

**COMPETENCY BASED CURRICULUM**

**FOR THE TRADE OF**

**WELDER (Fabrication & Fitting)**

**SEMESTER-I & II**

**UNDER**

**CRAFTSMAN TRAINING SCHEME (CTS)**

**IN SEMESTER PATTERN**

**BY**



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

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## 1. INTRODUCTION

The Ministry of Skill Development & Entrepreneurship is the apex organization for development and coordination at National level for the programmes relating to vocational training including Women's Vocational Training and Employment Services. Employment service is operated through a countrywide network of Employment Exchanges. Industrial Training Institutes are under the administrative and financial control of State Governments or Union Territory Administrations. The Ministry also operates Vocational Training Schemes in some of the specialized areas through field institutes under its direct control. Development of these programmes at national level, particularly in the area concerning common policies, common standards and procedures, training of instructors and trade testing are the responsibility of the Ministry. But, day-to-day administration of employment Exchanges and Industrial Training Institutes rests with the State Governments/ Union Territories Administrations.

CSTARI one of the field institute of the Ministry is mandated to develop curricula for various courses under different schemes viz., CTS, ATS, MES, CoE& CITS. All the courses are certificate level and run on pan India basis under the aegis of NCVT. The curricula developed so far by this institute are skill based which catered the need of the industry manpower there by contributing significantly in the development of technical manpower. Hence vocational training provides country wide manpower and this trained manpower actually builds the wealth for the nation.

The broad concept of industry competency concerns the ability to perform particular tasks and duties to the standard of performance expected in the workplace. Competency requires the application of specified skills, knowledge and attitudes relevant to effective participation in an industry, industry sector or enterprise.

Competency covers all aspects of workplace performance and involves performing individual tasks; managing a range of different tasks; responding to contingencies or breakdowns; and dealing with the responsibilities of the workplace, including working with others. Workplace competency requires the ability to apply relevant skills, knowledge and attitudes consistently over time and in the required workplace situations and environments.

In line with this concept of competency based curriculum focus on what is expected of a competent individual in the workplace as an outcome of learning, rather than focusing on the learning process itself.

“The Competency Based Training” establishes a direct link between the things which trainees must learn in institutions and knowledge and skills expected from them for employability “The Competency Based Training” is a means of instruction which :

- i) Identifies the competencies required for work performance,
- ii) Prepares the trainees through precise learning objectives,
- iii) Is based on the realities of the world of work

When learning deals with performance type activities, it is necessary to analyse each job performed under a particular vocation. Skills required for doing a job may be manipulative and may require sequential and chronological order of performance. Therefore, teaching and learning content shall be presented in a psychological and methodological manner. Hence, identification of competencies becomes an essential exercise for planning and design a curriculum for vocational courses.

The elements of competency are the basic building blocks of the unit of competency. They describe in terms of outcomes the significant functions and tasks that make up the competency.

The performance criteria specify the required performance in relevant tasks, roles, skills and in the applied knowledge that enables competent performance. They are usually written in passive voice. Critical terms or phrases may be written in bold italics and then defined in range statement, in the order of their appearance in the performance criteria.

The essential skills and knowledge are either identified separately or combined. Knowledge identifies what a person needs to know to perform the work in an informed and effective manner. Skills describe the application of knowledge to situations where understanding is converted into a workplace outcome.

The procedure followed for this purpose is as follows:

- I) listing of job opportunities,
- II) identification of duties for each job,
- III) analyzing the elements of competencies and setting Performance criteria against each elements of competencies,
- IV) determining courses objectives,
- V) Preparing course content by projecting elements of competencies, Performance criteria, skills and knowledge and personality traits.

## **2. JOB ROLES: Reference NOS & NCO**

### **Brief description of Job roles:**

**WELDER (Fabrication & Fitting) while gas welding**, fuses metal parts viz., M.S, S.S, Brass & Aluminium sheets and Cast Iron plates together using welding rod and oxygen acetylene flame. Examines parts to be welded, cleans portion to be joined, holds them together by some suitable device and if necessary makes narrow groove to direct flow of molten metal to strengthen joint. Selects correct type and size of welding rod, fluxes nozzle etc. and tests welding, torch. Wears dark glasses and other protective devices while welding. Releases and regulates valves of oxygen and acetylene cylinders to control their flow into torch. Ignites torch and regulates flame gradually. Preheats joints as required. Applies flux as required for welding Aluminium and Cast Iron. Guides flame along joint and heats it to melting point, simultaneously melting welding rod and spreading molten metal along joint shape, size etc. Makes Square butt, lap, Tee, Corner and Single Vee but joints by Gas welding. Rectifies defects if any.

**WELDER (Fabrication & Fitting) while gas cutting**, cuts metal to required shape and size by gas flame either manually or by machine. Examines material to be cut and marks it according to instruction of specification. Makes necessary connections and fits required size of nozzle in welding torch. Releases and regulates flow of gas in nozzle, ignites and adjusts flame. Guides flame by hand or machine along cutting line at required speed and cuts metal to required size.

**WELDER (Fabrication & Fitting) while gas brazing**, joints metal parts by heating using flux and filler rods. Cleans and fastens parts to be joined face to face by wire brush. Apply flux on the joint and heats by Oxy acetylene welding torch to melt filler rods into joint. Allows it to cool down. Clean and examines the joint.

**WELDER (Fabrication & Fitting) while Shielded Metal Arc welding (SMAW) on plates** fuses metals using arc-welding power source and electrodes. Examines parts to be welded, cleans them and sets joints together with clamps or any other suitable device. Starts welding power source and regulates current according to material and thickness of welding. Connect one lead to part to be welded, selects required type of electrode and clamps other lead to electrode holder. May join parts first at various points for holding at specified angles, shape, form and dimension by tack welding. Establish arc between electrode and joint and maintain it throughout the length of the joint. . Makes Square butt, lap, Tee, Corner and Single Vee but joints by Shielded Metal Arc Welding. Rectifies defects if any by Arc gouging and re-welding.

**WELDER (Fabrication & Fitting) while Fitting Structural assemblies** fits together various parts of heavy structures such as bridges, overhead cranes, hoists, ship etc. in workshop according to drawings under instructions of structural Engineer, and dismantles them for transporting to site for final construction. Examines drawings and other specifications. Checks parts to be fitted together. Cuts steel plates and angle iron

using power shear or flame cutting equipment. Drills holes for bolts and rivets. Aligns members in position with connecting pins to ensure that members fit together properly preparatory to permanent erection of structures at site. Checks alignment of members with spirit level, etc., to ensure accuracy of fit. Tack weld the assemblies. May bend or otherwise shape plates and assemble structural members by fitting, forging, drilling, riveting, bolting, or welding.

### **Reference NCO & NOS:**

- i) NCO-2004: 7212.10**
- ii) NCO-2004: 7212.20**
- iv) NCO-2004: 7212.40**
- v) NCO-2004: 7212.50**
- vi) NCO-2004: 7214.65**
- vii) NCO-2004: 7222.10**

### **NOS:-**

- i) Oxy Fuel Gas Cutter**  
Qualification Pack Code: CSC/Q 0203
- ii) Senior Manual Metal Arc Welder/Shielded Metal Arc Welder**  
Qualification Pack Code: CSC/Q 0204
- iii) Qualification Pack Code: CSC Q 0136-Fitter-Fabrication**

### **3. NSQF LEVEL COMPLIANCE**

NSQF level for WELDER (Fabrication & Fitting) trade under CTS: **Level 3**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

- a. Process
- b. professional knowledge,
- c. professional skill,
- d. core skill and
- e. Responsibility.

The Broad Learning outcome of WELDER (Fabrication & Fitting) trade under CTS mostly matches with the Level descriptor at Level- 3.

