

**SYLLABUS FOR INSTRUCTOR  
(WELDER)**

**Introduction to Welding** - Arc and Gas Welding Equipment's, tools and accessories; Different process of metal joining methods: Bolting, riveting, soldering, brazing, seaming etc.; Types of welding joints and its applications. Edge preparation and fit up for different thickness; Surface Cleaning; Arc welding power sources- Transformer, Rectifier and Inverter type welding machines and its care & maintenance; Weld slope and rotation;

### **Oxy Acetylene Welding:**

Calcium carbide uses and hazard; Acetylene gas properties and flash back arrestor; Oxygen gas and its properties; Charging process of oxygen and acetylene gases - Oxygen and Dissolved Acetylene gas; cylinders and Color coding for different gas cylinders; Uses of single and double stage Gas regulators; Oxy acetylene gas welding System; Metalizing; Manual Oxy - acetylene powder coating process- principles of operation and applications;

### **Oxy Acetylene Gas cutting:**

Common gases used for welding & cutting, flame temperatures and uses. - Types of oxy-acetylene flames and uses. - Oxy-Acetylene Cutting Equipment principle, parameters and application.

Difference between gas welding blow pipe(LP &HP) and gas cutting blow pipe; Gas welding techniques;

Specification of pipes; pipe joints; pipe welding- all positions, and procedure; plate welding; Pipe development for Elbow joint, "T" joint, Y joint and branch joint; Brief use of Manifold system;

Reading of assembly drawing - Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) Hard facing/ surfacing necessity, surface preparation, various hard facing alloys and advantages of hard facing.

**Arc welding:** Arc and Gas Welding terms and definitions; Basic electricity applicable to arc welding; Heat and temperature and its terms related to welding - Principle of arc welding and characteristics of arc. Advantages and disadvantages of A.C. and D.C. welding machines, - Welding positions as per EN & ASME; Welding symbols as per BIS & AWS.

Arc blow - causes and methods of controlling; Distortion in arc & gas welding- methods employed to minimize distortion - Arc Welding defects, causes and Remedies; Arc length - types, effects of arc length; Polarity-Types and applications; Gas welding filler rods, specifications and sizes. - Gas welding fluxes - types and functions

**Gas Brazing & Soldering:** principles, types fluxes & uses - Gas welding defects, causes and remedies; Electrode : types, functions of flux, coating factor, size specifications of electrode; Effects of moisture pick up.-Storage and baking of electrodes; Weldability of metals; importance of pre heating, post heating and maintenance of inter pass temperature; Welding of low, medium and high carbon steel and alloy steels, Cast Iron; weld decay and weldability.

Induction welding, brazing of copper tubes; - Brass - types, properties and welding methods; - Copper - types, properties and welding methods; Brazing cutting tools; Aluminium properties and weldability, Welding methods - Arc cutting & gouging.

### **Gas Metal Arc welding:**

Introduction to GMAW - equipment - accessories. - Various other names of the process(MIG/MAG/CO2 welding); Safety precautions; Advantages of GMAW welding over SMAW; limitations and applications - Process variables of GMAW; Wire feed system - types - care and maintenance; Welding wires used in GMAW; **shielding** gases used in GMAW and its applications; Flux cored arc welding - description, advantage, **welding** wires, coding as per AWS. Edge preparation; GMAW defects, causes and remedies; Heat **input** and techniques of controlling heat input during welding. - Heat distribution and effect of faster cooling, Pre heating & Post Weld Heat Treatment - Use of temperature indicating crayons. **Submerged** arc welding process - **principles**, equipment, advantages

and limitations; Thermit welding – process, types, principles, equipment's; Thermit mixture types and applications

**Gas Tungsten Arc welding:**

GTAW process - brief description, working principle; Difference between AC and DC welding equipment's, polarities and applications; Power sources for GTAW - AC & DC; Tungsten electrodes - types & uses, sizes and preparation; GTAW Torches- types, parts and their functions; GTAW filler rod and selection criteria. Edge preparation and fit up; GTAW parameters for welding of different thickness of metals, Argon / Helium gas properties – uses; GTAW Defects, causes and remedy.

Plastic welding machine with hot air gun and plastic material: Polypropylene (PP) Polyethylene (PE) Polyvinylchloride (PVC)

**Non-traditional welding:**

Friction welding process equipment and application; Laser beam welding (LBW); Plasma Arc Welding (PAW) and Plasma Arc cutting (PAC) process – equipment's and principles of operation; Types of Plasma arc advantages and applications; Resistance welding process -types, principles, power sources and welding parameters - Applications and limitations.

Weld quality inspection; common welding mistakes and appearance of good and defective welds; Weld gauges & its uses; Types of Inspection methods - Classification of destructive and NDT methods - Welding economics and Cost estimation.

**Engineering Drawing:**

Introduction to Engineering Drawing and Drawing Instruments; Conventions Sizes and layout of drawing sheets Title Block, its position and content Drawing Instrument - Free hand drawing of; Geometrical figures and blocks with dimension Transferring measurement from the given object to the free hand sketches; Free hand drawing of hand tools and measuring tools; Lines Types and applications in drawing; Drawing of Geometrical figures; Angle, Triangle, Circle, Rectangle, Square, Parallelogram; Lettering & Numbering – Single Stroke, double stroke, inclined - Reading of dimension and Dimensioning Practice; Reading of fabrication drawing, sectional view of different types of welding Joints; Sectional view of different pipe joints - Symbolic representation different symbols used in the related trades Reading of Job Drawing of related trades.

**Basic Mathematics and Science:**

-Unit, Fractions - Square root, Ratio and Proportions, Percentage - Material Science - Mass, Weight, Volume and Density -Heat & Temperature and Pressure - Basic Electricity - Mensuration - Trigonometry