer to the notes you made while studying the company.
   - Some good questions to ask at this point are:
     - What do you consider the most important criteria for success in this job?
     - How will my performance be evaluated?
     - What are the opportunities for advancement?
     - What are the next steps in the hiring process?
   - Remember, never ask for information that is easily available on the company website.

Tips

- Ask insightful and probing questions.
- When communicating, use effective forms of body language like smiling, making eye contact, and actively listening and nodding. Don't slouch, play with nearby items, fidget, chew gum, or mumble.

5.4.2 Preparing an Effective Resume: How to Create an Effective Resume?

A resume is a formal document that lists a candidate's work experience, education and skills. A good resume gives a potential employer enough information to believe the applicant is worth interviewing. That's why it is so important to create a résumé that is effective. Take a look at the steps to create an effective resume:

Step 1: Write the Address Section

The Address section occupies the top of your resume. It includes information like your name, address, phone number and e-mail address. Insert a bold line under the section to separate it from rest of your resume.

Example:

Khyati Mehta
Breach Candy, Mumbai – India
Contact No: +91 2223678270
Email: jasmine.watts@gmail.com

Step 2: Add the Profile Summary Section

This part of your resume should list your overall experiences, achievements, awards, certifications and strengths. You can make your summary as short as 2-3 bullet points or a s long as 8-10 bullet points.

Example:

Profile Summary

- A Floor Supervisor graduated from University of Delhi having 6 years of experience in managing a retail outlet.
- Core expertise lies in managing retail staff, including cashiers and people working on the floor.

Step 3: Include Your Educational Qualifications

When listing your academic records, first list your highest degree. Then add the second highest qualification under the highest one and so on. To provide a clear and accurate picture of your educational background, it is critical that include information on your position, rank, percentage or CPI for every degree or certification that you have listed.
If you have done any certifications and trainings, you can add a Trainings & Certifications section under your Educational Qualifications section.

Example:

Educational Qualifications
<Enter qualification> <enter date of qualification> from <enter name of institute> with <enter percentage or any other relevant scoring system>.

Step 4: List Your Technical Skills

When listing your technical skills, start with the skills that you are most confident about. Then add the skills that you do not have as good a command over. It is perfectly acceptable to include just one skill, if you feel that particular skill adds tremendous value to your résumé. If you do not have any technical skills, you can omit this step.

Example:

Technical Skills
- *<Enter your technical skill here, if applicable>*

Step 5: Insert Your Academic Project Experience

List down all the important projects that you have worked on. Include the following information in this section:

- Project title
- Organization
- Platform used
- Contribution
- Description

Example:

Academic Projects
Project Title: *<Insert project title>*
Organization: *<Insert the name of the organization for whom you did the project>*
Platform used: *<Insert the platform used, if any>*
Contribution: *<Insert your contribution towards this project>*
Description: *<Insert a description of the project in one line>*

Step 6: List Your Strengths

This is where you list all your major strengths. This section should be in the form of a bulleted list.

Example:

Strengths
- Excellent oral, written and presentation skills
- Action-oriented and result-focused
- Great time management skills

Step 7: List Your Extracurricular Activities

It is very important to show that you have diverse interests and that your life consists of more than academics. Including your extracurricular activities can give you an added edge over other candidates who have similar academic scores and project experiences. This section should be in the form of a bulleted list.

Example:

< Insert your extracurricular activity here. E.g.: Member of, _____ played (name of sport) at _____ level, won (name of prize/award) for _____>

Step 8: Write Your Personal Details

The last section of your résumé must include the following personal information:

- Date of birth
- Gender & marital status
- Nationality
- Languages known

Example:

Personal Details
- Date of birth: 25th May, 1981
- Gender & marital status: Female, Single
- Nationality: Indian

Tips

- Keep your resume file name short, simple and informational.
- Make sure the resume is neat and free from typing errors.
- Always create your resume on plain white paper.

5.4.3 Interview FAQs

Take a look at some of the most frequently asked interview questions, and some helpful tips on how to answer them.

Q1. Can you tell me a little about yourself?

Tips to answer:

- Don't provide your full employment or personal history.
- Offer 2-3 specific experiences that you feel are most valuable and relevant.
- Conclude with how those experiences have made you perfect for this specific role.

Q2. How did you hear about the position?

Tips to answer:

- Tell the interviewer how you heard about the job – whether it was through a friend (name the friend), event or article (name them) or a job portal (say which one).
- Explain what excites you about the position and what in particular caught your eye about this role.

Q3. What do you know about the company?

Tips to answer:

- Don't recite the company's About Us page.
- Show that you understand and care about the company's goals.
- Explain why you believe in the company's mission and values.

Q4. Why do you want this job?

Tips to answer:

- Show that you are passionate about the job.
- Identify why the role is a great fit for you.
- Explain why you love the company.

Q5. Why should we hire you?

Tips to answer:

- Prove through your words that you can not only do the work, but can definitely deliver excellent results.
- Explain why you would be a great fit with the team and work culture.
- Explain why you should be chosen over any other candidate.

Q6. What are your greatest professional strengths?

Tips to answer:

- Be honest – share some of your real strengths, rather than give answers that you think sound good.
- Offer examples of specific strengths that are relevant to the position you are applying for.
- Provide examples of how you've demonstrated these strengths.

Q7. What do you consider to be your weaknesses?

Tips to answer:

- The purpose of this question is to gauge your self-awareness and honesty.
- Give an example of a trait that you struggle with, but that you're working on to improve.

Q8. What are your salary requirements?

Tips to answer:

- Do your research beforehand and find out the typical salary range for the job you are applying for.
- Figure out where you lie on the pay scale based on your experience, education, and skills.
- Be flexible. Tell the interviewer that you know your skills are valuable, but that you want the job and are willing to negotiate.

Q9. What do you like to do outside of work?

Tips to answer:

- The purpose of this question is to see if you will fit in with the company culture.
- Be honest – open up and share activities and hobbies that interest and excite you.

Q10. If you were an animal, which one would you want to be?

Tips to answer:

- The purpose of this question is to see if you are able to think on your feet.
- There's no wrong answer – but to make a great impression try to bring out your strengths or personality traits through your answer.

Q11: What do you think we could do better or differently?

Tips to answer:

- The purpose of this question is to see if you have done your research on the company, and to test whether you can think critically and come up with new ideas.
- Suggest new ideas. Show how your interests and expertise would help you execute these ideas.

Q12: Do you have any questions for us?

Tips to answer:

- Do not ask questions to which the answers can be easily found on the company website or through a quick online search.
- Ask intelligent questions that show your ability to think critically.

Tips

- Be honest and confident while answering.
- Use examples of your past experiences wherever possible to make your answers more impactful.

5.4.4 Work Readiness – Terms & Terminologies: Basic Workplace Terminology

Every employee should be well versed in the following terms:

- **Annual leave:** Paid vacation leave given by employers to employees.
- **Background Check:** A method used by employers to verify the accuracy of the information provided by potential candidates.
- **Benefits:** A part of an employee's compensation package.
- **Breaks:** Short periods of rest taken by employees during working hours.
- **Compensation Package:** The combination of salary and benefits that an employer provides to his/her employees.
- **Compensatory Time (Comp Time):** Time off in lieu of pay.
- **Contract Employee:** An employee who works for one organization that sells said employee's service to another company, either on a project or time basis.
- **Contract of Employment:** When an employee is offered work in exchange for wages or salary, and accepts the offer made by the employer, a contract of employment exists.
- **Corporate Culture:** The beliefs and values shared by all the members of a company, and imparted from one generation of employees to another.
- **Counter Offer/Counter Proposal:** A negotiation technique used by potential candidates to increase the amount of salary offered by a company.
- **Cover Letter:** A letter that accompanies a candidate's resume. It emphasizes the important points in the candidate's resume and provides real examples that prove the candidate's ability to perform the expected job role.
- **Curriculum Vitae (CV)/Resume:** A summary of a candidate's achievements, educational work experience, skills and strengths.
- **Declining Letter:** A letter sent by an employee to an employer, turning down the job offer employer to the employee.
- **Deductions:** Amounts subtracted from an employee's pay and listed on the employee's pay slip.
- **Discrimination:** The act of treating one person not as favourably as another person.
- **Employee:** A person who works for another person in exchange for payment.
- **Employee Training:** A workshop or in-house training that an employee is asked to attend by his or her superior, for the benefit of the employer.
- **Employment Gaps:** Periods of unemployed time between jobs.
- **Fixed-Term Contract:** A contract of employment which gets terminated on an agreed-upon date.
- **Follow-Up:** The act of contacting a potential employer after a candidate has submitted his or her resume.
- **Freelancer/Consultant/Independent Contractor:** A person who works for him or herself for temporary jobs and projects with different employers.
- **Holiday**: Paid time-off from work.
- **Hourly Rate**: The amount of salary or wages paid for 60 minutes of work.

- **Internship**: A job opportunity offered by an employer to a potential employee, called an at the employer's company for a fixed, limited time period.
- **Interview**: A conversation between a potential employee and a representative of an order to determine if the potential employee should be hired.
- **Job Application**: A form which asks for a candidate's information like the candidate's name, details and work experience. The purpose of a candidate submitting a job application, is to show that candidate's interest in working for a particular company.
- **Job Offer**: An offer of employment made by an employer to a potential employee.
- **Job Search Agent**: A program that enables candidates to search for employment opportunities by selecting criteria listed in the program, for job vacancies. background, made by the and pitches intern, to work employer, in address, contact
- **Lay Off**: A lay off occurs when an employee is temporarily let go from his or her job, due to the employer not having any work for that employee.
- **Leave**: Formal permission given to an employee, by his or her employer, to take a leave of absence from work.
- **Letter of Acceptance**: A letter given by an employer to an employee, confirming the offer of employment made by the employer, as well as the conditions of the offer.
- **Letter of Agreement**: A letter that outlines the terms of employment.
- **Letter of Recommendation**: A letter written for the purpose of validating the work skills o f a person.
- **Maternity Leave**: Leave taken from work by women who are pregnant, or who have just given birth.
- **Mentor**: A person who is employed at a higher level than you, who offers you advice and guides you in your career.
- **Minimum wage**: The minimum wage amount paid on an hourly basis.
- **Notice**: An announcement made by an employee or an employer, stating that the employment contract will end on a particular date.
- **Offer of Employment**: An offer made by an employer to a prospective employee that contains important information pertaining to the job being offered, like the starting date, salary, working conditions etc.
- **Open-Ended Contract**: A contract of employment that continues till the employer or terminates it.
- **Overqualified**: A person who is not suited for a particular job because he or she has too m any years of work experience, or a level of education that is much higher than required f or the job, or is currently or was previously too highly paid.
- **Part-Time Worker**: An employee who works for fewer hours than the standard number of hours normally worked.
- **Paternity Leave**: Leave granted to a man who has recently become a father.
- **Recruiters/Head-hunters/Executive Search Firms**: Professionals who are paid by employers to search for people to fill particular positions.
- **Resigning/Resignations**: When an employee formally informs his or her employer that he or she is quitting his or her job.
- **Self-Employed**: A person who has his or her own business and does not work in the capacity of an employee.

