

**CURRICULUM**

**FOR THE TRADE OF**

**WELDER (Dual Mode)**

**UNDER**

**DUAL TRAINING SYSTEM**

**BY**



**GOVERNMENT OF INDIA**  
**MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP**  
**DIRECTORATE GENERAL OF TRAINING**

PROPOSED TIME DISTRIBUTION FOR WELDER TRADE UNDER  
DUAL TRAINING SCHEME

<b>BLOCK WITH DURATION</b>	<b>THEORY</b>	<b>PRAC.</b>	<b>WSC/ CAL</b>	<b>ENGG. DRG.</b>	<b>EMP. SKILL</b>	<b>ECA, LIB. &amp; OTHERS</b>	<b>REM.</b>
BLOCK – I (05months/ 22 Weeks duration ) Institute level trg.	230hrs.	300 hrs.	80 hrs.	120 hrs.	100hr s.	10 hrs.	40 hrs. Revision & Test
BLOCK – II (05months / 22 weeks duration) Industry level trg.	---	880hrs.	---	---	---	---	---
BLOCK – III (2 months/ 8 Weeks duration) Institute level trg.	90 hrs.	114 hrs. (Practical practice and submission of report related to industry training)	30hrs.	30hrs.	10 hrs.	06 hrs.	Last 1 week revision & exam.
<b>GRAND TOTAL</b>	<b>320hrs.</b>	<b>1294hrs.</b>	<b>110 hrs.</b>	<b>150 hrs.</b>	<b>110 hrs.</b>	<b>16hrs.</b>	<b>80 hrs.</b>
<b>Total duration of training inclusive of Industry &amp; Institute is 1 years (2080 hrs.)</b>							

## GENERAL INFORMATION

- 1. Name of the Trade** : WELDER (Dual Mode)
- 2. N.C.O. Code No.** : 7212.10, 7212.20, 7212.30, 7212.40 & 7212.50
- 3. Duration of Craftsmen Training:** 12 months (Three Blocks).
- 4. Power norms** : 16 KW
- 5. Space norms** : Workshop: 80 Square meters. (5 Sq.m/trainee)
- 6. Entry Qualification** : Pass 8<sup>th</sup> Class Examination
- 7. Unit size (No. of student):** 16 (Max. supernumeraries seats: 5)

**8. Instructor's /Trainer's qualification Trade theory & trade practical**

(A) : Essential (any one of the below)

- (i) NTC/NAC with Three years Experience in relevant field with Craft Instructors Training Certificate.
- (ii) Diploma in Mechanical and allied with two years experience in relevant field.
- (iii) Degree in Mechanical / Metallurgy / Production Engineering/Mechatronics with one year experience in relevant field.

(B) Desirable qualification: for (ii) & (iii) Craft Instructors Training Certificate.

**Note:**

- (i) Out of two Instructors required for the unit of 1+1, one must have Degree/Diploma and other must have NTC/NAC qualifications.
- (ii) Instructor qualification for W/shop Calculation, Engg Drawing & Employability Skill would be as per the training manual.

**Distribution of training on Hourly basis:**

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
40 Hours	25 Hours	6 Hours	2 Hours	3 Hours	2 Hours	2 Hours

## SYLLABUS CONTENT WITH TIME STRUCTURE FOR WELDER TRADE

Block – I

Duration- 05 Months (22 weeks /880Hrs.)

### Institute Level Training: -

Sl. No.	Practical Duration:- 300 hrs.	Theory Duration:- 230 hrs.
1.	<b>Induction training:</b> <ul style="list-style-type: none"> <li>- Familiarisation with the Institute.</li> <li>- Importance of trade Training</li> <li>- Machinery used in the trade.</li> <li>- Introduction to safety equipment and their use etc.</li> <li>- Hack sawing, filing square to dimensions.</li> <li>- Marking out on MS plate and punching.</li> </ul>	<b>General</b> <ul style="list-style-type: none"> <li>- Importance of Welding in Industry</li> <li>- Safety precautions in Shielded Metal Arc Welding, and Oxy-Acetylene Welding and Cutting.</li> <li>- Introduction and definition of welding.</li> <li>- Arc and Gas Welding Equipments, tools and accessories .</li> <li>- Arc and Gas Welding terms and definitions. Different process of metal joining methods: Bolting, riveting, soldering, brazing, seaming etc.</li> <li>- Types of welding joints and its applications.</li> </ul>
2.	<b>Gas welding Practice</b> <ul style="list-style-type: none"> <li>- Setting of oxy-acetylene welding equipment, Lighting and setting of flame.</li> <li>- Fusion run without and with filler rod on M.S. sheet 2 mm thick in flat position.</li> <li>- Butt joint on MS sheet 2 mm thick on all practical Positions</li> <li>- Fillet “T” joint on MS sheet 2 mm thick on all practical positions</li> </ul>	<b>Gas Welding</b> <ul style="list-style-type: none"> <li>- Chemistry of oxy-acetylene flame.</li> <li>- Types of oxy-acetylene flames and uses.</li> <li>- Oxy-Acetylene Cutting Equipment principle, parameters and application.</li> <li>- Acetylene gas properties and generating methods.</li> <li>- Oxygen gas and its properties</li> </ul>
3.	<b>Gas welding Practice</b> <ul style="list-style-type: none"> <li>- Structural pipe welding butt joint on MS pipe Ø 50 and 3mm thick in 1G position.</li> <li>- Pipe welding “T” joint on MS pipe Ø 50 and 3mm thick.</li> <li>- Square Butt &amp; Lap joint on M.S. sheet 2 mm thick by brazing</li> </ul>	<b>Gas Welding</b> <ul style="list-style-type: none"> <li>- Oxygen and Dissolved Acetylene gas cylinders and Color coding for different gas cylinders.</li> <li>- Gas regulators, types and uses.</li> <li>- Difference between gas welding blow pipe and gas cutting blow pipe</li> </ul>
4.	<b>Gas Cutting Practice</b> <ul style="list-style-type: none"> <li>- Marking and straight line cutting of MS plate. 10 mm thick by gas.</li> <li>- Beveling of MS plates 10 mm thick by gas cutting.</li> </ul>	<b>Gas Welding</b> <ul style="list-style-type: none"> <li>- Gas welding techniques. Rightward and Leftward techniques.</li> <li>- Manifold system</li> <li>- Gas welding filler rods, specifications and sizes.</li> <li>- Gas welding fluxes – types and functions.</li> <li>- Gas Brazing &amp; Soldering : principles, types fluxes &amp; uses</li> <li>- Gas welding defects, causes and remedies.</li> </ul>
5.	<b>MMAW Practices</b>	<b>MMAW</b>