The NSQF level-3 descriptor is given below:

| <b>LEVEL</b> | <b>Process required</b>                                                                          | <b>Professional knowledge</b>                                          | <b>Professional skill</b>                                                                     | <b>Core skill</b>                                                                                                                                                                          | <b>Responsibility</b>                                                             |
|--------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Level 3      | Person may carry put a job which may require limited range of activities routine and predictable | Basic facts, process and principle applied in the module of employment | recall and demonstrate practical skill, routine and repetitive in narrow range of application | Communication written and oral, with minimum required clarity, skill to basic Arithmetic and algebraic principles, personal banking, basic understanding of social and natural environment | Under close supervision<br>Some Responsibility for own work within defined limit. |

#### **4. Learning outcome**

The following are minimum broad general learning outcome after completion of the Welder course of one year duration:

##### **A. GENERIC OUTCOME**

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Work in a team, understand and practice soft skills, technical English to communicate with required clarity.
3. Demonstrate knowledge of concept and principles of basic arithmetic & algebraic and apply knowledge of specific area to perform practical operations.
4. Understand basic science in the field of study including.
5. Read and understand engineering drawing for different application in the field of work
6. Understand the concept in productivity, quality tools, and labour welfare legislation.
7. Explain energy conservation, global warming and pollution.
8. Explain time management, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
9. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

##### **B. SPECIFIC OUTCOME**

1. Join MS sheet by Gas welding in different positions.
2. Join MS plates by SMAW in different positions.
3. Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.
4. Perform different type of MS pipe joints by Gas welding (OAW).
5. Weld different types of MS pipe joints on structural pipes by SMAW.
6. Weld Stainless steel, Cast iron, Aluminium and Brass by OAW .
7. Perform brazing on MS sheets.
8. Perform Arc gauging on MS plate.

9. Perform linear and angular measurement and check surface level using specified gauges and carry out marking using marking block.
10. Develop and make different Geometrical shapes.
11. Study the design drawing related to structural and pressure parts and identify of metals, bars, plates, flats, channels, I section, T section, and box /hollow section etc for the purpose of fabricating structure.
12. Mark, cut and bevel the parts and prepare edges by Oxy acetylene Gas cutting for fabrication of structures
13. Perform drilling machine operations to steel structures for fabrication of structures
14. Mark and cut sheet metals to required size using guillotine shearing machine
15. Perform bending, straightening and edge planning for fabrication of structures
16. Make fit up and carry out tack welding to fabricate structures as per the standard tack welding procedure
17. Mark and prepare edges for different types of pipe joints viz T,Y&K joints and Tack welding Pipes
18. Mark and prepare riveted joints.
19. Make templates for simple objects and fixtures
20. Perform Marking on Girder and Trusses and make a simple lattice structure.
21. Make pipeline Assembly, welded section and cylindrical Tanks by SMAW
22. Rectify distorted welded structure by flame straightening.
23. Carry out dimensional inspection of fit ups
24. Perform Cleaning & Painting on fitted structures.

***NOTE: Learning outcomes are reflection of total competencies of a trainee. Each learning outcome may include multiple assessment components. However assessment will be carried out as per assessable outcome and assessment criteria***

## **5. GENERAL INFORMATION**

1. **Qualification** : WELDER (Fabrication & Fitting)
2. **Ref. N.C.O./NOS Code No.** : NCO-2004: 7212.10, 7212.20, 7212.40, 7212.50, 7214.65, 7222.10
- NOS: CSC/Q 0203, CSC/Q 0204, CSC/Q 0136,
3. **NSQF Level** : Level-3
4. **Duration of Craftsmen Training** : One year (Two semesters each of six months duration).
5. **Entry Qualification** : Passed 8<sup>th</sup> Class pass
6. **Trainees per unit** : 16 (Max. supernumeraries seats: 5)

### **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                   |

## 6. COURSE STRUCTURE

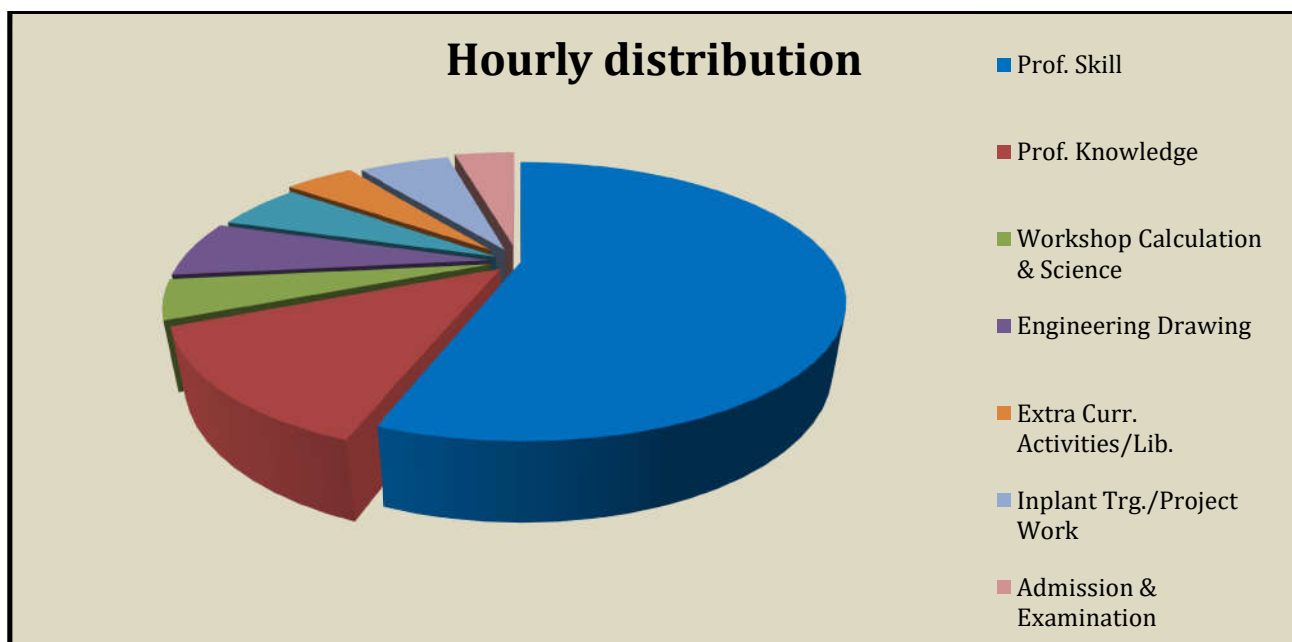
**1. Name of the Qualification :- WELDER (Fabrication & Fitting)**

**2. Total duration of the course: - 12 Months**

**3. Training duration details : -**

|   | COURSE ELEMENTS                  | HOURLY DISTRIBUTION |
|---|----------------------------------|---------------------|
| A | PROFESSIONAL SKILL               | 1100HRS             |
| B | PROFESSIONAL KNOWLEDGE           | 260 HRS             |
| C | WORKSHOP CALCULATION & SCIENCE   | 90 HRS              |
| D | ENGINEERING DRAWING              | 130 HRS             |
| E | EMPLOYABILITY SKILLS             | 110 HRS             |
| F | EXTRA CURRICULAR ACTIVITIES/LIB. | 90 HRS              |
| G | INPLANT TRG./PROJECT WORK        | 120 HRS             |
| H | ADMISSION & EXAMINATION          | 80 HRS              |

### PIE-CHART



## **7. General Training Plan, Examination & Pass regulation**

### **General Training Plan**

The skills stated in assessment outcome are to be imparted in accordance with the instructions contained within Section 10 in respect of the content and time structure of the vocational education and training (General Training Plan).

### **Examination**

Each Semester examination is to take place after the end of the six months of training. The each semester examination encompasses such skills as are listed for that period of training (Detail in Section -10) and also includes theoretical knowledge, Core skills & Employability Skills.

#### **Candidates are to demonstrate that they are able to:**

1. read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
2. perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
3. apply professional knowledge, core skills & employability skills while performing the task.
4. check the job as per drawing/assembly for functioning, identify and rectify errors in job/assembly.
5. document the technical parameters related to the task undertaken.

The details of the examination and assessment standard are as per section-11.

### **Pass regulation**

For the purposes of determining the overall result, weighting of 50 percent is applied to each semester examination. The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%.

## **8. ASSESSABLE OUTCOME**

### **Assessable outcome after completion of one year Welder (Fabrication & Fitting)**

#### **I. Generic**

1. Apply safe working practices.
2. Comply environment regulation and housekeeping
3. Interpret & use Company terminology and technical communication
4. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic calculations and apply knowledge of specific area to perform practical operations.
5. Understand and explain basic science in the field of study including basic electrical.
6. Read and apply engineering drawing for different application in the field of work.
7. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
10. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

#### **II. Specific outcome:**

11. Join MS sheet by Gas welding in different positions.
12. Join MS plates by SMAW in different positions.
13. Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.
14. Perform different type of MS pipe joints by Gas welding (OAW).
15. Weld different types of MS pipe joints on structural pipes by SMAW.
16. Weld Stainless steel, Cast iron, Aluminium and Brass by OAW .
17. Perform brazing on MS sheets.
18. Perform Arc gauging on MS plate.
19. Perform linear and angular measurement and check surface level using specified gauges and carry out marking using marking block
20. Develop and make different geometrical shapes.