- **Time Sheet**: A form that is submitted to an employer, by an employee, that contains the number of hours worked every day by the employee.

UNIT 5.5: Understanding Entrepreneurship

Unit Objectives

At the end of this unit, you 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

5.5.1 Concept Introduction (Characteristic of Entrepreneur, types of firms / types of enterprises)

Entrepreneurs and Entrepreneurship

Anyone who is determined to start a business, no matter what the risk, is an entrepreneur. Entrepreneurs run their own start-up, take responsibility for the financial risks and use creativity, innovation and vast reserves of self-motivation to achieve success. They dream big and are determined to do whatever it takes to turn their idea into a viable offering. The aim of a n entrepreneur is to create an enterprise. The process of creating this enterprise is known as entrepreneurship.

Importance of Entrepreneurship

1. Entrepreneurship is very important for the following reasons:
2. It results in the creation of new organizations
3. It brings creativity into the marketplace
4. It leads to improved standards of living
5. It helps develop the economy of a country

Characteristics of Entrepreneurs

All successful entrepreneurs have certain characteristics in common.

They are all:

- Extremely passionate about their work
- Confident in themselves
- Disciplined and dedicated
- Motivated and driven
- Highly creative
- Visionaries
- Open-minded
- Decisive

Entrepreneurs also have a tendency to:

- Have a high-risk tolerance
- Thoroughly plan everything
- Manage their money wisely
- Make their customers their priority
- Understand their offering and their market in detail
- Ask for advice from experts when required
- Know when to cut their losses

Examples of Famous Entrepreneurs

Some famous entrepreneurs are:

- Dhirubhai Ambani (Reliance)
- Azim Premji (Wipro)
- Dr. Karsanbhai Patel (Nirma)
- Anil Agarwal (Vedanta Resources)

Types of Enterprises

As an entrepreneur in India, you can own and run any of the following types of enterprises:

Sole Proprietorship

In a sole proprietorship, a single individual owns, manages and controls the enterprise. This type of business is the easiest to form with respect to legal formalities. The business and the owner have no separate legal existence. All profit belongs to the proprietor, as do all the losses the liability of the entrepreneur is unlimited.

Partnership

A partnership firm is formed by two or more people. The owners of the enterprise are called partners. A partnership deed must be signed by all the partners. The firm and its partners have no separate legal existence. The profits are shared by the partners. With respect to losses, the liability of the partners is unlimited. A firm has a limited life span and must be dissolved when any one of the partners dies, retires, claims bankruptcy or goes insane.

Limited Liability Partnership (LLP)

In a Limited Liability Partnership or LLP, the partners of the firm enjoy perpetual existence as well as the advantage of limited liability. Each partner's liability is limited to their agreed contribution to the LLP. The partnership and its partners have a separate legal existence.

Tips

- Learn from others' failures.
- Be certain that this is what you want.
- Search for a problem to solve, rather than look for a problem to attach to your idea.

5.5.2 Leadership & Teamwork: Leadership and Leaders

Leadership means setting an example for others to follow. Setting a good example means not asking someone to do something that you wouldn't willingly want to do yourself. Leadership is about figuring out what to do in order to win as a team, and as a company. Leaders believe in doing the right things. They also believe in helping others to do the right things. An effective leader is someone who:

- Creates an inspiring vision of the future.
- Motivates and inspires his team to pursue that vision.

Leadership Qualities That All Entrepreneurs Need

Building a successful enterprise is only possible if the entrepreneur in charge possesses excellent leadership qualities. Some critical leadership skills that every entrepreneur must have are:

1. **Pragmatism:** This means having the ability to highlight all obstacles and challenges, in order to resolve issues and reduce risks.
2. **Humility:** This means admitting to mistakes often and early, and being quick to take responsibility for your actions. Mistakes should be viewed as challenges to overcome, not opportunities to point blame.
3. **Flexibility:** It is critical for a good leader to be very flexible and quickly adapt to change. It is equally critical to know when to adapt and when not to.
4. **Authenticity:** This means showing both, your strengths and your weaknesses. It means being human and showing others that you are human.
5. **Reinvention:** This means refreshing or changing your leadership style when necessary. To do this, it's important to learn where your leadership gaps lie and find out what resources are required to close them.
6. **Awareness:** This means taking the time to recognize how others view you. It means understanding how your presence affects those around you.

Benefits of Effective Leadership

Effective leadership results in numerous benefits. Great leadership leads to the leader successfully:

- Gaining the loyalty and commitment of the team members
- Motivating the team to work towards achieving the company's goals and objectives
- Building morale and instilling confidence in the team members
- Fostering mutual understanding and team-spirit among team members
- Convincing team members about the need to change when a situation requires adaptability

Teamwork and Teams

Teamwork occurs when the people in a workplace combine their individual skills to pursue a common goal. Effective teams are made up of individuals who work together to achieve this common goal. A great team is one who holds themselves accountable for the end result.

1. **Unity of purpose:** All the team members should clearly understand and be equally committed to the purpose, vision and goals of the team.
2. **Great communication skills:** Team members should have the ability to express their concerns, ask questions and use diagrams, and charts to convey complex information.
3. **The ability to collaborate:** Every member should feel entitled to provide regular feedback on new ideas.
4. **Initiative:** The team should consist of proactive individuals. The members should have the enthusiasm to come up with new ideas, improve existing ideas, and conduct their own research.

5. **Visionary members:** The team should have the ability to anticipate problems and act on these potential problems before they turn into real problems.
6. **Great adaptability skills:** The team must believe that change is a positive force. Change should be seen as the chance to improve and try new things.
7. **Excellent organizational skills:** The team should have the ability to develop standard work processes, balance responsibilities, properly plan projects, and set in place methods to measure progress and ROI.

Tips

- Don't get too attached to your original idea. Allow it to evolve and change.
- Be aware of your weaknesses and build a team that will complement your shortfalls.
- Hiring the right people is not enough. You need to promote or incentivize your most
- Talented people to keep them motivated.
- Earn your team's respect.

5.5.3 Communication Skills: Listening & Speaking the Importance of Listening Effectively

Listening is the ability to correctly receive and understand messages during the process of communication. Listening is critical for effective communication. Without effective listening skills, messages can easily be misunderstood. This results in a communication breakdown and can lead to the sender and the receiver of the message becoming frustrated or irritated. It's very important to note that listening is not the same as hearing. Hearing just refers to sounds that you hear. Listening is a whole lot more than that. To listen, one requires focus. It means not only paying attention to the story, but also focusing on how the story is relayed, the way language and voice is used, and even how the speaker uses their body language. The ability to listen depends on how effectively one can perceive and understand both, verbal and non-verbal cues.

How to Listen Effectively?

To listen effectively you should:

- Stop talking
- Stop interrupting
- Focus completely on what is being said
- Nod and use encouraging words and gestures
- Be open-minded
- Think about the speaker's perspective
- Be very, very patient
- Pay attention to the tone that is being used
- Pay attention to the speaker's gestures, facial expressions and eye movements
- Not try and rush the person
- Not let the speaker's mannerisms or habits irritate or distract you

The Importance of Speaking Effectively

How successfully a message gets conveyed depends entirely on how effectively you are able to get it through. An effective speaker is one who enunciates properly, pronounces words correctly, chooses the right words and speaks at a pace that is easily understandable.

Besides this, the words spoken out loud need to match the gestures, tone and body language used. What you say, and the tone in which you say it, results in numerous perceptions being formed. A person who speaks hesitantly may be perceived as having low self-esteem or lacking in knowledge of the discussed topic. Those with a quiet voice may very well be labelled as shy. And those who speak in commanding tones with high levels of clarity, are usually considered to be extremely confident. This makes speaking a very critical communication skill.

How to Speak Effectively?

To speak effectively you should:

- Incorporate body language in your speech like eye contact, smiling, nodding, gesturing etc.
- Build a draft of your speech before actually making your speech.
- Ensure that all your emotions and feelings are under control.
- Pronounce your words distinctly with the correct pitch and intensity. Your speech should be crystal clear at all times. Use a pleasant and natural tone when speaking. Your audience should not feel like you are putting on an accent or being unnatural in any way.

- Use precise and specific words to drive your message home. Ambiguity should be avoided at all costs.
- Ensure that your speech has a logical flow.
- Be brief. Don't add any unnecessary information.
- Make a conscious effort to avoid irritating mannerisms like fidgeting, twitching etc.
- Choose your words carefully and use simple words that the majority of the audience will have no difficulty understanding.
- Use visual aids like slides or a whiteboard.
- Speak slowly so that your audience can easily understand what you're saying. However, be careful not to speak too slowly because this can come across as stiff, unprepared or even condescending.
- Remember to pause at the right moments.

Tips

- If you're finding it difficult to focus on what someone is saying, try repeating their words in your head.
- Always maintain eye contact with the person that you are communicating with, when speaking as well as listening. This conveys and also encourages interest in the conversation.

5.5.4 Problem Solving & Negotiation Skills: What is a Problem?

As per The Concise Oxford Dictionary (1995), a problem is, "A doubtful or difficult matter requiring a solution"

All problems contain two elements:

1. Goals
2. Obstacles

The aim of problem solving is to recognize the obstacles and remove them in order to achieve the goals.

How to Solve Problems?

Solving a problem requires a level of rational thinking. Here are some logical steps to follow when faced with an issue:

Step 1: Identify the problem

Step 2: Study the problem in detail

Step 3: List all possible solutions

Step 4: Select the best solution

Step 5: Implement the chosen solution

Step 6: Check that the problem has really been solved

Important Traits for Problem Solving

Highly developed problem-solving skills are critical for both, business owners and their employees. The following personality traits play a big role in how effectively problems are solved:

Being open minded

Not panicking

Asking the right questions

Having a positive attitude

Being proactive

Focusing on the right problem

How to Assess for Problem Solving Skills?