	<ul style="list-style-type: none"> <li>- Setting up of Arc welding machine &amp; accessories and Striking an arc</li> <li>- Straight line beads on M.S. plate 10 mm thick in flat position.</li> <li>- Weaved bead on M. S plate 10mm thick in flat position.</li> <li>- Fillet “T” joint on M.S. Plate 10 mm thick in flat position.</li> </ul>	<ul style="list-style-type: none"> <li>- Basic electricity applicable to arc welding and related electrical terms &amp; definitions.</li> <li>- Principle of arc welding.</li> <li>- Arc welding power sources: Transformer, Motor Generator set, Rectifier and Inverter type welding machines and its care &amp; maintenance..</li> <li>- Advantages and disadvantages of A.C. and D.C. welding machines</li> </ul>
6.	<ul style="list-style-type: none"> <li>- Straight line beads and multi layer practice on M.S. Plate 10 mm thick in Horizontal position.</li> <li>- Fillet “ T” joint on M.S. plate 10 mm thick in Horizontal position.</li> <li>- Straight line beads and multi layer practice on M.S. Plate 10 mm thick in Vertical position.</li> <li>- Weaved bead on M.S Plate 10mm in vertical position.</li> <li>-Fillet “T” joint on M.S. plate 10 mm thick in vertical position.</li> </ul>	<b>MMAW</b> <ul style="list-style-type: none"> <li>- Welding positions as per EN &amp;ASME : flat, horizontal, vertical and over head position.</li> <li>- Welding symbols as per BIS &amp; AWS.</li> <li>- Arc length – types – effects of arc length.</li> <li>- Polarity: Types and applications.</li> <li>- Arc blow – causes and methods of controlling.</li> </ul>
7.	<ul style="list-style-type: none"> <li>- Straight line beads on M.S. plate 10mm thick in over head position</li> <li>- Weaved bead on M.S Plate 10mm in Overhead position.</li> <li>- Fillet “T” joint on M.S. plate 10 mm thick in over head position.</li> </ul>	<b>MMAW</b> <ul style="list-style-type: none"> <li>- Electrode : types, functions of flux, coating factor, sizes of electrode Coding of electrode as per BIS, AWS,</li> <li>- Effects of moisture pick up.</li> <li>- Storage and baking of electrodes.</li> <li>- Arc Welding defects, causes and Remedies.</li> </ul>
8.	<b>GMAW Practices</b> <ul style="list-style-type: none"> <li>- Setting up of GMAW welding machine &amp; accessories and Striking an arc</li> <li>- Depositing straight line beads on M.S Plate.</li> <li>- Fillet weld – “T” joint on M.S plate 10mm thick in flat position by Dip transfer.</li> <li>- Fillet weld – “T” joint on M.S. sheet 3mm thick in flat position by Dip transfer.</li> </ul>	<b>GMAW</b> <ul style="list-style-type: none"> <li>- Safety precautions in Gas Metal Arc Welding, and Gas Tungsten Arc welding.</li> <li>- Introduction to GMAW -equipment – accessories.</li> <li>- Advantages of GMAW welding over SMAW , limitations and applications</li> <li>- Process variables of GMAW.</li> <li>- Modes of metal transfer – dip or short circuiting transfer, spray transfer and globular transfer and Pulsed metal transfer.</li> </ul>
9.	<b>GMAW Practices</b> <ul style="list-style-type: none"> <li>- Fillet weld – “T” joint on M.S plate 10mm thick in Horizontal position by Dip transfer.</li> <li>- Fillet weld – “T” joint on M.S. sheet 3mm thick in Horizontal position by Dip transfer.</li> <li>- Fillet weld – “T” joint on M.S plate 10mm thick in vertical position by Dip transfer.</li> <li>- Fillet weld – corner joint on M.S. sheet 3mm thick in vertical position by Dip transfer.</li> <li>- Fillet weld – “T” joint on M.S sheet 3mm thick in over head position by Dip transfer.</li> </ul>	<b>GMAW</b> <ul style="list-style-type: none"> <li>- Wire feed system – types – care and maintenance.</li> <li>- Welding wires used in GMAW, standard diameter and codification as per AWS.</li> <li>- Types of shielding gases and gas mixtures used in GMAW and its applications.</li> <li>- Flux cored arc welding – description, advantage, welding wires, coding as per AWS.</li> <li>- GMAW defects, causes and remedies</li> </ul>
10.	<b>GTAW practices:</b> <ul style="list-style-type: none"> <li>- Depositing bead on Aluminium sheet 2 mm</li> </ul>	<b>GTAW</b> <ul style="list-style-type: none"> <li>- GTAW process - brief description Difference</li> </ul>