21. Study the design drawing related to structural and pressure parts and identify of metals, bars, plates, flats, channels, I section, T section, and box /hollow section etc for the purpose of fabricating structure
22. Mark, cut and bevel the parts and prepare edges by Oxy acetylene Gas cutting for fabrication of structures
23. Perform drilling machine operations to steel structures for fabrication of structures
24. Mark and cut sheet metals to required size using guillotine shearing machine
25. Perform bending, straightening and edge planning for fabrication of structures
26. Prepare pipe joint for high pressure pipe welding
27. Cut Pipe, bend, thread and join and assembly.
28. Mark on curved and bend plates and sections, mark on built up section and mark using pantograph.
29. Prepare T,Y&K joints and marking on structures
30. Make simple riveted joints,Girder,trusses and lattice structure
31. Make templates for cutting to size simple objects and gussets and making simple fixtures
32. Make pipeline Assembly, welded section and cylindrical and cylindrical Tanks by SMAW
33. Rectify distorted welded structure by flame straightening.
34. Carry out dimensional inspection of fit ups
35. Perform Cleaning & Painting on fitted structures.

## **9. ASSESSABLE OUTCOME WITH ASSESSMENT CRITERIA**

**ASSESSABLE OUTCOME ALONGWITH ASSESSMENT CRITERIA TO BE ACHIEVED AFTER EACH SEMESTER & COMPLETION OF QUALIFICATION**

- i) The training shall be conducted as per syllabus defined in reference no: Section 10.
- ii) The trainee shall demonstrate the competencies which are defined below in assessable outcome and assessment criteria.
- iii) All the assessable outcomes are to be tested during formative assessment, Theory & Practical examinations, various observation and viva-voce.
- iv) Assessable outcome of Employability Skills, Workshop Calculation & Science and Engineering Drawing shall be tested separately and also be applied in Theory and Practical examinations.
- v) These assessable outcomes and assessment criteria will serve as guide lines for Trainers, Paper setters, Moderators and Assess

### **GENERIC ASSESSABLE OUTCOME:**

| <b>ASSESSABLE OUTCOMES</b>           | <b>ASSESSMENT CRITERIA</b>                                                                                                                                                          |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Apply safe working practices      | 1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements and according to site policy.     |
|                                      | 1.2 Recognize and report all unsafe situations according to site policy.                                                                                                            |
|                                      | 1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.                                                          |
|                                      | 1.4 Identify, handle and store / dispose off dangerous goods and substances according to site policy and procedures following safety regulations and requirements.                  |
|                                      | 1.5 Identify and observe site policies and procedures in regard to illness or accident.                                                                                             |
|                                      | 1.6 Identify safety alarms accurately.                                                                                                                                              |
|                                      | 1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures. |
|                                      | 1.8 Identify and observe site evacuation procedures according to site policy.                                                                                                       |
|                                      | 1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.                                                                               |
|                                      | 1.10 Identify basic first aid and use them under different circumstances.                                                                                                           |
|                                      | 1.11 Identify different fire extinguisher and use the same as per requirement.                                                                                                      |
| 2. Comply environment regulation and | 2.1 Identify environmental pollution & contribute to the avoidance of instances of environmental pollution.                                                                         |
|                                      | 2.2 Deploy environmental protection legislation & regulations                                                                                                                       |

|                                                                                                                                                                           |                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| housekeeping                                                                                                                                                              | 2.3 Take opportunities to use energy and materials in an environmentally friendly manner                                                     |
|                                                                                                                                                                           | 2.4 Avoid waste and dispose waste as per procedure                                                                                           |
|                                                                                                                                                                           | 2.5 Recognize different components of 5S and apply the same in the working environment.                                                      |
| 3. Interpret & use company and technical communication                                                                                                                    | 3.1 Obtain sources of information and recognize information.                                                                                 |
|                                                                                                                                                                           | 3.2 Use and draw up technical drawings and documents.                                                                                        |
|                                                                                                                                                                           | 3.3 Use documents and technical regulations and occupationally related provisions.                                                           |
|                                                                                                                                                                           | 3.4 Conduct appropriate and target oriented discussions with higher authority and within the team.                                           |
|                                                                                                                                                                           | 3.5 Present facts and circumstances, possible solutions & use English special terminology.                                                   |
|                                                                                                                                                                           | 3.6 Resolve disputes within the team                                                                                                         |
| 4. Demonstrate knowledge of concept and principles of basic arithmetic, algebraic calculations and apply knowledge of specific area to perform practical operations       | 3.7 Conduct written communication.                                                                                                           |
|                                                                                                                                                                           |                                                                                                                                              |
| 5. Understand and explain basic science in the field of study including basic electrical,                                                                                 | 4.1 Semester examination to test basic skills on arithmetic, and algebra.                                                                    |
|                                                                                                                                                                           | 4.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination. |
| 6. Read and apply engineering drawing for different application in the field of work.                                                                                     | 5.1 Semester examination to test basic skills on science in the field of study including basic electrical                                    |
|                                                                                                                                                                           | 5.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination. |
| 7. Understand and explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality. | 6.1 Semester examination to test basic skills on engineering drawing.                                                                        |
|                                                                                                                                                                           | 6.2 Their applications will also be assessed during execution of assessable outcome and also tested during theory and practical examination. |
| 8. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.                                    | 7.1 Semester examination to test the concept in productivity, quality tools and labour welfare legislation.                                  |
|                                                                                                                                                                           | 7.2 Their applications will also be assessed during execution of assessable outcome.                                                         |
|                                                                                                                                                                           | 8.1 Semester examination to test knowledge on energy conservation, global warming and pollution.                                             |
|                                                                                                                                                                           | 8.2 Their applications will also be assessed during execution of assessable outcome.                                                         |

|                                                                                                                                                                         |                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.                                      | 9.1 Semester examination to test knowledge on personnel finance, entrepreneurship.<br>9.2 Their applications will also be assessed during execution of assessable outcome.                                         |
| 10. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry. | 10.1 Semester examination to test knowledge on basic computer working, basic operating system and uses internet services.<br>10.2 Their applications will also be assessed during execution of assessable outcome. |

### **SPECIFIC ASSESSABLE OUTCOME:**

#### **Semester-I**

|                                                                             |                                                                                                                                 |
|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 11. Join MS sheets by Gas welding in different positions.                   | 11.1 Plan and select the nozzle size, working pressure type of flame, filler rod as per requirement.                            |
|                                                                             | 11.2 Prepare, set and tack the pieces as per drawing.                                                                           |
|                                                                             | 11.3 Setting up the tacked joint in specific position.                                                                          |
|                                                                             | 11.4 Deposit the weld following proper welding technique and safety aspect.                                                     |
|                                                                             | 11.5 Carry out visual inspection to ascertain quality weld joint.                                                               |
| 12. Join MS plates by SMAW in different positions.                          | 12.1 Plan and select the type & size of electrode, welding current, type of edge preparation etc. as per requirement.           |
|                                                                             | 12.2 Prepare, set and tack the pieces as per drawing.                                                                           |
|                                                                             | 12.3 Set up the tacked pieces in specific position.                                                                             |
|                                                                             | 12.4 Deposit the weld maintaining appropriate arc length, electrode angle, welding speed, weaving technique and safety aspects. |
|                                                                             | 12.5 Clean the welded joint thoroughly.                                                                                         |
|                                                                             | 12.6 Carry out visual inspection for appropriate weld joint.                                                                    |
|                                                                             | 12.7 Inspect the weld using DPT/MPT.                                                                                            |
| 13. Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene | 13.1 Plan and mark on MS plate surface for straight/bevel/circular cutting.                                                     |
|                                                                             | 13.2 Select the nozzle size and working pressure of                                                                             |