As an entrepreneur, it would be a good idea to assess the level of problem solving skills of potential candidates before hiring them. Some ways to assess this skill are through:

1. Application forms: Ask for proof of the candidate's problem solving skills in the application form.
2. Psychometric tests: Give potential candidates logical reasoning and critical thinking tests and see how they fare.
3. Interviews: Create hypothetical problematic situations or raise ethical questions and see how the candidates respond.
4. Technical questions: Give candidates examples of real life problems and evaluate their thought process.

What is Negotiation?

Negotiation is a method used to settle differences. The aim of negotiation is to resolve differences through a compromise or agreement while avoiding disputes. Without negotiation, conflicts are likely to lead to resentment between people. Good negotiation skills help satisfy both parties and go a long way towards developing strong relationships.

Why Negotiate?

Starting a business requires many, many negotiations. Some negotiations are small while others are critical enough to make or break a start-up. Negotiation also plays a big role inside the workplace. As an entrepreneur, you need to know not only know how to negotiate yourself, but also how to train employees in the art of negotiation.

How to Negotiate?

Take a look at some steps to help you negotiate:

Step 1: Pre-Negotiation Preparation	Agree on where to meet to discuss the problem, decide who all will be present and set a time limit for the discussion.
Step 2: Discuss the problem	This involves asking questions, listening to the other side, puttingyour views forward and clarifying doubts.
Step 3: Clarify the Objective	Ensure that both parties want to solve the same problem and reach the same goal.
Step 4: Aim for a Win-Win Outcome	Try your best to be open minded when negotiating. Compromise and offer alternate solutions to reach an outcome where both parties win.
Step 5: Clearly Define the Agreement	When an agreement has been reached, the details of the agreement should be crystal clear to both sides, with no scope for misunderstandings.
Step 6: Implement the Agreed Upon Solution	Agree on a course of action to set the solution in motion

Tips

- Know exactly what you want before you work towards getting it
- Give more importance to listening and thinking, than speaking
- Focus on building a relationship rather than winning
- Remember that your people skills will affect the outcome
- Know when to walk away – sometimes reaching an agreement may not be possible

5.5.5 Business Opportunities Identification: Entrepreneurs and Opportunities

"The entrepreneur always searches for change, responds to it and exploits it as an opportunity."
Peter Drucker
The ability to identify business opportunities is an essential characteristic of an entrepreneur.

What is an Opportunity?

The word opportunity suggests a good chance or a favourable situation to do something offered by circumstances.

Common Questions Faced by Entrepreneurs

A critical question that all entrepreneurs face is how to go about finding the business opportunity that is right for them.

- Some common questions that entrepreneurs constantly think about are:
- Should the new enterprise introduce a new product or service based on an unmet need?
- Should the new enterprise select an existing product or service from one market and offer it in another where it may not be available?
- Should the enterprise be based on a tried and tested formula that has worked elsewhere?

It is therefore extremely important that entrepreneurs must learn how to identify new and existing business opportunities and evaluate their chances of success.

When is an Idea an Opportunity?

An idea is an opportunity when:

- It creates or adds value to a customer
- It solves a significant problem, removes a pain point or meets a demand
- Has a robust market and profit margin
- Is a good fit with the founder and management team at the right time and place

Factors to Consider When Looking for Opportunities

Consider the following when looking for business opportunities:

- Economic trends
- Changes in funding
- Changing relationships between vendors, partners and suppliers
- Market trends
- Changes in political support
- Shift in target audience

Ways to Identify New Business Opportunities

1. **Identify Market Inefficiencies**

   When looking at a market, consider what inefficiencies are present in the market. Think about ways to correct these inefficiencies.

2. **Remove Key Hassles**

   Rather than create a new product or service, you can innovatively improve a product, service or process.

3. **Create Something New**

   Think about how you can create a new experience for customers, based on existing business models.

4. **Pick a Growing Sector/Industry**

   Research and find out which sectors or industries are growing and think about what opportunities you can tap in the same.

5. **Think About Product Differentiation**

   If you already have a product in mind, think about ways to set it apart from the existing ones.

Ways to Identify Business Opportunities within Your Business

1. **SWOT Analysis**

   An excellent way to identify opportunities inside your business is by creating a SWOT analysis. The acronym SWOT stands for strengths, weaknesses, opportunities, and threats. SWOT analysis framework:

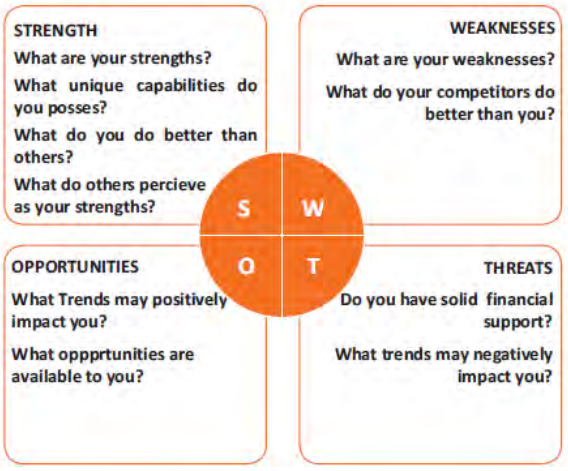

Fig.10.5.1. SWOT Analysis

Consider the following when looking for business opportunities:

By looking at yourself and your competitors using the SWOT framework, you can uncover opportunities that you can exploit, as well as manage and eliminate threats that could derail your success.

2. **Establishing Your USP**

   Establish your USP and position yourself as different from your competitors. Identify why customers should buy from you and promote that reason.

Opportunity Analysis

Once you have identified an opportunity, you need to analyse it.

To analyse an opportunity, you must:

- Remember, opportunities are situational.
- Look for a proven track record.
- Avoid the latest craze.
- Love your idea.

5.5.6 Entrepreneurship Support Eco-System: Who is an Entrepreneur?

An entrepreneur is a person who:

- Does not work for an employee
- Runs a small enterprise
- Assumes all the risks and rewards of the enterprise, idea, good or service

Types of Entrepreneurs

There are four main types of entrepreneurs:

1. **The Traditional Entrepreneur:** This type of entrepreneur usually has some kind of skill – they can be a carpenter, mechanic, cook etc. They have businesses that have been around for numerous years like restaurants, shops and carpenters. Typically, they gain plenty of experience in a particular industry before they begin their own business in a similar field.
2. **The Growth Potential Entrepreneur:** The desire of this type of entrepreneur is to start an enterprise that will grow, win many customers and make lots of money. Their ultimate aim is to eventually sell their enterprise for a nice profit. Such entrepreneurs usually have a science or technical background.
3. **The Project-Oriented Entrepreneur:** This type of entrepreneur generally has a background in the Arts or psychology. Their enterprises tend to be focus on something that they are very passionate about.
4. **The Lifestyle Entrepreneur:** This type of entrepreneur has usually worked as a teacher or a secretary. They are more interested in selling something that people will enjoy, rather than making lots of money.

Characteristics of an Entrepreneur

Successful entrepreneurs have the following characteristics:

- They are highly motivated
- They are creative and persuasive
- They are mentally prepared to handle each and every task
- They have excellent business skills – they know how to evaluate their cash flow, sales and revenue
- They are willing to take great risks
- They are very proactive – this means they are willing to do the work themselves, rather than wait for someone else to do it
- They have a vision – they are able to see the big picture
- They are flexible and open-minded
- They are good at making decisions

Entrepreneur Success Stories

Dhiru Bhai Ambani

Dhirubhai Ambani began his entrepreneurial career by selling “bhajias” to pilgrims in Mount Girnar on weekends. At 16, he moved to Yemen where he worked as a gas-station attendant, and as a clerk in an oil company. He returned to India with Rs. 50,000 and started a textile trading company. Reliance went on to become the first Indian company to raise money in global markets and the first Indian company to feature in Forbes 500 list.

Dr. Karsanbhai Patel

Karsanbhai Patel made detergent powder in the backyard of his house. He sold his product door-to door and offered a money back guarantee with every pack that was sold. He charged Rs.3 per kg when the cheapest detergent at that time was Rs.13 per kg. Dr. Patel eventually started Nirma which became a whole new segment in the Indian domestic detergent market.

The Entrepreneurial Process 

Let’s take a look at the stages of the entrepreneurial process.

Stage 1: Idea Generation. The entrepreneurial process begins with an idea that has been thought of by the entrepreneur. The idea is a problem that has the potential to be solved.

Stage 2: Germination or Recognition. In this stage a possible solution to the identified problem is thought of.

Stage 3: Preparation or Rationalization. The problem is studied further and research is done to find out how others have tried to solve the same problem.

Stage 4: Incubation or Fantasizing. This stage involves creative thinking for the purpose of coming up with more ideas. Less thought is given to the problem areas.

Stage 5: Feasibility Study: The next step is the creation of a feasibility study to determine if the idea will make a profit and if it should be seen through.

Stage 6: Illumination or Realization. This is when all uncertain areas suddenly become clear. The entrepreneur feels confident that his idea has merit.

Stage 7: Verification or Validation. In this final stage, the idea is verified to see if it works and if it is useful.

Take a look at the diagram below to get a better idea of this process.