	<p>thick in flat position.</p> <ul style="list-style-type: none"> <li>- Square butt joint on Aluminium sheet 1.6mm thick in flat position.</li> </ul>	<p>between AC and DC welding, equipments , polarities and applications.</p> <ul style="list-style-type: none"> <li>- Power sources for GTAW - AC &amp; DC</li> <li>- Tungsten electrodes –types &amp; uses, sizes and preparation</li> <li>- GTAW Torches- types, parts and their functions</li> </ul>
<b>11.</b>	<p><b>GTAW practices:</b></p> <ul style="list-style-type: none"> <li>- Fillet weld – “T” joint on Aluminium sheet 1.6 mm thick in flat position.</li> <li>- Depositing bead on SS sheet 2 mm thick in flat position.</li> <li>- Fillet weld – “ T” joint on Stainless steel sheet 1.6 mm thick in flat position.</li> </ul>	<p><b>GTAW</b></p> <ul style="list-style-type: none"> <li>- GTAW filler rods and selection criteria</li> <li>- Edge preparation and fit up.</li> <li>- GTAW parameters for welding of different thickness of metals</li> <li>- Pulsed TIG welding - brief description, pulse parameters slope up and slope down.</li> <li>- Argon / Helium gas properties – uses.</li> <li>- GTAW Defects, causes and remedy.</li> </ul>
<b>12.</b>	<p><b>Resistance welding practices:</b></p> <ul style="list-style-type: none"> <li>- MS sheets joining by Resistance Spot welding</li> </ul>	<p><b>Other Processes</b></p> <ul style="list-style-type: none"> <li>- Resistance welding process -types, principles, power sources and welding parameters, Applications and limitations.</li> <li>- Submerged arc welding process –principles, equipment, advantages and limitations</li> </ul>
<b>13.</b>	<p>-MMAW welding practices</p>	<p><b>Metals &amp; Properties</b></p> <ul style="list-style-type: none"> <li>- Classification of steel.</li> <li>- Welding of low, medium and high carbon steel and alloy steels.</li> <li>- Effects of alloying elements on steel</li> <li>- Weldability of metals and importance of pre heating, post heating</li> </ul>
<b>14.</b>	<p>- GMAW welding practices</p>	<p><b>Metals &amp; Properties</b></p> <ul style="list-style-type: none"> <li>- Stainless steel : types- weld decay and weldability.</li> <li>- Aluminium and its alloys, properties and weldability, Welding methods</li> <li>- Arc cutting &amp; gouging,</li> <li>- Cast iron and its properties types.</li> <li>- Welding methods of cast iron.</li> </ul>
<b>15.</b>	<p>- GTAW welding practices</p>	<p><b>Surfacing Techniques</b></p> <ul style="list-style-type: none"> <li>- Manual Oxy – acetylene powder coating process- principles of operation and applications</li> <li>- Hard facing/ surfacing necessity, surface preparation, various hard facing alloys and advantages of hard facing .</li> </ul>
<b>16.</b>	<p><b>Testing practices</b></p> <ul style="list-style-type: none"> <li>- Testing of weld joints by visual inspection .</li> <li>- Inspection of welds by using weld gauges.</li> <li>- Dye penetrant test,</li> <li>- Magnetic particle test.</li> <li>- Nick- break test.</li> </ul>	<p><b>Inspection</b></p> <ul style="list-style-type: none"> <li>- Weld quality inspection, common welding mistakes and appearance of good and defective welds</li> <li>- Weld gauges &amp; its uses</li> <li>- Types of Inspection methods</li> </ul>

	- Free bend test. - Fillet fracture test.	- Classification of destructive and NDT methods
<b>17.</b>	<b>REVISION &amp; EXAMINATION</b>	

**NOTE: - Maximum uses of video demonstration and other IT based teaching aids may be adopted to deliver the theoretical knowledge.**

Syllabus for

**EMPLOYABILITY SKILLS**



**GENERAL INFORMATION**  
**(Employability Skill)**

1. **Name of the subject:** EMPLOYABILITY SKILLS
2. **Hours of Instruction:** 110 Hrs.
3. **Examination:** The examination will be held at the end of the training.
4. **Instructor Qualification:**

MBA OR BBA with two years experience OR Graduate in Sociology/ Social Welfare/ Economics with Two years experience OR Graduate/ Diploma with Two years experience and trained in Employability Skills from DGET institutes

AND

Must have studied English/ Communication Skills and Basic Computer at 12<sup>th</sup> / Diploma level and above

OR

Existing Social Studies Instructors duly trained in Employability Skills from DGET institutes

5. **Instructor:**

One full time regular instructor shall be engaged on every 240 numbers of trainees for teaching the subject “Employability Skills”. One additional full time regular instructor would be required on increase in every 240 trainees. Wherever the trainees are less than 240 or part thereof, a part-time instructor may be engaged to teach the subject.