|                                                                   |                                                                                                                                           |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| cutting process.                                                  | gases as per requirement.                                                                                                                 |
|                                                                   | 13.3 Set the marked plate properly on cutting table.                                                                                      |
|                                                                   | 13.4 Perform the straight and bevel cutting operation maintaining proper techniques and all safety aspects.                               |
|                                                                   | 13.5 Perform the circular cutting operation by using profile cutting machine maintaining proper techniques and all safety aspects         |
|                                                                   | 13. 6 Clean the cutting burrs and inspect the cut surface for soundness of cutting.                                                       |
| 14.Perform different type of MS pipe joints by Gas welding (OAW). | 14.1 Plan and prepare the development for a specific type of pipe joint.                                                                  |
|                                                                   | 14.2 Mark and cut the MS pipe as per development.                                                                                         |
|                                                                   | 14.3 Select the size of filler rod, size of nozzle, working pressure etc.                                                                 |
|                                                                   | 14.4 Set and tack the pieces as per drawing.                                                                                              |
|                                                                   | 14.5 Deposit the weld bead maintaining proper technique and safety aspects.                                                               |
|                                                                   | 14.6 Inspect the welded joint visually for poor penetration, uniformity of bead and surface defects.                                      |
| 15. Weld different types of MS pipe joints by SMAW.               | 15.1 Plan and prepare the development for a specific type of pipe joint.                                                                  |
|                                                                   | 15.2 Mark and cut the MS pipe as per development.                                                                                         |
|                                                                   | 15.3 Select the electrode size and welding current for welding.                                                                           |
|                                                                   | 15.4 Set and tack the pieces as per drawing.                                                                                              |
|                                                                   | 15.5 Deposit the weld bead maintaining proper technique and safety aspects.                                                               |
|                                                                   | 15.6 Insect the welded joint visually for root penetration, uniformity of bead and surface defects.                                       |
| 16. Weld Stainless steel, Cast iron, Brass & Aluminum by OAW.     | 16.1 Plan and prepare the pieces for welding.                                                                                             |
|                                                                   | 16.2 Select the type and size of filler rod and flux, size of nozzle, gas pressure, preheating method and temperature as per requirement. |
|                                                                   | 16.3 Set and tack plates as per drawing.                                                                                                  |
|                                                                   | 16.4 Deposit the weld maintaining appropriate technique and safety aspects.                                                               |
|                                                                   | 16.5 Cool the welded joint by observing appropriate cooling method. Use post heating as per requirement.                                  |

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|                                | 16.6 Clean the joint and inspect the weld for its uniformity and different types of surface defects. |
| 17. Perform Arc gauging on MS. | 17.1 Plan and select the size of electrode for Arc gouging.                                          |
|                                | 17.2 Select the polarity and current as per requirement.                                             |
|                                | 17.3 Perform gouging adapting proper gouging technique.                                              |
|                                | 17.4 Clean and check to ascertain the required stock removed.                                        |

## Semester-II

|                                                                                                                                                                                    |                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 18. Perform linear and angular measurement and check surface level using specified gauges and carry out marking using marking block.                                               | 18.1 Measure inside & out side dimensions using Vrenier caliper.                                                                                                         |
|                                                                                                                                                                                    | 18.2 Check surface Level using sprit level.                                                                                                                              |
|                                                                                                                                                                                    | 18.3 Measure heights using Vernier height gauge.                                                                                                                         |
|                                                                                                                                                                                    | 18.4 Measure angle using Bevel protractor.                                                                                                                               |
|                                                                                                                                                                                    | 18.5 Mark dimensions using marking block.                                                                                                                                |
| 19. Develop and make different geometrical shapes.                                                                                                                                 | 19.1 Develop Prism to the given dimensions out of sheet metal                                                                                                            |
|                                                                                                                                                                                    | 19.2 Develop Cylinder to the given dimensions out of sheet metal                                                                                                         |
|                                                                                                                                                                                    | 19.3 Develop Cylinder to the given dimensions out of sheet metal                                                                                                         |
|                                                                                                                                                                                    | 19.4 Develop Cone to the given dimensions out of sheet metal                                                                                                             |
| 20. Study the design drawing related to structural and pressure parts and identify of metals, bars, plates, flats, channels, I section, T section, and box /hollow section etc for | 20.1 Read fabrication drawings and identify the metal bars, plates, flats, channels, I section, T section, and box /hollow section etc. Identify specification of metals |
|                                                                                                                                                                                    | 20.2 Identify metal by colour code and measure dimension of Bars, Plates, Flats, Channels, I section, 'T' section, L section and Box section.                            |

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| the purpose of fabricating structure.                                                                          |                                                                                                                            |
| 21. Mark, cut and bevel the parts and prepare edges by Oxy acetylene Gas cutting for fabrication of structures | 21.1 Clean surface of plate by grinding and filing                                                                         |
|                                                                                                                | 21.2 Mark on plates for bevelling and chamfering                                                                           |
|                                                                                                                | 21.3 Prepare edge for Single “V” butt joint, Single bevel butt joint and Double V butt joint by Oxy acetylene Gas cutting. |
|                                                                                                                | 21.4 Grind and file for maintaining root face                                                                              |
| 22. Perform drilling machine operations to steel structures for fabrication of structures                      | 22.1 Drill different diameter of through holes by drilling                                                                 |
|                                                                                                                | 22.2 Drill Blind holes                                                                                                     |
|                                                                                                                | 22.3 Perform Countersinking                                                                                                |
| 23. Mark and cut sheet metals to required size using guillotine shearing machine                               | 23.1 Identify the safety Precautions, and operate power Shearing machine.                                                  |
|                                                                                                                | 23.2 Mark on sheets to the require Size.                                                                                   |
|                                                                                                                | 23.3 Shear different sizes of sheets by adapting safety precaution.                                                        |
| 24. Perform bending, straightening and edge planning for fabrication of structures                             | 24.1 Bend plates & pipe by using plate/pipe bending machine                                                                |
|                                                                                                                | 24.2 Bend pipes to different angles and shapes by using Pipe bending machine                                               |
|                                                                                                                | 24.3 Straighten plates by hammering (cold straightening)                                                                   |
|                                                                                                                | 24.4 Straighten plates by heating and hammering ( hot straightening.                                                       |
| 25. Prepare pipe joint for high pressure pipe welding                                                          | 25.1 Cut high pressure pipe to required size by Gas cutting                                                                |
|                                                                                                                | 25.1 Mark and bevel the pipes to required bevel angle                                                                      |

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|                                                                                                                      | and root face size by Gas cutting                                                                      |
|                                                                                                                      | 25.2 Grind and file pipe edges pipes to required bevel angle and root face and clean the pipe surface. |
|                                                                                                                      | 25.3 Tack weld the pipes together by SMAW.                                                             |
| 26. Cut Pipe, bend, thread and join fabricate pipe assembly.                                                         | 26.1 Cut pipes to the size                                                                             |
|                                                                                                                      | 26.2 Thread pipes as required                                                                          |
|                                                                                                                      | 26.3 Fabricate pipe line assembly.                                                                     |
| 27 Marking on curved and bend plates and section<br>- Marking on built up section<br>Usage of pantograph for marking | 27.1. Marking on curved and bend plates and section                                                    |
|                                                                                                                      | 27.2 Marking on built up section                                                                       |
|                                                                                                                      | 27.3 Usage of pantograph for marking structure                                                         |
| 28. Prepare T,Y&K joints and marking on structures                                                                   | 28.1 Develop templates for Gas cutting Pipes for 'T' 'Y' and 'K' joint.                                |
|                                                                                                                      | 28.2 Fit up the Pipes and tack weld the pipes as per the standard procedure for 'T' 'Y' and 'K' joint  |
|                                                                                                                      | 28.3 Mark for assembly and tack welding of gusset plates using height gauge                            |
|                                                                                                                      | 28.4 Mark on joint section beam using height gauge                                                     |
|                                                                                                                      | 27.5 Mark on joint column using height gauge                                                           |
|                                                                                                                      | 28.6 Mark on curved and bend plates and sections using measuring and marking tools.                    |
|                                                                                                                      | 28.7 Mark on build up sections using measuring and marking tools.                                      |
|                                                                                                                      | 28.8 Mark using pantograph                                                                             |