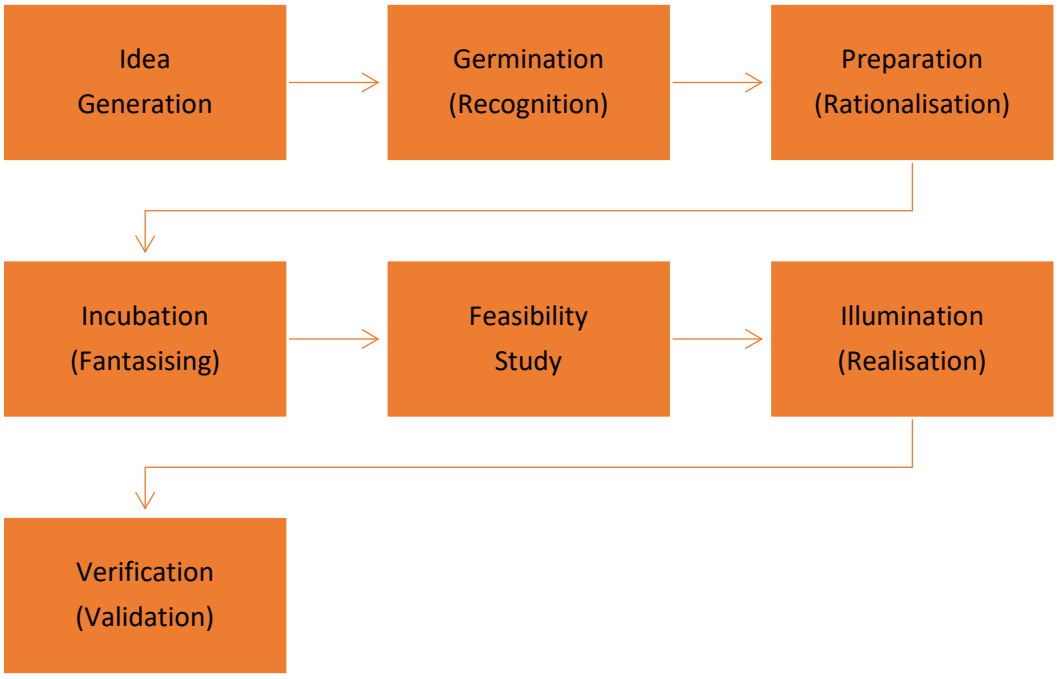

Fig.9.5.1. Entrepreneurship process

Introduction to the Entrepreneurship Ecosystem

The entrepreneurship support ecosystem signifies the collective and complete nature of entrepreneurship. New companies emerge and flourish not only because of the courageous, visionary entrepreneurs who launch them, but they thrive as they are set in an environment or 'ecosystem' made of private and public participants. These players nurture and sustain the new ventures, facilitating the entrepreneurs' efforts. An entrepreneurship ecosystem comprises of the following six domains:

1. **Favourable Culture:** This includes elements such as tolerance of risk and errors, valuable networking and positive social standing of the entrepreneur.
2. **Facilitating Policies & Leadership:** This includes regulatory framework incentives and existence of public research institutes.
3. **Financing Options:** Angel financing, venture capitalists and micro loans would be good examples of this.
4. **Human Capital:** This refers to trained and untrained labour, entrepreneurs and entrepreneurship training programmes, etc.
5. **Conducive Markets for Products & Services:** This refers to an existence or scope of existence of a market for the product/service.
6. **Institutional & Infrastructural Support:** This includes legal and financing advisers, telecommunications, digital and transportation infrastructure, and entrepreneurship networking programmes.

These domains indicate whether there is a strong entrepreneurship support ecosystem and what actions should the government put in place to further encourage this ecosystem.

The six domains and their various elements have been graphically depicted.

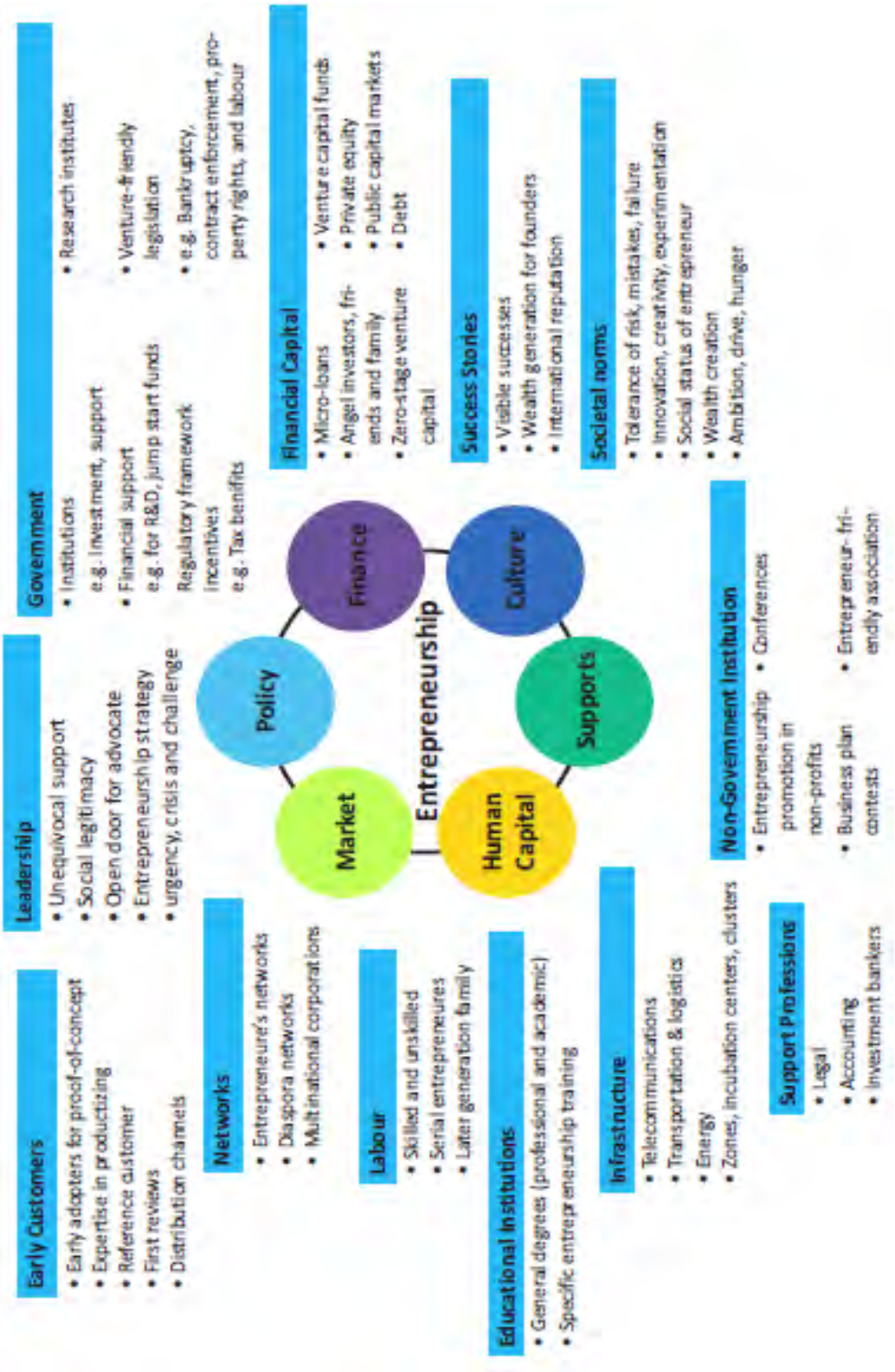

Fig.7.5.2. Entrepreneurship at a Glance

Every entrepreneurship support ecosystem is unique and all the elements of the ecosystem are interdependent. Although every region's entrepreneurship ecosystem can be broadly described by the above features, each ecosystem is the result of the hundred elements interacting in highly complex and particular ways.

Entrepreneurship ecosystems eventually become (largely) self-sustaining. When the six domains are resilient enough, they are mutually beneficial. At this point, government involvement can and should be significantly minimized. Public leaders do not need to invest a lot to sustain the ecosystem. It is imperative that the entrepreneurship ecosystem incentives are formulated to be self-liquidating, hence focussing on sustain ability of the environment.

Make in India Campaign

Every entrepreneur has certain needs. Some of their important needs are:

- To easily get loans
- To easily find investors
- To get tax exemptions
- To easily access resources and good infrastructure
- To enjoy a procedure that is free of hassles and is quick
- To be able to easily partner with other firms

The Make in India campaign, launched by Prime Minister Modi aims to satisfy all these needs of young,aspiring entrepreneurs. Its objective is to:

- Make investment easy
- Support new ideas
- Enhance skill development
- Safeguard the ideas of entrepreneurs
- Create state-of-the-art facilities for manufacturing goods

Key Schemes to Promote Entrepreneurs

The government offers many schemes to support entrepreneurs. These schemes are run by various Ministries/Departments of Government of India to support First Generation Entrepreneurs. Take a look at a few key schemes to promote entrepreneurship:

Sl.	Name of the Scheme
1.	Pradhan Mantri MUDRA Yojana - Micro Units Development and Refinance Agency (MUDRA),
2.	STAND UP INDIA
3.	Prime Minister Employment Generation Programme (PMEGP)
4.	International Cooperation
5.	Performance and Credit Rating
6.	Marketing Assistance Scheme
7.	Reimbursement of Registration Fee for Bar Coding
8.	Enable Participation of MSMEs in State/District level Trade Fairs and Provide Funding Support
9.	Capital Subsidy Support on Credit for Technology up gradation
10.	Credit Guarantee Fund for Micro and Small Enterprise (CGFMSE)

11. Reimbursement of Certification Fees for Acquiring ISO Standards
12. Agricultural Marketing
13. Small Agricultural Marketing
14. Mega Food Park
15. Adivasi Mahila Sashaktikaran Yojana

1. **Pradhan Mantri MUDRA Yojana**, - Micro Units Development and Refinance Agency (MUDRA),

Description

Under the aegis support of Pradhan Mantra MUDRA Yojana, MUDRA has already created its initial products/schemes. The interventions have been named 'Shisha', 'Kishore' and 'Taren' to signify the stage of growth/development and funding needs of the beneficiary micro unit/entrepreneur and also provide a reference point for the next phase of graduation/growth to look forward to:

a. Shisha: Covering loans up to Rs. 50,000/-
b. Kishor: Covering loans above Rs. 50,000/- and up to Rs.5 lakh
c. Tarun: Covering loans above Rs. 5 lakh to Rs.10 lakh

Who can apply?

Any Indian citizen who has a business plan for a non-farm sector income generating activity such as manufacturing, processing, trading or service sector and whose credit need is less than Rs.10 lakh can approach either a Bank, MFI, or NBFC for availing of MUDRA loans under Pradhan Mantri Mudra Yojana (PMMY).

2. **Stand Up India**

Description

The objective of the Standup India scheme is to facilitate bank loans between Rs.10 lakh and Rs.1 crore to at least one Schedule Caste (SC) or Scheduled Tribe (ST) borrower and at least one woman borrower per bank branch for setting up a Greenfield enterprise. This enterprise may be in manufacturing, services or the trading sector. In case of non-Individual enterprises at least 51% of the shareholding and controlling stake should be held be either an SC/ST or Woman Entrepreneur.