**ALLOTMENT OF TIME AND MARKS AMONG THE TOPICS**

Sl. No.	Topics	Allotted Hours	Marks Allotted	To be covered in
1.	English Literacy	20 hrs.	9	<b>Block – I</b>
2.	I.T. Literacy	20 hrs.	9	
3.	Communication Skills	15 hrs.	7	
4.	SUB TOTAL:	55	25	
5.	Entrepreneurship Skills	15 hrs.	6	
6.	Productivity	10 hrs.	5	
7.	Occupational safety , health and Environment Education	15 hrs.	6	
8.	Labour Welfare Legislation	05 hrs.	3	
9.	Quality Tools	10 hrs.	5	
	Sub Total:	55	25	
	<b>TOTAL</b>	<b>110 hrs.</b>	<b>50</b>	

## Detail of Syllabus

<b>1. English Literacy</b>	
<b>Hours of Instruction: 20 Hrs. Marks Allotted: 09</b>	
<b>Pronunciation</b>	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
<b>Functional Grammar</b>	Transformation of sentences, Voice change, Change of tense, Spellings.
<b>Reading</b>	Reading and understanding simple sentences about self, work and environment
<b>Writing</b>	Construction of simple sentences Writing simple English
<b>Speaking / Spoken English</b>	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
<b>2. I.T. Literacy</b>	
<b>Hours of Instruction: 20 Hrs. Marks Allotted: 09</b>	
<b>Basics of Computer</b>	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
<b>Computer Operating System</b>	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
<b>Word processing and Worksheet</b>	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets
<b>Computer Networking and INTERNET</b>	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet, Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
<b>3. Communication Skills Hour of Instruction: 15 Hrs. Marks Allotted: 07</b>	
Topic	Contents
<b>Introduction to Communication Skills</b>	Communication and its importance
	Principles of Effective communication
	Types of communication - verbal, non verbal,

	written, email, talking on phone.
	Non verbal communication -characteristics, components- Para-language
	Body - language
	Barriers to communication and dealing with barriers.
	Handling nervousness/ discomfort.
<b>Listening Skills</b>	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.
	Triple- A Listening - Attitude, Attention & Adjustment.
	Active Listening Skills.
<b>Motivational Training</b>	Characteristics Essential to Achieving Success
	The Power of Positive Attitude
	Self awareness
	Importance of Commitment
	Ethics and Values
	Ways to Motivate Oneself
	Personal Goal setting and Employability Planning.
<b>Facing Interviews</b>	Manners, Etiquettes, Dress code for an interview
	Do's & Don'ts for an interview
<b>Behavioral Skills</b>	Problem Solving
	Confidence Building
	Attitude
<b>4. Entrepreneurship Skills Hour of Instruction: 15 Hrs. Marks</b>	
<b>Allotted: 06</b>	
<b>Concept of Entrepreneurship</b>	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of
	entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
<b>Project Preparation &amp; Marketing analysis</b>	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
<b>Institutions Support</b>	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
<b>Investment Procurement</b>	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
<b>5. Productivity</b>	
<b>Hour of Instruction: 10 Hrs. Marks Allotted: 05</b>	

<b>Benefits</b>	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard. Industry Nation.
<b>Affecting Factors</b>	Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.
<b>Comparison with developed countries</b>	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
<b>Personal Finance Management</b>	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
<b>7. Occupational Safety, Health and Environment Education Hour of</b>	
<b>Instruction: 15 Hrs. Marks Allotted: 06</b>	
<b>Safety &amp; Health</b>	Introduction to Occupational Safety and Health importance of safety and health at workplace.
<b>Occupational Hazards</b>	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
<b>Accident &amp; safety</b>	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety measures.
<b>First Aid</b>	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person
<b>Basic Provisions</b>	Idea of basic provision of safety, health, welfare under legislative of India.