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| 29. Make simple riveted joints, Girder, trusses and lattice structure                             | 29.1 Making simple riveted plate assembly - Girder , trusses                                                                     |
|                                                                                                   | 29.2 Make Girder and trusses                                                                                                     |
|                                                                                                   | 29.3 Make a simple lattice structure                                                                                             |
| 30. Make templates for cutting to size simple objects and gussets and making simple fixtures      | 30.1 Make templates for marking on Simple objects.                                                                               |
|                                                                                                   | 30.2 Make templates for Gussets and joint sections                                                                               |
|                                                                                                   | 30.3 Make simple fixtures                                                                                                        |
| 31. Make pipeline Assembly, welded section and cylindrical Tanks by SMAW                          | 31.1 Make pressure pipe line assembly by SMAW.                                                                                   |
|                                                                                                   | 31.2 Make welded section assembly by SMAW                                                                                        |
|                                                                                                   | 31.3 Make cylindrical tanks by SMAW                                                                                              |
| 32. Rectify distorted welded structure by flame straightening.                                    | 32.1 Rectify distorted welded structure by flame straightening with the use of oxy-acetylene flame heating, hammer and pull rod. |
| 33. Carry out dimensional inspection of fit ups. Perform Cleaning & Painting on fitted structures | 33.1 Check dimensions of welded structures using measuring tape, try square, Levelling instruments etc.                          |
|                                                                                                   | 33.2 Clean the structures properly using chipping hammer, wire brush etc.                                                        |
|                                                                                                   | 33.3 Perform Painting                                                                                                            |

## 10. SYLLABUS CONTENT WITH TIME STRUCTURE

### 10.1 SYLLABUS CONTENT FOR PROFESSIONAL SKILL & KNOWLEDGE

**First Semester**  
**(Semester Code no. WLD - 01)**  
**Duration: Six Month**

### **LEARNING OBJECTIVES OF 1<sup>ST</sup> SEMESTER WELDER ( Fabrication & Fitting)**

1. To Join MS sheet by Gas welding in different positions.
2. To Join MS plate by SMAW in different positions.
3. To Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.
4. To Perform different type of MS pipe joints by Gas welding (OAW).
5. To Weld different types of MS pipe joints by SMAW.
6. To Weld Stainless steel, Cast iron, Brass & Aluminium by OAW.
7. To Perform Arc gauging on MS.
8. To Apply safe working practices.
9. To Comply environment regulation and housekeeping
10. To Interpret & use Company terminology and technical communication

| Week No | Professional Skills         |                                                                                                                                                                                                                                                                                                                                                                              | Professional Knowledge                                                                                                                                                                                                                                                                        |
|---------|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | Trade Practical             |                                                                                                                                                                                                                                                                                                                                                                              | Trade Theory                                                                                                                                                                                                                                                                                  |
| 1       | F-01<br>F-02                | <ul style="list-style-type: none"> <li>- Induction training:</li> <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> | <ul style="list-style-type: none"> <li>- General discipline in the Institute</li> <li>- Elementary First Aid.</li> <li>- Importance of Welding in Industry</li> <li>- Safety precautions in Shielded Metal Arc Welding, and Oxy-Acetylene Welding and Cutting.</li> </ul>                     |
| 2       |                             | <ul style="list-style-type: none"> <li>- Setting up of Arc welding machine &amp; accessories and Striking an arc</li> <li>- Setting of oxy-acetylene welding equipment, Lighting and setting of flame.</li> </ul>                                                                                                                                                            | <ul style="list-style-type: none"> <li>- Introduction and definition of welding.</li> <li>- Arc and Gas Welding Equipments, tools and accessories .</li> <li>- Various Welding Processes and its applications .</li> <li>- Arc and Gas Welding terms and definitions.</li> </ul>              |
| 3       | OAW-01<br>OAW-02<br>OAGC-01 | <ul style="list-style-type: none"> <li>- Fusion run without and with filler rod on M.S. sheet 2 mm thick in flat position.</li> <li>- Edge joint on MS sheet 2 mm thick in flat position with out filler rod.</li> <li>- Marking and straight line cutting of MS plate. 10 mm thick by gas.</li> </ul>                                                                       | <ul style="list-style-type: none"> <li>- Different process of metal joining methods: Bolting, riveting, soldering, brazing, seaming etc.</li> <li>- Types of welding joints and its applications. Edge preparation and fit up for different thickness.</li> <li>- Surface Cleaning</li> </ul> |
| 4       | SMAW-01                     | <ul style="list-style-type: none"> <li>- Straight line beads 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;</li> </ul>                                                                                                                                                            |

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|    | SMAW-02                      | - Weaved bead on M. S plate 10mm thick in flat position.                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>definitions.</li> <li>Heat and temperature and its terms related to welding</li> <li>Principle of arc welding. And characteristics of arc .</li> </ul>                                                                                                                                            |
| 5  | OAW-03<br>SMAW-03            | <ul style="list-style-type: none"> <li>Square butt joint on M.S. sheet 2 mm 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>Common gases used for welding &amp; cutting, flame temperatures and uses.</li> <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> </ul>                                  |
| 6  | OAGC-02<br>OAW-04<br>SMAW-04 | <ul style="list-style-type: none"> <li>Bevelling of MS plates 10 mm thick. By gas cutting.</li> <li>Open corner joint on MS sheet 2 mm thick in flat Position</li> <li>Fillet lap joint on M.S. plate 10 mm thick in flat position.</li> </ul>                                                             | <ul style="list-style-type: none"> <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>                                                                     |
| 7  | OAGC-03<br>OAW-05<br>SMAW-05 | <ul style="list-style-type: none"> <li>Circular gas cutting on MS plate 10 mm thick by profile cutting machine.</li> <li>Fillet “T” joint on MS sheet 2 mm thick in flat position</li> <li>Open Corner joint on MS plate 10 mm thick in flat position.</li> </ul>                                          | <ul style="list-style-type: none"> <li>Welding positions as per EN &amp; ASME : flat, horizontal, vertical and over head position.</li> <li>Weld slope and rotation.</li> <li>Welding symbols as per BIS &amp; AWS.</li> </ul>                                                                                                           |
| 8  | OAW-06<br>SMAW-06            | <ul style="list-style-type: none"> <li>Fillet Lap joint on MS sheet 2 mm thick in flat position.</li> <li>Single “V” Butt joint on MS plate 12 mm thick in flat position (1G) .</li> </ul>                                                                                                                 | <ul style="list-style-type: none"> <li>Arc length – types – effects of arc length.</li> <li>Polarity: Types and applications.</li> </ul>                                                                                                                                                                                                 |
| 9  | OAW-07<br>SMAW-07<br>SMAW-08 | <ul style="list-style-type: none"> <li>Square Butt joint on M.S. sheet. 2 mm thick in Horizontal position .</li> <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> </ul> | <ul style="list-style-type: none"> <li>Calcium carbide properties and uses.</li> <li>Acetylene gas properties and generating methods.</li> <li>Acetylene gas Purifier, Hydraulic back pressure valve and Flash back arrestor</li> </ul>                                                                                                  |
| 10 | OAW-08<br>SMAW-09            | <ul style="list-style-type: none"> <li>Fillet Lap joint on M.S. sheet 2 mm thick in horizontal position .</li> <li>Fillet Lap joint on M.S. plate 10 mm thick in horizontal position .</li> </ul>                                                                                                          | <ul style="list-style-type: none"> <li>Oxygen gas and its properties</li> <li>Production of oxygen by Air liquefaction .</li> <li>Charging process of oxygen and acetylene gases</li> <li>Oxygen and Dissolved Acetylene gas cylinders and Color coding for different gas cylinders.</li> <li>Gas regulators, types and uses.</li> </ul> |
| 11 | OAW-09<br>OAW-10<br>SMAW-10  | <ul style="list-style-type: none"> <li>Fusion run with filler rod in vertical position on 2mm thick M.S sheet</li> <li>Square Butt joint on M.S. sheet. 2 mm thick in vertical position</li> <li>Single Vee Butt joint on M.S. plate 12 mm thick in horizontal position (2G).</li> <li>-</li> </ul>        | <ul style="list-style-type: none"> <li>Oxy acetylene gas welding Systems (Low pressure and High pressure). Difference between gas welding blow pipe(LP &amp; HP) and gas cutting blow pipe</li> <li>Gas welding techniques. Rightward and Leftward techniques.</li> </ul>                                                                |
| 12 | SMAW- 11<br>OAW-11           | <ul style="list-style-type: none"> <li>Weaved bead on M.S Plate 10mm in vertical position.</li> <li>Fillet “T” joint on M.S sheet 2 mm thick</li> </ul>                                                                                                                                                    | <ul style="list-style-type: none"> <li>Arc blow – causes and methods of controlling.</li> <li>Distortion in arc &amp; gas welding and</li> </ul>                                                                                                                                                                                         |