Who can apply?

ST, SC &Women

3. **Prime Minister Employment Generation Programme (PMEGP)**

Description

The Scheme is implemented by Khadi and Village Industries Commission (KVIC), as the nodal agency at the National level. At the State level, the Scheme is implemented through State KVIC Directorates, State Khadi and Village Industries Boards (KVIBs) and District Industries Centres (DICs) and banks. The Government subsidy under the Scheme is routed by KVIC through identified banks for eventual distribution to the beneficiaries/entrepreneurs in their bank accounts.

Nature of assistance

The maximum cost of the project/unit admissible under manufacturing sector is Rs.25 lakh and under business/service sector is Rs.10 lakh. Levels of funding under PMEGP

Categories of beneficiaries under PMEGP	Beneficiary's contribution of project cost)	Rate of Subsidy of project cost)
rea (location of project/unit)		rban Rural
eneral Category	0%	15% 5%
pecial (including SC / ST / OBC / Minorities / Women, Ex-servicemen, hysically handicapped, NER, Hill and Border reas, etc.	5%	25% 35%

The balance amount of the total project cost will be provided by Banks as term loan as well as working capital.

Who can apply?

Any individual, above 18 years of age. At least VIII standard pass for projects costing above Rs.10 lakh in the manufacturing sector and above Rs.5 lakh in the business/service sector. Only new projects are considered for sanction under PMEGP. Self Help Groups (including those belonging to BPL provided that they have not availed benefits under any other Scheme), Institutions registered under Societies Registration Act,1860; Production Co-operative Societies, and Charitable Trusts are also eligible. Existing Units (under PMRY, REGP or any other scheme of Government of India or State Government) and the units that have already availed Government Subsidy under any other scheme of Government of India or State Government are NOT eligible.

4. International Cooperation

Description

The Scheme would cover the following activities:

a. Deputation of MSME business delegations to other countries for exploring new areas of technology infusion/upgradation, facilitating joint ventures, improving market of MSMEs products, foreign collaborations, etc.
b. Participation by Indian MSMEs in international exhibitions, trade fairs and buyer-seller meets in foreign countries as well as in India, in which there is international participation.
c. Holding international conferences and seminars on topics and themes of interest to the MSME.

Nature of assistance

IC Scheme provides financial assistance towards the airfare and space rent of entrepreneurs. Assistance is provided on the basis of size and the type of the enterprise.

Who can apply?

a. State/Central Government Organisations;
b. Industry/Enterprise Associations; and
c. Registered Societies/Trusts and Organisations associated with the promotion and development of MSMEs

5. Performance and Credit Rating for Micro and Small Enterprises

Description

The objective of the Scheme is to create awareness amongst micro & small enterprises about the strengths and weaknesses of their operations and also their credit worthiness.

Turn Over	Fee to be reimbursed by Ministry of MSME
Up to Rs.50 lacs	75% of the fee charged by the rating agency subject to a ceiling Rs. 15,000/-
Above Rs.50 lacs to Rs.200 Lacs	75% of the fee charged by the rating agency subject to a ceiling of Rs.30,0001-
Above Rs.200 lacs	75% of the fee charged by the rating agency subject

Nature of assistance

Who can apply?

Any enterprise registered in India as a micro or small enterprise is eligible to apply.

6. Marketing Assistance Scheme

Description

The assistance is provided for the following activities:

a. Organizing exhibitions abroad and participation in international exhibitions/trade fairs
b. Co-sponsoring of exhibitions organized by other organisations/industry associations/agencies
c. Organizing buyer-seller meets, intensive campaigns and marketing promotion events

Nature of assistance

Financial assistance of up to 95% of the airfare and space rent of entrepreneurs. Assistance is provided on the basis of size and the type of the enterprise. Financial assistance for co-sponsoring would be limited to 40% of the net expenditure, subject to maximum amount of Rs.5 lakh.

Who can apply?

MSMEs, Industry Associations and other organizations related to MSME sector.

7. Reimbursement of Registration Fee for Bar Coding

Description

The financial assistance is provided towards 75% reimbursement of only one-time registration fee and 75% of annual recurring fee for first three years paid by MSEs to GS1 India for using bar coding.

Nature of assistance

Funding support for reimbursement of 75% of one time and recurring bar code registration fees.

Who can apply?

All MSMEs with EM registration.

8. Enabling Participation of MSMEs in State/District Level Trade Fairs and Provide Funding Support

Description

Provide marketing platform to manufacturing MSMEs by enabling their participation in state/district level exhibitions being organized by state/district authorities/associations.

Nature of assistance

1. Free registration for participating in trade fairs

Note: *The selection of participants would be done by the MSME-DIs post the submission of application.*

2. Reimbursement of 50% of to and fro actual fare by shortest distance/direct train (limited to AC II tier class) from the nearest railway station/bus fare to the place of exhibition and 50% space rental charges for MSMEs (General category entrepreneurs).

3. For Women/SC/ST entrepreneurs & entrepreneurs from North Eastern Region Govt. of India will reimburse 80% of items listed above in Point (2).

Note: The total reimbursement will be max. Rs. 30,000/- per unit for the SC/ST/Women/Physically Handicapped entrepreneurs, while for the other units the max. limit will be Rs. 20,000/- per person per MSME unit.

Note: *The participant is required to submit follow-up proofs post attending the event to claim reimbursement. The proofs can be submitted after logging in online under the section "My Applications" or directly contacting a DI office.*

Who can apply?

All MSMEs with EM registration.

9. Capital Subsidy Support on Credit for Technology Upgradation

Description

MSMEs can get a capital subsidy (~15%) on credit availed for technology upgradation.

Nature of assistance

Financial assistance for availing credit and loan.

Who can apply?

1. Banks and financial institutions can apply to DC-MSME for availing support.

2. MSMEs need to directly contact the respective banks for getting credit and capital subsidy.

How to apply?

If you are a financial institution, click on the "Apply Now" button or else you can also directly contact the Office of DC-MSME. You can view the contact details of Office of DC-MSME. If you are an MSME, directly contact the respective banks/financial institutions as listed in the scheme guidelines.

10. Provision of Collateral Free Credit for MSMEs

Description

Banks and financial institutions are provided funding assistance under this scheme so that they can in turn lend collateral free credit to MSMEs.

Nature of assistance

Funding support to banks and financial institutions for lending collateral-free credit to MSMEs.

Who can apply?

Banks and financial institutions can apply to office of DC-MSME/MSME-DIs for availing support. MSMEs need to directly contact the respective banks for getting credit.

11. Reimbursement of certification fees for acquiring ISO standards

ISO 9000/ISO 14001 Certification Reimbursement.

Description

The GoI assistance will be provided for one-time reimbursement of expenditure to such MSME manufacturing units which acquire ISO 18000/ISO 22000/ISO 27000 certification.

Nature of assistance

Reimbursement of expenditure incurred on acquiring ISO standards.

Who can apply?

MSMEs with EM registration.

12. Agricultural Marketing

Description

A capital investment subsidy for construction/renovation of rural godowns . Creation of scientific storage capacity and prevention of distress sale.

Nature of assistance

Subsidy @ 25% to farmers, 15% of project cost to companies.

Who can apply?

NGOs, SHGs, companies, co-operatives.

13. Small Agricultural Marketing

Description

Business development description provides venture capital assistance in the form of equity, and arranges training and visits of agri-preneurs.

Farmers' Agriculture Business Consortium

Business development description provides venture capital assistance in the form of equity, and arranges training and visits of agri-preneurs.

Nature of assistance

Financial assistance with a ceiling of Rs.5 lakh.

Who can apply?

Individuals, farmers, producer groups, partnership/propriety firms, SGHs, agri-preneurs, etc.

14. Mega Food Park

Description

Mechanism to link agricultural production and market to maximize value addition, enhance farmer's income, create rural employment.

Nature of assistance

One-time capital grant of 50% of project cost with a limit of Rs.50 crore.

Who can apply?

Farmers, farmer groups, SHGs.

15. Adivasi Mahila Sashaktikaran Yojana

Description

Concessional scheme for the economic development of ST women.

Nature of assistance

Term loan at concessional rates up to 90% of cost of scheme.

Who can apply?

Scheduled Tribes Women.

Tips

- Research the existing market, network with other entrepreneurs, venture capitalists, angel investors, and thoroughly review the policies in place to enable your entrepreneurship.
- Failure is a stepping stone and not the end of the road. Review yours and your peers' errors and correct them in your future venture.
- Be proactive in your ecosystem. Identify the key features of your ecosystem and enrich them to ensure self-sustainability of your entrepreneurship support ecosystem.

5.5.7 Risk Appetite & Resilience: Entrepreneurship and Risk

Entrepreneurs are inherently risk takers. They are path-makers not path-takers. Unlike a normal, cautious person, an entrepreneur would not think twice about quitting his job (his sole income) and taking a risk on himself and his idea.
An entrepreneur is aware that while pursuing his dreams, assumptions can be proven wrong and unforeseen events may arise. He knows that after dealing with numerous problems, success is still not guaranteed. Entrepreneurship is synonymous with the ability to take risks. This ability, called risk-appetite, is an entrepreneurial trait that is partly genetic and partly acquired.

What is Risk Appetite?

Risk appetite is defined as the extent to which a company is equipped to take risk, in order to achieve its objectives. Essentially, it refers to the balance, struck by the company, between possible profits and the hazards caused by changes in the environment (economic ecosystem, policies, etc.). Taking on more risk may lead to higher rewards but have a high probability of losses as well. However, being too conservative may go against the company as it can miss out on good opportunities to grow and reach their objectives. The levels of risk appetite can be broadly categorized as “low”, “medium” and “high.” The company’s entrepreneur(s) have to evaluate all potential alternatives and select the option most likely to succeed. Companies have varying levels of risk appetites for different objectives.

The levels depend on:

- The type of industry
- Market pressures
- Company objectives

For example, a start-up with a revolutionary concept will have a very high risk appetite. The start-up can afford short term failures before it achieves longer term success. This type of appetite will not remain constant and will be adjusted to account for the present circumstances of the company.