<b>Ecosystem</b>	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
<b>Pollution</b>	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
<b>Energy Conservation</b>	Conservation of Energy, re-use and recycle.
<b>Global warming</b>	Global warming, climate change and Ozone layer depletion.
<b>Ground Water</b>	Hydrological cycle, ground and surface water, Conservation and Harvesting of water
<b>Environment</b>	Right attitude towards environment, Maintenance of in -house environment
<b>7. Labour Welfare Legislation Hour of Instruction: 05 Hrs. Marks Allotted: 03</b>	
<b>Welfare Acts</b>	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
<b>Hour of Instruction: 10 Hrs.</b>	
<b>8. Quality Tools</b>	<b>Marks Allotted: 05</b>
<b>Quality Consciousness</b>	Meaning of quality, Quality characteristic.
<b>Quality Circles</b>	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
<b>Quality Management System</b>	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
<b>House Keeping</b>	Purpose of Housekeeping, Practice of good Housekeeping.
<b>Quality Tools</b>	Basic quality tools with a few examples

### **Tools & Equipments for Employability Skills:**

<b>Sl. No.</b>	<b>Name of the Equipment</b>	<b>Quantity</b>
1	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 nos.
2	UPS - 500Va	10 nos.
3	Scanner cum Printer	1 no.
4	Computer Tables	10 nos.
5	Computer Chairs	20 nos.
6	LCD Projector	1 no.
7	White Board 1200mm x 900mm	1 no.

\* Note: Above Tools & Equipments not required, if Computer LAB is available in the institute.

Syllabus for

# **ENGINEERING DRAWING**



**GENERAL INFORMATION**  
**(Engineering Drawing)**

1. **Name of the Subject :** ENGINEERING DRAWING
2. **Hours of Instruction:** 150 hrs.
3. **Instructor Qualification:** Degree in Engineering with one year experience  
OR  
Diploma in Engineering with two years experience  
OR  
NCVT / NAC in the Draughtsman (Mechanical / Civil)  
with three years experience.
4. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
5. **Instructor:**
  - One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.
  - For seats less than 144, the instructor may be out sourced/ hired on contract basis.

## Details of syllabus

Sl. No.	Topics (Total duration – 150 hrs.)
1.	Introduction to Engineering Drawing and Drawing Instruments : <ul style="list-style-type: none"> <li>- Conventions</li> <li>- Viewing of engineering drawing sheets.</li> <li>- Method of Folding of printed Drawing Sheet as per BIS SP:46-2003</li> <li>- Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.</li> </ul>
2.	Lines : <ul style="list-style-type: none"> <li>- Definition, types and applications in Drawing as per BIS SP:46-2003</li> <li>- Classification of lines (Hidden, centre, construction, Extension, Dimension, Section)</li> <li>- Drawing lines of given length (Straight, curved)</li> <li>- Drawing of parallel lines, perpendicular line</li> <li>- Methods of Division of line segment</li> </ul>
3.	Free hand drawing of <ul style="list-style-type: none"> <li>- Lines, polygons, ellipse, etc.</li> <li>- geometrical figures and blocks with dimension</li> </ul> Transferring measurement from the given object to the free hand sketches.
4.	Lettering and Numbering as per BIS SP46-2003: <ul style="list-style-type: none"> <li>- Single Stroke, Double Stroke, inclined,</li> </ul>
5.	Drawing of Geometrical Figures: Definition, nomenclature and practice of <ul style="list-style-type: none"> <li>- Angle: Measurement and its types, method of bisecting.</li> <li>- Triangle -different types</li> <li>- Rectangle, Square, Rhombus, Parallelogram.</li> <li>- Circle and its elements.</li> </ul>
6.	Sizes and Layout of Drawing Sheets <ul style="list-style-type: none"> <li>- Selection of sizes</li> <li>- Title Block, its position and content</li> <li>- Item Reference on Drawing Sheet (Item List)</li> </ul>
7.	Method of presentation of Engineering Drawing <ul style="list-style-type: none"> <li>- Pictorial View</li> <li>- Orthographic View</li> <li>- Isometric view</li> </ul>
8.	Symbolic Representation used in the related trade (as per BIS SP:46-2003) of : <ul style="list-style-type: none"> <li>- Fastener (Rivets, Bolts and Nuts)</li> <li>- Bars and profile sections</li> <li>- Weld, brazed and soldered joints.</li> <li>- Electrical and electronics element</li> <li>- Piping joints and fittings</li> </ul>
9.	Dimensioning practice: <ul style="list-style-type: none"> <li>- Position of dimensioning (unidirectional, aligned, as per BIS SP:46-2003)</li> <li>- Types of arrowhead</li> <li>- Leader Line with text</li> <li>- Symbols preceding the value of dimension and dimensional tolerance.</li> </ul>
10.	- Drawing of Solid figures (Cube, Cuboids, Cone) with dimensions.
11.	Free hand Drawing of Solid figures (Prism, Pyramid, Frustum of Cone and Pyramid.) with

	dimensions.
12.	Free Hand sketch of hand tools and measuring tools used in respective trades.
13.	Projections: <ul style="list-style-type: none"> <li>- Concept of axes plane and quadrant.</li> <li>- Orthographic projections</li> <li>- Method of first angle and third angle projections (definition and difference)</li> <li>- Symbol of 1<sup>st</sup> angle and 3<sup>rd</sup> angle projection as per IS specification.</li> </ul>
14.	Drawing of Orthographic projection in 3 <sup>rd</sup> angle.
15.	Free hand Drawing of simple fastener (Rivet, Bolts, Nuts & Screw)
16.	Free hand sketching of simple objects related to trade.
17.	Reading of fabricated engineering drawing