|    |                              |                                                                                                                                                                                                      |                                                                                                                                                                                                                                                     |
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|    | SMAW-12                      | in vertical position .<br>-Fillet “T” joint on M.S. plate 10 mm thick in vertical position.                                                                                                          | methods employed to minimize distortion<br>- Arc Welding defects, causes and Remedies.                                                                                                                                                              |
| 13 | OAW-12<br>SMAW-13            | - Structural pipe welding butt joint on MS pipe Ø 50 and 3mm WT in 1G position.<br>- Fillet Lap joint on M.S. Plate 10 mm in vertical position.                                                      | - Specification of pipes, various types of pipe joints, pipe welding positions, and procedure.<br>- Difference between pipe welding and plate welding.                                                                                              |
| 14 | SMAW-14<br>OAW-13            | - Open Corner joint on MS plate 10 mm thick in vertical position.<br>-Pipe welding - Elbow joint on MS pipe Ø 50 and 3mm WT.                                                                         | - Pipe development for Elbow joint, “T” joint, Y joint and branch joint<br>- Manifold system                                                                                                                                                        |
| 15 | OAW-14<br>SMAW-15            | - Pipe welding “T” joint on MS pipe Ø 50 and 3mm WT.<br>- Single “V” Butt joint on MS plate 12 mm thick in vertical position (3G) .                                                                  | - Gas welding filler rods, specifications and sizes.<br>- Gas welding fluxes – types and functions.<br>- Gas Brazing & Soldering : principles, types fluxes & uses<br>- Gas welding defects, causes and remedies.                                   |
| 16 | OAW-15<br>SMAW-16            | - Pipe welding 45 ° angle joint on MS pipe Ø 50 and 3mm WT.<br>- Straight line beads on M.S. plate 10mm thick in over head position.                                                                 | - Electrode : types, functions of flux, coating factor, sizes of electrode<br>Coding of electrode as per BIS, AWS,<br>- Effects of moisture pick up.<br>- Storage and baking of electrodes.<br>- Special purpose electrodes and their applications. |
| 17 | SMAW-17<br>SMAW-18           | - Pipe Flange joint on M.S plate with MS pipe Ø 50 mm X 3mm WT<br>- Fillet “T” joint on M.S. plate 10 mm thick in over head position.                                                                | - Weldability of metals, importance of pre heating, post heating and maintenance of inter pass temperature.                                                                                                                                         |
| 18 | SMAW-19<br>SMAW-20           | - Pipe welding butt joint on MS pipe Ø 50 and 5 mm WT. in 1G position.<br>- Fillet Lap joint on M.S. plate 10 mm thick in over head position.                                                        | - Classification of steel.<br>- Welding of low, medium and high carbon steel and alloy steels.                                                                                                                                                      |
| 19 | SMAW-21<br>SMAW-22           | - Single “V” Butt joint on MS plate 10mm thick in over head position(4G)<br>- Pipe butt joint on M. S. pipe Ø 50mm WT 6mm (1G Rolled).                                                               | - Effects of alloying elements on steel<br>- Stainless steel : types- weld decay and weldability.                                                                                                                                                   |
| 20 | OAW-16<br>SMAW -23<br>OAW-17 | - Square Butt joint on S.S. sheet. 2 mm thick in flat position.<br>- Square Butt joint on S.S. Sheet 2 mm thick in flat position.<br>- Square Butt joint on Brass sheet 2 mm thick in flat position. | - Brass – types – properties and welding methods.<br>- Copper – types – properties and welding methods.                                                                                                                                             |
| 21 | OAW-18<br>SMAW-24<br>AG-01   | - Square Butt & Lap joint on M.S. sheet 2 mm thick by brazing.<br>- Single “V” butt joint C.I. plate 6mm thick in flat position.<br>- Arc gouging on MS plate 10 mm thick.                           | - Aluminium and its alloys, properties and weldability, Welding methods<br>- Arc cutting & gouging,                                                                                                                                                 |
| 22 | OAW-19<br>OAW-20             | - Square Butt joint on Aluminium sheet. 3 mm thick in flat position .<br>- Bronze welding of cast iron (Single “V”                                                                                   | - Cast iron and its properties types.<br>- Welding methods of cast iron.                                                                                                                                                                            |

|    |                                           |                             |  |
|----|-------------------------------------------|-----------------------------|--|
|    |                                           | butt joint) 6mm thick plate |  |
| 23 | <b>Industrial Training / Project Work</b> |                             |  |
| 24 | <b>Industrial Training / Project Work</b> |                             |  |
| 25 | <b>Revision</b>                           |                             |  |
| 26 | <b>Examination</b>                        |                             |  |

**Abbreviations:**

SMAW        - Shielded Metal Arc Welding  
OAW         - Oxy-Acetylene gas Welding  
OAGC       - Oxy-Acetylene Gas Cutting  
F             - Fitting  
WT          - Wall Thickness.

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**Second Semester**  
**(Semester Code no. WLD - 02)**  
**Duration: Six Month**

**LEARNING OBJECTIVES OF 2<sup>ND</sup> SEMESTER Welder (Fabrication & Fitting)**

1. To perform linear and angular measurement and check surface level using specified gauges and carry out marking using marking block.
20. To develop and make different Geometrical shapes.
21. To Study the design drawing related to structural and pressure parts and identify of metals, bars, plates, flats, channels, I section, T section, and box /hollow section etc for the purpose of fabricating structure.
22. To mark, cut and bevel the parts and prepare edges by Oxy acetylene Gas cutting for fabrication of structures
23. To perform drilling machine operations to steel structures for fabrication of structures
24. To mark and cut sheet metals to required size using guillotine shearing machine
25. To perform bending, straightening and edge planning for fabrication of structures
26. To make fit up and carry out tack welding to fabricate structures as per the standard tack welding procedure
27. To mark and prepare edges for different types of pipe joints viz T,Y&K joints and Tack welding Pipes
28. To mark and prepare riveted joints.
29. To make templates for simple objects and fixtures
30. To perform Marking on Girder and Trusses and make a simple lattice structure.
31. To make pipeline Assembly, welded section and cylindrical Tanks by GMAW
32. To rectify distorted welded structure by flame straightening.
33. To carry out dimensional inspection of fit ups, cleaning & painting on fitted structures

**SYLLABUS FOR TRADE PRACTICAL AND TRADE THEORY**  
**SEMESTER-II**

| Week No | Trade Practical | Trade Theory |
|---------|-----------------|--------------|
|---------|-----------------|--------------|

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|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <ul style="list-style-type: none"> <li>- Familiarisation with the machinery Hand tools used in the trade.</li> <li>- Introduction to safety equipment and their use</li> <li>- Handling of measuring instruments - Steel tape, Vernier caliper, Spirit level, Micrometer, Try square, Height gauge, Marking blocks, Bevel protractor etc.</li> </ul> | <ul style="list-style-type: none"> <li>- Outline of the subjects to be covered</li> <li>- Role of fabrication in industry</li> <li>- Basic Trigonometric calculations –</li> <li>- Marking of Angles, Triangles, Square, Rectangle, Parallelogram, Hexagon, Octagon and Circles.</li> </ul>                                              |
| 2 | <ul style="list-style-type: none"> <li>- Development practice of surface of prism, cylinder, pyramids, cones, etc.</li> </ul>                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>- Calculation of volume and surface area of rectangular prism, cubes and cylinders</li> <li>- Development of right solids, prisms, cylinders, pyramids, cones, frustum of pyramid, cone etc.</li> </ul>                                                                                           |
| 3 | <ul style="list-style-type: none"> <li>- Marking on plates for drilling practice</li> <li>- Drilling required diameter hole</li> </ul>                                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>- Workshop practice - Hack sawing, Filing, Chipping, Hand grinding, Marking, Punching, Drilling, Tapping, Die-passing, etc.</li> <li>- Drilling machine - construction and operation feature</li> </ul>                                                                                           |
| 4 | <ul style="list-style-type: none"> <li>- Marking on plates for beveling and chamfering</li> <li>- Beveling and chamfering to required Angle</li> </ul>                                                                                                                                                                                               | <ul style="list-style-type: none"> <li>- Machine shop practice - Milling machine construction and operation - Milling cutter - Types of Milling etc. Lathe - construction and operation</li> <li>- Turning - Facing - Taper Turning - Threading etc.</li> </ul>                                                                          |
| 5 | <ul style="list-style-type: none"> <li>- Straight line beads on M S plate by SMAW</li> <li>- Tack welding on M S plate &amp; channels by SMAW in different position.</li> <li>- Square butt joint weld on M S plate in down hand position by SMAW</li> </ul>                                                                                         | <ul style="list-style-type: none"> <li>- Principles of Shielded metal Arc welding (SMAW)</li> <li>- Basic Electricity of welding power source</li> <li>- AC / DC power source advantages and disadvantages.</li> <li>- Polarity types &amp; Arc length</li> </ul>                                                                        |
| 6 | <ul style="list-style-type: none"> <li>- Fillet, Tee and Lap joint weld in down hand position by SMAW</li> <li>- Fillet weld open corner joint on MS plate in down hand position by SMAW</li> <li>- Single V butt joint on MS flat in down hand position by SMAW</li> </ul>                                                                          | <ul style="list-style-type: none"> <li>- Electrode - Types, description &amp; Specification - BIS, AWS, etc..</li> <li>- Functions of flux &amp; Characteristics of flux &amp; arc</li> <li>- Selection of electrodes and coating factors</li> <li>- Tack welding procedure on plate, channels &amp; pipe: Length &amp; pitch</li> </ul> |
| 7 | <ul style="list-style-type: none"> <li>- Identification of metals, bars, plates, flats, channels, I section, T section, and box section etc.</li> </ul>                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>- Metals used in fabrication</li> <li>- Types of fabrication joints</li> <li>- Types and classification of steel and application</li> <li>- Framed structures - shell structure - Rolled sections, I section, channel section, angle section, T-section</li> </ul>                                |
| 8 | <ul style="list-style-type: none"> <li>- Study of design drawing related to structural and pressure parts and preparation of fitting square.</li> </ul>                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>- Welding symbols</li> <li>- Structural/ Pressure vessel design drawing reading and understanding the concepts</li> </ul>                                                                                                                                                                         |