Risk Appetite Statement

Companies have to define and articulate their risk appetite in sync with decisions made about their objectives and opportunities. The point of having a risk appetite statement is to have a framework that clearly states the acceptance and management of risk in business. It sets risk taking limits within the company. The risk appetite statement should convey the following:

- The nature of risks the business faces.
- Which risks the company is comfortable taking on and which risks are unacceptable.
- The nature of risks the business faces.
- Which risks the company is comfortable taking on and which risks are unacceptable.
- How much risk to accept in all the risk categories.
- The desired trade-off between risk and reward.
- Measures of risk and methods of examining and regulating risk exposures.

Entrepreneurship and Resilience

Entrepreneurs are characterized by a set of qualities known as resilience. These qualities play an especially large role in the early stages of developing an enterprise. Risk resilience is an extremely valuable characteristic as it is believed to protect entrepreneurs against the threat of challenges and changes in the business environment.

What is Entrepreneurial Resilience?

Resilience is used to describe individuals who have the ability to overcome setbacks related to their life and career aspirations. A resilient person is someone who is capable of easily and quickly recovering from setbacks. For the entrepreneur, resilience is a critical trait. Entrepreneurial resilience can be enhanced in the following ways:

- By developing a professional network of coaches and mentors
- By accepting that change is a part of life
- By viewing obstacles as something that can be overcome

Characteristics of a Resilient Entrepreneur

The characteristics required to make an entrepreneur resilient enough to go the whole way in their business enterprise are:

- A strong internal sense of control
- Ability to diversify and expand
- Strong social connections
- Survivor attitude
- Skill to learn from setbacks
- Cash-flow conscious habits
- Ability to look at the bigger picture
- Attention to detail

Tips

- Cultivate a great network of clients, suppliers, peers, friends and family. This will not only help you promote your business, but will also help you learn, identify new opportunities and stay tuned to changes in the market.
- Don’t dwell on setbacks. Focus on what you need to do next to get moving again.
- While you should try, and curtail expenses, ensure that it is not at the cost of your growth.

5.5.8 Success & Failures: Understanding Successes and Failures in Entrepreneurship

Shyam is a famous entrepreneur, known for his success story. But what most people don’t know, is that Shyam failed numerous times before his enterprise became a success. Read his interview to get an idea of what entrepreneurship is really about, straight from an entrepreneur who has both, failed and succeeded.

Interviewer: Shyam, I have heard that entrepreneurs are great risk-takers who are never afraid of failing. Is this true?

Shyam: Ha ha, no of course it's not true! Most people believe that entrepreneurs need to be fearlessly enthusiastic. But the truth is, fear is a very normal and valid human reaction, especially when you are planning to start your own business! In fact, my biggest fear was the fear of failing. The reality is, entrepreneurs fail as much as they succeed. The trick is to not allow the fear of failing to stop you from going ahead with your plans. Remember, failures are lessons for future success!

Interviewer: What, according to you, is the reason that entrepreneurs fail?

Shyam: Well, there is no one single reason why entrepreneurs fail. An entrepreneur can fail due to numerous reasons. You could fail because you have allowed your fear of failure to defeat you. You could fail because you are unwilling to delegate (distribute) work. As the saying goes, "You can do anything, but not everything!" You could fail because you gave up too easily – maybe you were not persistent enough. You could fail because you were focusing your energy on small, insignificant tasks and ignoring the tasks that were most important. Other reasons for failing are partnering with the wrong people, not being able to sell your product to the right customers at the right time at the right price… and many more reasons!

Interviewer: As an entrepreneur, how do you feel failure should be looked at?

Shyam: I believe we should all look at failure as an asset, rather than as something negative. The way I see it, if you have an idea, you should try to make it work, even if there is a chance that you will fail. That's because not trying is failure right there, anyway! And failure is not the worst thing that can happen. I think having regrets because of not trying, and wondering 'what if' is far worse than trying and actually failing.

Interviewer: How did you feel when you failed for the first time?

Shyam: I was completely heartbroken! It was a very painful experience. But the good news is, you do recover from the failure. And with every subsequent failure, the recovery process gets a lot easier. That's because you start to see each failure more as a lesson that will eventually help you succeed, rather than as an obstacle that you cannot overcome. You will start to realize that failure has many benefits.

Interviewer: Can you tell us about some of the benefits of failing?

Shyam: One of the benefits that I have experienced personally from failing is that the failure made me see things in a new light. It gave me answers that I didn't have before. Failure can make you a lot stronger. It also helps keep your ego in control.

Interviewer: What advice would you give entrepreneurs who are about to start their own enterprises?

Shyam: I would tell them to do their research and ensure that their product is something that is actually wanted by customers. I'd tell them to pick their partners and employees very wisely and cautiously. I'd tell them that it's very important to be aggressive – push and market your product as aggressively as possible. I would warn them that starting an enterprise is very expensive and that they should be prepared for a situation where they run out of money. I would tell them to create long term goals and put a plan in action to achieve that goal. I would tell them to build a product that is truly unique. Be very careful and ensure that you are not copying another start-up. Lastly, I'd tell them that it's very important that they find the right investors.

Interviewer: That's some really helpful advice, Shyam! I'm sure this will help all entrepreneurs to be more prepared before they begin their journey! Thank you for all your insight!

Tips

- Remember that nothing is impossible.
- Identify your mission and your purpose before you start.
- Plan your next steps – don't make decisions hastily.

UNIT 5.6: Preparing to be an Entrepreneur

Unit Objectives

At the end of this unit, you 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 your own enterprise
16. List important questions that every entrepreneur should ask before starting an enterprise

5.6.1 Market Study / The 4 Ps of Marketing / Importance of an IDEA: Understanding Market Research

Market research is the process of gathering, analysing and interpreting market information on a product or service that is being sold in that market. It also includes information on:

- Past, present and prospective customers
- Customer characteristics and spending habits
- The location and needs of the target market
- The overall industry
- Relevant competitors

Market research involves two types of data:

- Primary information. This is research collected by yourself or by someone hired by you.
- Secondary information. This is research that already exists and is out there for you to find and use.

Primary research

Primary research can be of two types:

- Exploratory: This is open-ended and usually involves detailed, unstructured interviews.
- Specific: This is precise and involves structured, formal interviews. Conducting specific

Secondary research

Secondary research uses outside information. Some common secondary sources are:

- **Public sources:** These are usually free and have a lot of good information. Examples are government departments, business departments of public libraries etc.
- **Commercial sources:** These offer valuable information but usually require a fee to be paid. Examples are research and trade associations, banks and other financial institutions etc.
- **Educational institutions:** These offer a wealth of information. Examples are colleges, universities, technical institutes etc.

The 4 Ps of Marketing

The 4 Ps of marketing are Product, Price, Promotion and Place. Let's look at each of these 4 Ps in detail.

Product

A product can be:

- A tangible good
- An intangible service

Whatever your product is, it is critical that you have a clear understanding of what you are offering, and what its unique characteristics are, before you begin with the marketing process.

Some questions to ask yourself are:

- What does the customer want from the product/service?
- What needs does it satisfy?
- Are there any more features that can be added?
- Does it have any expensive and unnecessary features?
- How will customers use it?
- What should it be called?
- How is it different from similar products?
- How much will it cost to produce?

Price

Once all the elements of Product have been established, the Price factor needs to be considered. The Price of a Product will depend on several factors such as profit margins, supply, demand and the marketing strategy.

Some questions to ask yourself are:

- What is the value of the product/service to customers?
- Do local products/services have established price points?
- Is the customer price sensitive?
- Should discounts be offered?
- How is your price compared to that of your competitors?

Promotion

Once you are certain about your Product and your Price, the next step is to look at ways to promote it. Some key elements of promotion are advertising, public relations, social media marketing, email marketing, search engine marketing, video marketing and more.
Some questions to ask yourself are:

- Where should you promote your product or service?
- What is the best medium to use to reach your target audience
- When would be the best time to promote your product?
- How are your competitors promoting their products?

Place

According to most marketers, the basis of marketing is about offering the right product, at the right price, at the right place, at the right time. For this reason, selecting the best possible location is critical for converting prospective clients into actual clients.

Some questions to ask yourself are:

- Will your product or service be looked for in a physical store, online or both?
- What should you do to access the most appropriate distribution channels?
- Will you require a sales force?
- Where are your competitors offering their products or services?
- Should you follow in your competitors' footsteps?
- Should you do something different from your competitors?

Importance of an IDEA

Some questions to ask yourself are:
Ideas are the foundation of progress. An idea can be small or ground-breaking, easy to accomplish or extremely complicated to implement. Whatever the case, the fact that it is an idea gives it merit. Without ideas, nothing is possible. Most people are afraid to speak out their ideas, out for fear of being ridiculed. However, if are an entrepreneur and want to remain competitive and innovative, you need to bring your ideas out into the light.

Some ways to do this are by:

- Establishing a culture of brainstorming where you invite all interested parties to contribute
- Discussing ideas out loud so that people can add their ideas, views, opinions to them
- Being open minded and not limiting your ideas, even if the idea who have seems ridiculous
- Not discarding ideas that you don't work on immediately, but instead making a note of them and shelving them so they can be revisited at a later date.

Tips 

- Keep in mind that good ideas do not always have to be unique.
- Remember that timing plays a huge role in determining the success of your idea.
- Situations and circumstances will always change, so be flexible and adapt your idea accordingly.

5.6.2 Business Entity Concepts: Basic Business Terminology

If your aim is to start and run a business, it is crucial that you have a good understanding of basic business terms. Every entrepreneur should be well versed in the following terms:

- Accounting: A systematic method of recording and reporting financial transactions.
- Accounts payable: Money owed by a company to its creditors.
- Accounts Receivable: The amount a company is owed by its clients.
- Assets: The value of everything a company owns and uses to conduct its business.
- Balance Sheet: A snapshot of a company's assets, liabilities and owner's equity at a given moment.
- Bottom Line: The total amount a business has earned or lost at the end of a month.
- Business: An organization that operates with the aim of making a profit.
- Business to Business (B2B): A business that sells goods or services to another business.
- Business to Consumer (B2C): A business that sells goods or services directly to the end user.
- Capital: The money a business has in its accounts, assets and investments. The two main types of capital are debt and equity.
- Cash Flow: The overall movement of funds through a business each month, including income and expenses.
- Cash Flow Statement: A statement showing the money that entered and exited a business during a specific period of time.
- Contract: A formal agreement to do work for pay.
- Depreciation: The degrading value of an asset over time.
- Expense: The costs that a business incurs through its operations.
- Finance: The management and allocation of money and other assets.
- Financial Report: A comprehensive account of a business' transactions and expenses.