## **LIST OF TOOLS & EQUIPMENTS**

<b>Sl. No.</b>	<b>NAME OF TOOLS / EQUIPMENTS</b>	<b>QUANTITY</b>
1.	Drawing Board	20
2.	Models : Solid & cut section	as required
3.	Table for trainees	20
4.	Stool for trainees	20
5.	Cupboard (big)	01
6.	White Board (size: 8ft. x 4ft.)	01
7.	Trainer's Table	01
8.	Trainer's Chair	01

Syllabus for

**Workshop Calculation & Science**

**GENERAL INFORMATION**  
**(Workshop Calculation & Science)**

1. **Name of the subject :** WORKSHOP CALCULATION & SCIENCE
2. **Hours of Instruction:** 110 hrs.
3. **Examination:** The examination for the subject will be held at the end of training.
4. **Instructor Qualification:** Degree in Engineering with two years experience OR  
Diploma in Engineering with one year experience
5. **Desirable:** Craft Instructor Certificate in RoD & A course under NCVT.
6. **Instructor:**

One full time instructor is required for 144Engineering seats sanctioned in the institute. Additional instructor will be required on increase in every 144 students.  
For seats less than 144, the instructor may be out sourced/ hired on contract basis.

## SYLLABUS FOR WORKSHOP CALCULATION AND SCIENCE

(Total duration - 110 hrs.)

Topic No	Workshop Calculation	Workshop Science
1.	<p><b>Unit:</b> Systems of unit- FPS, CGS, MKS/SI unit,  Unit of length, Mass and time.  Conversion of units.</p>	<p><b>Material Science :</b> Definition, properties (physical &amp; mechanical) and uses of Metal, Non-metal, Alloy &amp; Insulator.  Types of ferrous and Non-ferrous metals.  Difference between Ferrous and Non-Ferrous metals.</p>
2.	<p><b>Basic Mathematics</b> - BODMAS rule Fraction-Addition, Subtraction, multiplication and Division-Problem solving, Decimal-Addition.  Simple calculation using Scientific Calculator.</p>	<p><b>Mass, Weight and Density:</b> Mass, Unit of Mass, Weight, difference between mass and weight.  Density, unit of density. Relation between mass, weight &amp; density.  Simple problems related to mass, weight, and density.</p>
3.	Conversion of Fraction to Decimal and vice-versa.	
4.	<b>Ratio &amp; Proportion:</b> Simple calculations & related problems solving.	
5.	<p><b>Percentage:</b> Introduction, Simple calculation.  Changing percentage to fraction and decimal &amp; vice-versa.</p>	
6.	<p><b>Basic Algebra:</b> Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).</p>	<p><b>Elasticity:</b> Elastic &amp; Plastic material. Stress &amp; strain and their units. Young's modulus. Ultimate stress and breaking stress.</p>
7.	<p><b>Mensuration :</b> Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle,  Volume of solids – cube, cuboid, cylinder and Sphere.  Surface area of solids – cube, cuboid, cylinder and Sphere.</p>	<p><b>Heat &amp; Temperature:</b> Heat and temperature, their units, difference between heat and temperature, boiling point, melting point,  Scale of temperature, relation between different scale of temperature.  Thermometer, pyrometer.  Transmission of heat, conduction, convection, radiation.</p>

8.		<b>Basic Electricity:</b> Introduction and use of Electricity.  AC, DC & their comparisons. Current, Voltage, Resistance & their units.  Power, Energy & their units.  Insulator and conductors & their uses.
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## **BLOCK – II**

**DURATION: 05 MONTHS (22 weeks)**

### **Industry level training**

### **BROAD LEARNING TO BE COVERED IN INDUSTRY FOR WELDER TRADE:**

- 1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)**
- 2. Record keeping and documentation**
- 3. Practical skills on SMAW process**
- 4. Practical skills on GMAW process**
- 5. Practical skills on GTAW process**
- 6. Practical skills on Welding Inspection and Testing**

### **DETAILS OF PRACTICAL SKILLS TO BE COVERED DURING INDUSTRY TRAINING FOR WELDER TRADE**

Duration of training: - 05 Months

**Actual training will depend on the existing facilities available in the establishments.**

The candidate should be competent to execute following operation/ skills after completion of the industrial training: -

1. Instructions in safety precautions on the shop floor and use of PPE.
2. Use of shop floor material handling equipment
3. Use of clamps & Jigs & Fixtures
4. Reading of fabrication drawing & welding symbols
5. Cutting of metal to size
6. Fitting practices as applicable to the welder trade
7. Methods of using various welding gases from cylinders/manifold system and its safety precautions
8. Preparation of surfaces for welding
9. Gas welding, brazing and soldering of different joints of MS sheets using appropriate filler rods & Flux
10. Setting up of welding machines for production purpose and basic maintenance
11. Groove and fillet joints of MS parts in down hand, horizontal, vertical and overhead positions by SMAW using different types of electrodes.
12. Pipe joints in 1G & 2G positions by SMAW
13. Minimizing distortion by weld sequence and heat input
14. Reclamation of worn-out parts by welding

15. Hard facing
16. Plasma cutting and Arc Gouging practice
17. Preheating and post heating of welds
18. Fillet and groove joints of MS parts in down hand, horizontal, vertical and overhead positions by GMAW
19. Fillet and groove joints of MS parts by FCAW
20. Butt and Fillet joints of Aluminium and SS parts in down hand, horizontal and vertical positions by GTAW
21. Welding of SS by purging techniques
22. Welding of thin sheets by resistance spot welding & other related process.
23. Welding objects according to drawing
24. Inspection and testing of welds and use of weld gauges
25. Testing of welds destructive and non-destructive methods
26. Project work assigned by industry.