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| 9  | <ul style="list-style-type: none"> <li>- Using guillotine shearing machine, marking and cutting of sheet metals to required size.</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>- Description and operation of croppers, shearing machine, Guillotine shears, punching machines, Edge planning machine and nibbling machine etc.</li> <li>- Description and operation of straightening machines</li> </ul> |
| 10 | <ul style="list-style-type: none"> <li>- Practice on bending of plates and pipes to required shape.</li> <li>- Straightening plates and section</li> <li>- Edge planning as per requirement.</li> </ul>                | <ul style="list-style-type: none"> <li>- Methods of bending plates, angle iron etc.</li> <li>- Cold bending and hot bending etc.</li> <li>- Bending of angles and channels</li> <li>- Press work</li> <li>- Flame straightening methods</li> </ul>                |
| 11 | <ul style="list-style-type: none"> <li>- Preparation of pipe joint for high pressure pipe welding</li> <li>- Pipe Welding - preparation of edges - cleaning the joint surface -</li> <li>- Fit up the pipes</li> </ul> | <ul style="list-style-type: none"> <li>- Pipes and pipe fitting - Pipe schedule - types - methods of bending - use of bending fixture - pipe bending machine - use of pipe cutter, pipe wrenches - pipe vices - pipe threads - pipe dies and taps etc.</li> </ul> |
| 12 | <ul style="list-style-type: none"> <li>- Tack weld two pipes together</li> <li>- Pipe work - cutting - bending - threading - joining and assembly.</li> </ul>                                                          | <ul style="list-style-type: none"> <li>- Edge preparation for pressure line pipes</li> <li>- Fit up procedure</li> </ul>                                                                                                                                          |
| 13 | <ul style="list-style-type: none"> <li>- Preparation of single riveted lap joint</li> <li>- Double riveted lap joint</li> </ul>                                                                                        | <ul style="list-style-type: none"> <li>- Hand riveting, cold and hot - methods of riveting - use of pneumatic riveting, hydraulic riveting - checking rivets - removing of bad rivets</li> </ul>                                                                  |
| 14 | <ul style="list-style-type: none"> <li>- Single cover plate riveted butt joint</li> <li>- Double cover plate riveted butt joint</li> <li>- Bolted joints</li> </ul>                                                    | <ul style="list-style-type: none"> <li>- Types of bolts - black bolt, turned bolt, high strength bolt etc. and their application</li> <li>- Development of pipe templates for T,Y,K joints</li> </ul>                                                             |
| 15 | <ul style="list-style-type: none"> <li>- Preparation of pipes for T, Y, K joints</li> <li>- Marking gusset plates</li> <li>- Marking joint section beam</li> <li>- Marking joint column using height gauge</li> </ul>  | <ul style="list-style-type: none"> <li>- Kind of structures - Column base, plate girders, Gantry girders, Root trusses - description, types and use</li> <li>- Beam connection, beam to column connection - framed connection and seated connection</li> </ul>    |
| 16 | <ul style="list-style-type: none"> <li>- Marking on curved and bend plates and section</li> <li>- Marking on built up section</li> <li>- Usage of pantograph for marking</li> </ul>                                    | <ul style="list-style-type: none"> <li>- Type of pressure vessels - Boilers, Heat exchangers, High pressure pipe lines etc.</li> <li>- Marking for cutting to size, marking for beveling and chamfering and marking for pipes and intersection</li> </ul>         |
| 17 | <ul style="list-style-type: none"> <li>- Making templates for cutting to size and simple objects</li> </ul>                                                                                                            | <ul style="list-style-type: none"> <li>- Jigs and Template making - Design and description of templates for cutting - templates of gussets - templates for marking angle</li> </ul>                                                                               |
| 18 | <ul style="list-style-type: none"> <li>- Making templates for Gussets and joint sections</li> <li>- Making simple fixtures</li> </ul>                                                                                  | <ul style="list-style-type: none"> <li>- Template for marking joint section</li> <li>- Design and development of jigs for drilling and angles</li> <li>- Design of simple fixture and clamping devices</li> </ul>                                                 |
| 19 | <ul style="list-style-type: none"> <li>- Making simple riveted plate assembly - Girder , trusses</li> <li>- Making a simple lattice structure</li> </ul>                                                               | <ul style="list-style-type: none"> <li>- Assembly: Procedure and technique for assembly</li> <li>- Assembling of riveted plates, girders and trusses</li> </ul>                                                                                                   |

|    |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                       |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 20 | <ul style="list-style-type: none"> <li>- Making pressure pipe line assembly</li> <li>- Making welded section assembly</li> <li>- Making cylindrical tanks</li> </ul> | <ul style="list-style-type: none"> <li>- Assembly of welded section</li> <li>- Assembly of cylindrical tanks including fitting and lining of vessels</li> </ul>                                                                                                                                                                                                                       |
| 21 | <ul style="list-style-type: none"> <li>- Rectification of distorted welded structure by flame straightening.</li> </ul>                                              | <ul style="list-style-type: none"> <li>- Distortion &amp; methods of control</li> <li>- Preventing and allowing for weld distortion</li> <li>- Common welding defects</li> <li>- Inspection and testing</li> <li>- Non destructive method of flaw detection - PT, MPT, Ultrasonic &amp; Radiographic inspection</li> </ul>                                                            |
| 22 | <ul style="list-style-type: none"> <li>- Dimensional inspection of fit ups</li> <li>- Cleaning &amp; Painting</li> </ul>                                             | <ul style="list-style-type: none"> <li>- Chipping &amp; Grinding : Chisels &amp; pneumatic chisels used for chipping- Method of chipping and cutting - Types of grinding machines – Grinding wheels - Method of removing welds and rivets by chipping and grinding.</li> <li>- Finishing &amp; Painting : Common types of painting. Stenciling, marking and colour marking</li> </ul> |
| 23 | <b>Industrial training / Project work</b>                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                       |
| 24 | <b>Industrial training / Project work</b>                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                       |
| 25 | <b>Revision</b>                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                       |
| 26 | <b>Examination</b>                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                       |

**Abbreviations:**

|      |                              |
|------|------------------------------|
| SMAW | - Shielded Metal Arc Welding |
| OAW  | - Oxy-Acetylene Gas Welding  |
| OAGC | - Oxy-Acetylene Gas Cutting  |