- Fixed Cost: A one-time expense.
- Income Statement (Profit and Loss Statement): Shows the profitability of a business during a period of time.
- Liabilities: The value of what a business owes to someone else.
- Marketing: The process of promoting, selling and distributing a product or service.
- Net Income/Profit: Revenues minus expenses.
- Net Worth: The total value of a business.
- Payback Period: The amount of time it takes to recover the initial investment of a business.
- Profit Margin: The ratio of profit, divided by revenue, displayed as a percentage.
- Return on Investment (ROI): The amount of money a business gets as return from an investment.
- Revenue: The total amount of income before expenses are subtracted.
- Sales Prospect: A potential customer.
- Supplier: A provider of supplies to a business.
- Target Market: A specific group of customers at which a company's products and services are aimed.
- Valuation: An estimate of the overall worth of the business.
- Variable Cost: Expenses that change in proportion to the activity of a business.
- Working Capital: Calculated as current assets minus current liabilities.
- Business Transactions: There are three types of business transactions. These are:
  - Simple Transactions – Usually a single transaction between a vendor and a customer. For example: Buying a cup of coffee.
  - Complex Transactions – These transactions go through a number of events before they can be completed. For example: Buying a house.
  - Ongoing transactions – These transactions usually require a contract. For example: Contract with a vendor.

Basic Accounting Formulas

Take a look at some important accounting formula that every entrepreneur needs to know.

1. **The Accounting Equation**: This is value of everything a company owns and uses to conduct its business.

Formula: Assets = Liability + Owner's Equity

2. **Net Income**: This is the profit of the company.

Formula: Net Income = Revenues – Expenses

3. **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.

Formula: Break-Even = Fixed Costs/Sales Price – Variable Cost per Unit

4. **Cash Ratio**: This tells us about the liquidity of a company.

Formula: Cash Ratio = Cash/Current Liabilities

5. **Profit Margin:** This is shown as a percentage. It shows what percentage of sales are left over after all the expenses are paid by the business.

Formula: Profit Margin = Net Income/Sales

6. **Debt-to-Equity Ratio:** This ratio shows how much equity and debt a company is using to finance its assets, and whether the shareholder equity can fulfil obligations to creditors if the business starts making a loss.

Formula: Debt-to-Equity Ratio = Total Liabilities/Total Equity

7. **Cost of Goods Sold**: This is the total of all costs used to create a product or service, which has been sold.

Formula: Cost of Goods Sold = Cost of Materials/Inventory – Cost of Outputs

8. **Return on Investment (ROI)**: This is usually shown as a percentage. It calculates the profits of an investment as a percentage of the original cost.

Formula: ROI = Net Profit/Total Investment * 100

9. **Simple Interest**: This is money you can earn by initially investing some money (the principal).

Formula:
A = P(1 + rt); R = r * 100
Where:
A = Total Accrued Amount (principal + interest)
P = Principal Amount
I = Interest Amount
r = Rate of Interest per year in decimal; r = R/100
t = Time Period involved in months or years

10. **Annual Compound Interest**: This calculates the addition of interest to the principal sum of a loan or deposit.

Formula:
A = P (1 + r/n) ^ nt:
Where:
A = the future value of the investment/loan, including interest
P = the principal investment amount (the initial deposit or loan amount)
r = the annual interest rate (decimal)
n = the number of times that interest is compounded per year
t = the number of years the money is invested or borrowed for

5.6.3 CRM & Networking: What is CRM?

CRM stands for Customer Relationship Management. Originally the expression Customer Relationship Management meant managing one's relationship with customers. However, today it refers to IT systems and software designed to help companies manage their relationships.

The Need for CRM

The better a company can manage its relationships with its customers, the higher the chances of the company's success.

For any entrepreneur, the ability to successfully retain existing customers and expand the enterprise is paramount. This is why IT systems that focus on addressing the problems of dealing with customers on a daily basis are becoming more and more in demand.

Customer needs change over time, and technology can make it easier to understand what customers really want. This insight helps companies to be more responsive to the needs of their customers. It enables them to modify their business operations when required, so that their customers are always served in the best manner possible. Simply put, CRM helps companies recognize the value of their clients and enables them to capitalize on improved customer relations.

Benefits of CRM

CRM has a number of important benefits:

- It helps improve relations with existing customers which can lead to:
  - Increased sales
  - Identification of customer needs
  - Cross-selling of products
- It results in better marketing of one's products or services
- It results in better marketing of one's products or services
- It enhances customer satisfaction and retention
- It improves profitability by identifying and focusing on the most profitable customers

What is Networking?

In business, networking means leveraging your business and personal connections in order to bring in a regular supply of new business. This marketing method is effective as well as low cost. It is a great way to develop sales opportunities and contacts. Networking can be based on referrals and introductions, or can take place via phone, email, and social and business networking websites.

The Need for Networking

Networking is an essential personal skill for business people, but it is even more important for entrepreneurs. The process of networking has its roots in relationship building. Networking results in greater communication and a stronger presence in the entrepreneurial ecosystem. This helps build strong relationships with other entrepreneurs.

Business networking events held across the globe play a huge role in connecting like-minded entrepreneurs who share the same fundamental beliefs in communication, exchanging ideas and converting ideas into realities. Such networking events also play a crucial role in connecting entrepreneurs with potential investors. Entrepreneurs may have vastly different experiences and backgrounds but they all have a common goal in mind – they all seek connection, inspiration, advice, opportunities and mentors. Networking offers them a platform to do just that.

Benefits of Networking

Networking offers numerous benefits for entrepreneurs. Some of the major benefits are:

- Getting high quality leads
- Increased business opportunities
- Good source of relevant connections
- Advice from like-minded entrepreneurs
- Gaining visibility and raising your profile
- Meeting positive and enthusiastic people
- Increased self-confidence
- Satisfaction from helping others
- Building strong and lasting friendships

Tips

- Use social media interactions to identify needs and gather feedback.
- When networking, ask open-ended questions rather than yes/no type questions.

5.6.4 Business Plan: Why Set Goals?

Setting goals is important because it gives you long-term vision and short-term motivation. Goals can be short term, medium term and long term.

Short-Term Goals

- These are specific goals for the immediate future.

Example: Repairing a machine that has failed.

Medium-Term Goals

- These goals are built on your short-term goals.
- They do not need to be as specific as your short-term goals.

Example: Arranging for a service contract to ensure that your machines don't fail again.

Long-Term Goals

These goals require time and planning.
They usually take a year or more to achieve.

Example: Planning your expenses so you can buy new machinery

Why Create a Business Plan?

A business plan is a tool for understanding how your business is put together. It can be used to monitor progress, foster accountable and control the fate of the business. It usually offers a 3-5year projection and outlines the plan that the company intends to follow to grow its revenues. A business plan is also a very important tool for getting the interest of key employees or future investors.
A business plan typically comprises of eight elements.

Executive Summary

The executive summary follows the title page. The summary should clearly state your desires as the business owner in a short and business like way. It is an overview of your business and your plans. Ideally this should not be more than 1-2 pages.

Your Executive Summary should include:

- The Mission Statement: Explain what your business is all about.

Example: Nike's Mission Statement

Nike's mission statement is "To bring inspiration and innovation to every athlete in the world."

- Company Information: Provide information like when your business was formed, the names and roles of the founders, the number of employees, your business location(s) etc.
- Growth Highlights: Mention examples of company growth. Use graphs and charts where possible.
- Your Products/Services: Describe the products or services provided.
- Financial Information: Provide details on current bank and investors.
- Summarize future plans: Describe where you see your business in the future.

Business Description

The second section of your business plan needs to provide a detailed review of the different elements of your business. This will help potential investors to correctly understand your business goal and the uniqueness of your offering.

Your Business Description should include:

- A description of the nature of your business
- The market needs that you are aiming to satisfy
- The ways in which your products and services meet these needs
- The specific consumers and organizations that you intend to serve
- Your specific competitive advantages

Market Analysis

The market analysis section usually follows the business description. The aim of this section is to showcase your industry and market knowledge. This is also the section where you should lay down your research findings and conclusions.

Your Market Analysis should include:

- Your industry description and outlook
- Information on your target market
- The needs and demographics of your target audience
- The size of your target market
- The amount of market share you want to capture
- Your pricing structure
- Your competitive analysis
- Any regulatory requirements

Organization & Management

This section should come immediately after the Market Analysis.
Your Organization & Management section should include:

- Your company's organizational structure
- Details of your company's ownership
- Details of your management team
- Qualifications of your board of directors
- Detailed descriptions of each division/department and its function
- The salary and benefits package that you offer your people

Service or Product Line

The next section is the service or product line section. This is where you describe your service or product, and stress on their benefits to potential and current customers. Explain in detail why your product of choice will fulfil the needs of your target audience.
Your Service or Product Line section should include:

- A description of your product/service
- A description of your product or service's life cycle
- A list of any copyright or patent filings
- A description of any R&D activities that you are involved in or planning

Marketing & Sales

Once the Service or Product Line section of your plan has been completed, you should start on the description of the marketing and sales management strategy for your business.
Your Marketing section should include the following strategies:

- **Market penetration strategy:** This strategy focuses on selling your existing products or services in existing markets, in order to increase your market share.
- **Growth strategy:** This strategy focuses on increasing the amount of market share, even if it reduces earnings in the short-term.
- **Channels of distribution strategy:** These can be wholesalers, retailers, distributers and even the internet.
- **Communication strategy:** These can be written strategies (e-mail, text, chat), oral strategies (phone calls, video chats, face-to-face conversations), non-verbal strategies (body language, facial expressions, tone of voice) and visual strategies (signs, webpages, illustrations).

Your Sales section should include the following information:

- **A salesforce strategy:** This strategy focuses on increasing the revenue of the enterprise.
- **A breakdown of your sales activities:** This means detailing out how you intend to sell your products or services – will you sell it offline or online, how many units do you intend to sell, what price do you plan to sell each unit at, etc.

Funding Request

This section is specifically for those who require funding for their venture.