**NOTE: -**

1. In addition to the above mentioned skills/ operations industry may impart training on any other skills/ operations related to the trade.
2. Assignment should be planned so that the trainees may spend 20% of the total time of production/service type of work (using gauges, templates, fixture etc.) for developing their skill and confidence about manufacturing which will help ever in self-employment, if found necessary in the future.

## **BLOCK – III**

**DURATION:** 2months (08weeks)

### **Institute level training**

**For last two months candidates will be engaged in following works: -**

1. Revision of theoretical components covered during Block – I.
2. Practical practice and project report submission
3. Preparing candidate to face interview, preparation of bio-data, awareness about different jobs in the related field and grooming to be an entrepreneur.
4. Self study and final AITT examination

### **Note:-**

1. The training may be conducted in Block mode i.e. few months in ITI & few in Industry.
2. The training may be conducted in flexible mode i.e. few days of a week in ITI& few days in Industry.
3. Five months industrial training is mandatory.
4. Last two months of training in ITI is mandatory.
5. No admission of trainees without signing MOU with industry by the Institute (ITI).
6. To sign MOU with ITI, industry must ensure that, training facility is available to impart all skill sets as indicated in Block-II. Industry should make arrangements to provide all the Skill set as in Block-II for Mechanic Diesel in the Industry either by itself or through its ancillary units or in association with some other Industries.
7. If the industry ensures delivery of skill training as per Sl. 6 then 2nd MOU is not necessary.
8. However, Industry should ensure 100% skill training indicated in Block-II & necessary arrangement to be made to cover training on rest skill set (beyond the % indicated in sl.6) in collaboration with any other related industries. Extensive use of E-learning process may also be adopted.

## **TRADE: WELDER (Dual mode)**

### **LIST OF TOOLS & EQUIPMENTS FOR 16 TRAINEES**

#### **A: TRAINEES TOOL KIT:-**

<b>Sl. No.</b>	<b>Name of the items</b>	<b>Quantity</b>
1	Welding helmet fibre	16 nos.
2	Welding hand shield fibre	16 nos.
3	Chipping hammer with metal handle 250 Grams	16 nos.
4	Chisel cold flat 19 mm x 150 mm	16 nos.
5	Centre punch 9 mm x 127 mm	16 nos.
6	Dividers 200 mm	16 nos.
7	Stainless steel rule 300mm	16 nos.
8	Scriber 150 mm double point	16 nos.
9	Flat Tongs 350mm long	16 nos.
10	Hack saw frame fixed 300 mm	16 nos.
11	File half round bastard 300 mm	16 nos.
12	File flat 350 mm bastard	16 nos.
13	Hammer ball pane 1 kg with handle	16 nos.
14	Tip Cleaner	16 nos.
15	Try square 6"	16 nos.

#### **B : General Machinery Shop outfit**

<b>Sl. No.</b>	<b>Name and Description of Tools</b>	<b>Quantity</b>
16	Spindle key	4
17	Screw Driver 300mm blade and 250 mm blade	1 each
18	Number punch 6 mm	2 set
19	Letter punch 6 mm	2 set
20	Magnifying glass 100 mm . dia	2
21	Universal Weld measuring gauge	2
22	Earth clamp 600A	6
23	Spanner D.E. 6 mm to 32mm	2 sets
24	C-Clamps 10 cm and 15 cm	2 each
25	Hammer sledge double faced 4 kg	1
26	S.S tape 5 meters flexible in case	1
27	Electrode holder 600 amps	6
28	H.P. Welding torch with 5 nozzles	2 sets
29	Oxygen Gas Pressure regulator double stage	2
30	Acetylene Gas Pressure regulator double stage	2
31	CO <sub>2</sub> Gas pressure regulator, with flow meter	2 set
32	Argon Gas pressure regulator with flow meter	2 set
33	Metal rack 182 cm x 152 cm x 45 cm	1

34	First Aid box	1
35	Steel lockers with 8 Pigeon holes	2
36	Steel almirah / cupboard	2
37	Black board and easel with stand	1
38	Flash back arrester (torch mounted)	4 pairs
39	Flash back arrester (cylinder mounted)	4 pairs