The Funding Request section should include the following information:

- How much funding you currently require.
- How much funding you will require over the next five years. This will depend on your long-term goals.
- The type of funding you want and how you plan to use it. Do you want funding that can be used only for a specific purpose, or funding that can be used for any kind of requirement?
- Strategic plans for the future. This will involve detailing out your long-term plans – what these plans are and how much money you will require to put these plans in motions.
- Historical and prospective financial information. This can be done by creating and maintaining all your financial records, right from the moment your enterprise started, to the present day. Documents required for this are your balance sheet which contains details of your company's assets and liabilities, your income statement which lists your company's revenues, expenses and net income for the year, your tax returns (usually for the last three years) and your cash flow budget which lists the cash that came in, the cash that went out and states whether you had a cash deficit (negative balance) or surplus (positive balance) at the end of each month.

Financial Planning

Before you begin building your enterprise, you need to plan your finances. Take a look at the steps for financial planning:

Step 1: Create a financial plan. This should include your goals, strategies and timelines for accomplishing these goals.

Step 2: Organize all your important financial documents. Maintain a file to hold your investment details, bank statements, tax papers, credit card bills, insurance papers and any other financial records.

Step 3: Calculate your net worth. This means figure out what you own (assets like your house, bank accounts, investments etc.), and then subtract what you owe (liabilities like loans, pending credit card amounts etc.) the amount you are left with is your net worth.

Step 4: Make a spending plan. This means write down in detail where your money will come from, and where it will go.

Step 5: Build an emergency fund. A good emergency fund contains enough money to cover at least 6 months' worth of expenses.

Step 6: Set up your insurance. Insurance provides long term financial security and protects you against risk.

Risk Management

As an entrepreneur, it is critical that you evaluate the risks involved with the type of enterprise that you want to start, before you begin setting up your company. Once you have identified potential risks, you can take steps to reduce them. Some ways to manage risks are:

- Research similar business and find out about their risks and how they were minimized.
- Evaluate current market trends and find out if similar products or services that launched a while ago are still being well received by the public.
- Think about whether you really have the required expertise to launch your product or service.
- Examine your finances and see if you have enough income to start your enterprise.
- Be aware of the current state of the economy, consider how the economy may change over time, and think about how your enterprise will be affected by any of those changes.
- Create a detailed business plan.

Tips

Ensure all the important elements are covered in your plan.

Scrutinize the numbers thoroughly.

Be concise and realistic.

Be conservative in your approach and your projections.

Use visuals like charts, graphs and images wherever possible.

5.6.5 Procedure and Formalities for Bank Finance: The Need for Bank Finance

For entrepreneurs, one of the most difficult challenges faced involves securing funds for start-ups. With numerous funding options available, entrepreneurs need to take a close look at which funding methodology works best for them. In India, banks are one of the largest funders of start-ups, offering funding to thousands of start-ups every year.

What Information Should Entrepreneurs Offer Banks for Funding?

When approaching a bank, entrepreneurs must have a clear idea of the different criteria that banks use to screen, rate and process loan applications. Entrepreneurs must also be aware of the importance of providing banks with accurate and correct information. It is now easier than ever for financial institutions to track any default behaviour of loan applicants. Entrepreneurs looking for funding from banks must provide banks with information relating to their general credentials, financial situation and guarantees or collaterals that can be offered.

General Credentials

This is where you, as an entrepreneur, provide the bank with background information on yourself. Such information includes:

- Letter(s) of Introduction: This letter should be written by a respected business person who knows you well enough to introduce you. The aim of this letter is set across your achievements and vouch for your character and integrity.
- Your Profile: This is basically your resume. You need to give the bank a good idea of your educational achievements, professional training, qualifications, employment record and achievements.
- Business Brochure: A business brochure typically provides information on company products, clients, how long the business has been running for etc.
- Bank and Other References: If you have an account with another bank, providing those bank references is a good idea.
- Proof of Company Ownership or Registration: In some cases, you may need to provide the bank with proof of company ownership and registration. A list of assets and liabilities may also be required.

Financial Situation

Banks will expect current financial information on your enterprise. The standard financial reports you should be prepared with are:

- Balance Sheet
- Cash-Flow Statement
- Business Plan
- Profit-and-Loss Account
- Projected Sales and Revenues
- Feasibility Study

Guarantees or Collaterals

Usually banks will refuse to grant you a loan without security. You can offer assets which the bank can seize and sell off if you do not repay the loan. Fixed assets like machinery, equipment, vehicles etc. are also considered to be security for loans.

The Lending Criteria of Banks

Your request for funding will have a higher chance of success if you can satisfy the following lending criteria:

- Good cash flow
- Adequate security
- Good reputation
- Adequate shareholders' funds
- Experience in business

The Procedure

To apply for funding the following procedure will need to be followed.

1. Submit your application form and all other required documents to the bank.
2. The bank will carefully assess your credit worthiness and assign ratings by analysing your business information with respect to parameters like management, financial, operational and industry information as well as past loan performance.
3. The bank will make a decision as to whether or not you should be given funding.

Tips

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

5.6.6 Enterprise Management - An Overview: How to Manage Your Enterprise?

To manage your enterprise effectively you need to look at many different aspects, right from managing the day-to-day activities to figuring out how to handle a large-scale event. Let's take a look at some simple steps to manage your company effectively.

Step 1: Use your leadership skills and ask for advice when required.

Let's take the example of Ramu, an entrepreneur who has recently started his own enterprise. Ramu has good leadership skills – he is honest, communicates well, knows how to delegate work etc. These leadership skills definitely help Ramu in the management of his enterprise. However, sometimes Ramu comes across situations that he is unsure how to handle. What should Ramu do in this case? One solution is for him to find a more experienced manager who is willing to mentor him. Another solution is for Ramu to use his networking skills so that he can connect with managers from other organizations, who can give him advice on how to handle such situations.

Step 2: Divide your work amongst others – realize that you cannot handle everything yourself.

Even the most skilled manager in the world will not be able to manage every single task that an enterprise will demand of him. A smart manager needs to realize that the key to managing his enterprise lies in his dividing all his work between those around him. This is known as delegation. However, delegating is not enough. A manager must delegate effectively if he wants to see results. This is important because delegating, when done incorrectly, can result in you creating even more work for yourself. To delegate effectively, you can start by making two lists. One list should contain the things that you know you need to handle yourself. The second list should contain the things that you are confident can be given to others to manage and handle.

Besides incorrect delegation, another issue that may arise is over-delegation. This means giving away too many of your tasks to others. The problem with this is, the more tasks you delegate, the more time you will spend tracking and monitoring the work progress of those you have handed the tasks to. This will leave you with very little time to finish your own work.

Step 3: Hire the right people for the job.

Hiring the right people goes a long way towards effectively managing your enterprise. To hire the best people suited for the job, you need to be very careful with your interview process. You should ask potential candidates the right questions and evaluate their answers carefully. Carrying out background checks is always a good practice. Running a credit check is also a good idea, especially if the people you are planning to hire will be handling your money. Create a detailed job description for each role that you want filled and ensure that all candidates have a clear and correct understanding of the job description. You should also have an employee manual in place, where you put down every expectation that you have from your employees. All these actions will help ensure that the right people are approached for running your enterprise.

Step 4: Motivate your employees and train them well.

Your enterprise can only be managed effectively if your employees are motivated to work hard for your enterprise. Part of being motivated involves your employees believing in the vision and mission of your enterprise and genuinely wanting to make efforts towards pursuing the same. You can motivate your employees with recognition, bonuses and rewards for achievements. You can also motivate them by telling them about how their efforts have led to the company's success. This will help them feel pride and give them a sense of responsibility that will increase their motivation. Besides motivating your people, your employees should be constantly trained in new practices and technologies. Remember, training is not a one-time effort. It is a consistent effort that needs to be carried out regularly.

Step 5: Train your people to handle your customers well.

Your employees need to be well-versed in the art of customer management. This means they should be able to understand what their customers want, and also know how to satisfy their needs. For them to truly understand this, they need to see how you deal effectively with customers.

This is called leading by example. Show them how you sincerely listen to your clients and the efforts that you put into understand their requirements. Let them listen to the type of questions that you ask your clients so they understand which questions are appropriate.

Step 6: Market your enterprise effectively.

Also, hire a marketing agency if you feel you need help in this area. Now that you know what is required to run your enterprise effectively, put these steps into play, and see how much easier managing your enterprise becomes!

Tips

- Get advice on funding options from experienced bankers.
- Be cautious and avoid borrowing more than you need, for longer than you need, at an interest rate that is higher than you are comfortable with.

5.6.7 20 Questions to Ask Yourself before Considering Entrepreneurship

1. Why am I starting a business?
2. What problem am I solving?
3. Have others attempted to solve this problem before? Did they succeed or fail?
4. Do I have a mentor or industry expert that I can call on?
5. Who is my ideal customer?
6. Who are my competitors?
7. What makes my business idea different from other business ideas?
8. What are the key features of my product or service?
9. Have I done a SWOT analysis?
10. What is the size of the market that will buy my product or service?
11. What would it take to build a minimum viable product to test the market?
12. How much money do I need to get started?
13. Will I need to get a loan?
14. How soon will my products or services be available?
15. When will I break even or make a profit?
16. How will those who invest in my idea make a profit?
17. How should I set up the legal structure of my business?
18. What taxes will I need to pay?
19. What kind of insurance will I need?
20. Have I reached out to potential customers for feedback?

Tips

- It is very important to validate your business ideas before you invest significant time, money and resources into it.
- The more questions you ask yourself, the more prepared you will be to handle to highs and lows of starting an enterprise.

Footnotes:

1. A mentor is a trusted and experienced person who is willing to coach and guide you.
2. A customer is someone who buys goods and/or services.
3. A competitor is a person or company that sells products and/or services similar to your products and/or services.
4. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. To conduct a SWOT analysis of your company, you need to list down all the strengths and weaknesses of your company, the opportunities that are present for your company and the threats faced by your company.
5. A minimum viable product is a product that has the fewest possible features, that can be sold to customers, for the purpose of getting feedback from customers on the product.
6. A company is said to break even when the profits of the company are equal to the costs.
7. The legal structure could be a sole proprietorship, partnership or limited liability partnership.
8. There are two types of taxes – direct taxes payable by a person or a company, or indirect taxes charged on goods and/or services.
9. There are two types of insurance – life insurance and general insurance. Life insurance overs human.

- Life while general insurance covers assets like animals, goods, cars etc

Notes

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Address: 602-608, 6th Floor, Ansal Chambers-II. Bhikaji Cama Place, New Delhi-110066

Email: info@essc-india.org

Website: www.essc-india.org

Phone: +91-11-46035050