### **C : General Installation**

40	Welding Transformer with all accessories ( 400A, OCV 60–100 V, 60% duty cycle)	1 set
41	Inverter based SMAW welding machine with all accessories (300A , OCV 60 – 100 V, 60% duty cycle)	1 set
42	D.C Arc welding rectifiers set with all accessories (400 A. OCV 60 – 100 V, 60% duty cycle )	1 set
43	GMAW welding machine 400A capacity with air cooled torch, Regulator, Gas preheater, Gas hose and Standard accessories	1 set
44	AC/DC GTAW welding machine with water cooled torch 300 A, Argon regulator, Gas hose, water circulating system and standard accessories.	1 set
45	Auto Darkening Welding Helmet	2
46	Spot welding machine to 15 KVA with all accessories	1 set
47	Portable gas cutting machine capable of cutting Straight & Circular with all accessories	1 set
48	Pedestal grinder fitted with coarse and medium grain size grinding wheels dia. 300 mm	1
49	Bench grinder fitted with fine grain size silicon carbide green grinding wheel dia. 150 mm	1
50	AG 4 Grinder	2
51	Suitable gas welding table with fire bricks	2
52	Suitable Arc welding table with positioner	9
53	Trolley for cylinder (H.P. Unit)	2
54	Hand shearing machine capacity to cut 6 mm sheets and flats	1
55	Power saw machine 18''	1
56	Portable drilling machine (Cap. 6 mm)	1
57	Oven, electrode drying 0 to 350°C, 10 kg capacity	1
58	Work bench 340x120x75 cm with 4 bench vices of 150 mm jaw opening	4 sets
59	Oxy Acetylene Gas cutting blow pipe	2 sets
60	Oxygen, Acetylene Cylinders	2 each*
61	CO <sub>2</sub> cylinder	2 Nos *
62	Argon gas cylinder	2 Nos *
63	Anvil 12 sq. inches working area with stand	1
64	Swage block	1
65	Die penetrant testing kit	1 set
66	Magnetic particle testing Kit	1 set
67	Fire extinguishers (foam type and CO <sub>2</sub> type)	1
68	Fire buckets with stand	4
69	Portable abrasive cut-off machine	1
70	Suitable Gas cutting table	1

NOTE:

1. \* Optionally Gas cylinders can also be hired as and when required
2. No additional items are required to be provided for unit or batch working in the Second shift except the items under trainee's tool kit and steel lockers.

**D: Class Room Furniture for Trade Theory**

<b>Sl. No</b>	<b>Names &amp; Description of Furniture</b>	<b>Quantity</b>
1	Instructor's table and Chair (Steel)	1 set
2	Students chairs with writing pads	16
3	White board size 1200mm X 900 mm	1
4	Instructors lap top with latest(vista & above) configuration pre loaded with operating system. and MS Office package.	1
5	LCD projector with screen.	1

**ALLOTMENT OF TIME & MARKS AMONG**  
**THE SUBJECTS FOR EXAMINATION**

<b>Sl. No.</b>	<b>SUBJECTS</b>	<b>Duration of exam (in Hrs.)</b>	<b>Full Marks</b>	<b>Pass Marks</b>
<b>1.</b>	Trade Theory + E/S (150+50)	3	200	80
<b>2.</b>	Workshop Cal. & Sc.	3	50	20
<b>3.</b>	Engineering Drawing	4	50	20
<b>4.</b>	Internal Marks (ITI)	--	50	30
<b>5.</b>	Trade Practical –I*	4	50	30
<b>6.</b>	Internal Marks (Industry)	--	50	30
<b>7.</b>	Trade Practical-II** + Project work (200+50)	8	250	150
<b>GRAND TOTAL</b>			<b>700</b>	<b>360</b>

**Note:-**

- a. “\*” represents practical conducted at ITI
- b. “\*\*” represents practical conducted at Industry at the end of training
- c. 40% pass marks for theory subjects and 60% pass marks for practical
- d. The project work will be conducted at industry and industry will allot marks for the same.

## Format for Internal Assessment

Name & Address of the Assessor :						Year of Enrollment :								
Name & Address of ITI (Govt./Pvt.) :						Date of Assessment :								
Name & Address of the Industry :						Assessment location: Industry / ITI								
Trade Name :			Block:			Duration of the Trade/course:								
Operation/Skill:														
Sl. No	Maximum Marks (Total 100 Marks)		15	5	10	5	10	10	5	10	15	15	Total internal assessment Marks	Result (Y/N)
	Candidate Name	Father's/Mother's Name	Safety consciousness	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA		
1														
2														



## **LIST OF TRADE COMMITTEE MEMBERS**

Sl. No.	Name & Designation	Organization
1.	Smt. Sandhya Salwan, Director of Training	DGT, MSDE
2.	Shri. A.Mahendiran, Director	FTI Bangalore
3.	Shri. Satya Shankar.BP, Director	APEX-Hi-Tech, Bangalore
4.	Shri N.K Thakur, DGM	L&T Chennai.
5.	Shri Rajeev Khurana, GM	Maruti Suzuki India Ltd Gurgoan.
6.	Shri. Nirmalya Nath, ADT	CSTARI Kolkata.
7.	Shri P. MOULI, ADT	DGT Delhi.
8.	Shri R N Manna, TO	CSTARI Kolkata.
9.	Shri M. Kumaravel, DDT	FTI, Bangalore
10.	Shri H.V. Vasuki, DGM	LTCEC, L&T, Bangalore
11.	Shri A. N. Reddy, GM	Ador Fontech Ltd., Bangalore
12.	Shri M. S. Hanumantharayappa, Instructor	Govt. ITI, Bangalore