## **10.2 SYLLABUS CONTENT OF CORE SKILLS**

**First Semester**  
**(Semester Code no. WLD- 01)**

**Duration: Six Month**

**SYLLABUS CODE :ED-FAB-I-1.1**  
**SYLLABUS FOR ENGINEERING DRAWING**  
**SEMESTER-I**

| <b>Sl. No</b> | <b>Engineering Drawing</b>                                                                                              | <b>Hours</b> |
|---------------|-------------------------------------------------------------------------------------------------------------------------|--------------|
| 1             | - Importance of Engineering Drawing and its Knowledge.<br>- Use of Drawing Instruments.                                 | 6            |
| 2             | - Letters, Numbers and Alphabets as per BIS<br>- Layout of Drawing Sheet & Title Block.                                 | 6            |
| 3             | - Drawing of straight lines, Geometrical constructions, rectangles, Circles, Polygons etc.                              | 6            |
| 4             | - Use of different types of line and symbols for drawing.<br>- Importance & dimensioning techniques as per BIS.         | 3            |
| 5             | - Isometric views with dimensions such as Cube, Rectangular Block, Cylinder, etc                                        | 3            |
| 6             | - Orthographic Projection in 3rd angle, as per BIS<br>- Orthographic Projection in 1st angle, as per BIS (Concept only) | 9            |
| 7             | - Plan and elevation of simple objects like Hexagonal Block, square Block, Circular Block, tapered Block, etc.          | 6            |
| 8             | - Views of simple Hollow and Solid Blocks with Dimensions.                                                              | 6            |
| 9             | - Construction of Orthographic Projection from the given Isometric view of simple shaped Blocks in 3rd angle method.    | 12           |
| 10            | - Construct an Orthographic Projection from the given Isometric view of shaped Blocks in 1st angle method.              | 6            |
| 11            | - Reading of simple Engineering drawing.                                                                                | 3            |
| 12            | <b>Revision</b>                                                                                                         |              |
| 13            | <b>Examination</b>                                                                                                      |              |

**SYLLABUS CODE NO.ED-FAB-II-1.2**  
**SYLLABUS FOR ENGINEERING DRAWING**  
**SEMESTER-II**

| <b>Sl. No</b> | <b>Engineering Drawing</b>                                                                                                                                                    | <b>Hours</b> |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 1             | - Reading of Engineering drawing related to missing lines and missing views.                                                                                                  | 3            |
| 2             | - Simple orthographic drawing- from the given Isometric views of simple objects.                                                                                              | 9            |
| 3             | - Conventional representation of Materials as per BIS.<br>- Views of simple solid bodies cut by section plane on drawing standard methods.<br>- (Full and Half Sections) BIS. | 6            |
| 4             | - Surface Development of Prism, Pyramid.                                                                                                                                      | 6            |
| 5             | - Cylinder Projection and Development, Cone Projection and Development.<br>- Examples based on right cones.                                                                   | 6            |
| 6             | - Types of rivets with dimensions as per BIS.                                                                                                                                 | 3            |
| 7             | - Types of Riveted joints.                                                                                                                                                    | 6            |
| 8             | - Hexagonal nuts and bolts with dimensions.                                                                                                                                   | 3            |
| 9             | - Screw threads with their dimensions as per BIS.                                                                                                                             | 3            |
| 10            | - Different symbols used in related trade.                                                                                                                                    | 3            |
| 11            | - Exercises on application of Trade related symbols.                                                                                                                          | 3            |
| 12            | - Freehand sketching of hand tools of the trade.                                                                                                                              | 3            |
| 13            | - Free hand sketching of simple objects related to trade.                                                                                                                     | 6            |
| 14            | - Reading of fabricated engineering drawing                                                                                                                                   | 3            |
| 15            | <b>Revision</b>                                                                                                                                                               |              |
| 16            | <b>Examination</b>                                                                                                                                                            |              |

**Second Semester**  
**(Semester Code no. WLD - 02)**

**Duration: Six Month**

**SYLLABUS CODE No.W/S-FAB--I- 1.1**  
**SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION**

| <b>HOURS</b> | <b>SCIENCE TOPICS</b>                                                                                                                                                                                                               | <b>HOURS</b> | <b>CALCULATION TOPICS</b>                                                                                                                                                              |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1            | Introduction and Importance of Science and Calculation to the Trade skill                                                                                                                                                           | 4            | General simplifications - BODMAS rule<br>Fraction-Addition, Subtraction, multiplication and Division-Problems.<br>Decimal-Addition, Subtraction, Multiplication, and Division-Problems |
| 2            | - System of Units - British, Metric and S. I. Units for Length, Mass, Area, Volume, Capacity and time. Conversions between British and Metric Systems.                                                                              | 2            | Conversion of Fraction to Decimal and vice-versa.                                                                                                                                      |
| 2            | - Density & Specific gravity<br>- Mass, weight. Definition and units                                                                                                                                                                | 4            | Square roots:<br>The Square and Square root of a Whole Number and Decimal                                                                                                              |
| 3            | - Metals: Properties and uses of cast iron, wrought iron, plain carbon steels and alloy steels<br>- Difference between metals, non-metals and alloys.                                                                               | 4            | Percentage - Changing Percent to Decimal and Fraction and vice – versa – applied problem                                                                                               |
| 2            | - Properties and uses of Copper, Zinc, Lead, Tin and Aluminum                                                                                                                                                                       | 4            | Concept on Ratio and Proportion- Direct and Inverse Proportion, simple applied problems                                                                                                |
| 2            | - Properties and uses of Brass, Bronze, Rubber, Timber and insulating materials.                                                                                                                                                    | 6            | Algebraic Symbols and Fundamentals Addition, Subtraction, Multiplication and Division-Problems.                                                                                        |
| 3            | - Concept of heat and temperature. Difference between heat and temperature. Effects of Heat, Thermometric Scales such as a Celsius, Fahrenheit and Kelvin, Temperature measuring Instruments - types of thermometers and pyrometers |              |                                                                                                                                                                                        |
| 3            | - Conversions between the above Scales of Temperature.                                                                                                                                                                              |              |                                                                                                                                                                                        |

|    |                                                                                                                                                                                               |  |    |  |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----|--|
|    | <ul style="list-style-type: none"> <li>- Units of Heat-Calorie, B.Th.U &amp; C.H.U., joule.</li> <li>- Concept of Specific Heat, Latent Heat, problems on Heat Loss and Heat Gain.</li> </ul> |  |    |  |
| 2  | <ul style="list-style-type: none"> <li>- Definition of Force - Units of Force in M.K.S.&amp; S.I. Systems .</li> <li>- Concept of Pressure and its Units in different systems</li> </ul>      |  |    |  |
| 20 | -                                                                                                                                                                                             |  | 24 |  |

**Total hours: 20 hours (Science) + 24 hours (Calculation) = 44 hours.**

**SYLLABUS CODE No.W/S-FAB--II- 1.2**  
**SYLLABUS FOR WORKSHOP SCIENCE AND CALCULATION**  
**SEMESTER-II**

| HOURS     | SCIENCE TOPICS                                                                                                                                                                                                                                       | HOURS     | CALCULATION TOPICS                                                                                                                                                                                                                                                                                                                                 |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4         | Electricity, Current, voltage, Power, resistance, Conductors, insulators, Ohm's law, Types of Current, Effects of current and related problems. Watt, kW, Electrical energy – watt-hour, kWh & Board of trade unit.                                  | 2         | Fundamental algebraic formulae viz. $(a+b)^2$ , $(a-b)^2$ etc. Simple Equations – related problems.                                                                                                                                                                                                                                                |
| 2         | <ul style="list-style-type: none"> <li>- Concept of fuse</li> <li>- Concept of open circuit, closed circuit, Short circuit</li> <li>- Concept of earthing</li> </ul>                                                                                 | 6         | <ul style="list-style-type: none"> <li>• Menstruation- Concept of 2D figures and 3D object,</li> <li>• Definition of perimeter, area and volume : related units - perimeter and area of plain figures like Square, Rectangle, Equilateral Triangle, Isosceles Triangle, Right Angled Triangle, Scalene Triangle-simple applied Problems</li> </ul> |
| 2         | <ul style="list-style-type: none"> <li>- Units of work in M.K.S, System and S.I. Unit of Work-</li> <li>- Simple Problems.</li> </ul>                                                                                                                | 3         | <ul style="list-style-type: none"> <li>• Perimeter and area: Hexagon, Circle, Circular ring, Sector &amp; Ellipse- Problems.</li> </ul>                                                                                                                                                                                                            |
| 2         | <ul style="list-style-type: none"> <li>- Units of Power such as Watt and Horse Power</li> <li>- Definition of I.H.P., B.H.P. and Efficiency.</li> </ul>                                                                                              | 3         | <ul style="list-style-type: none"> <li>• Volume and Weight of Simple Solid bodies such as Cube, Cuboids, Cone, Cylinder and Hollow Cylinder- applied Problems.</li> </ul>                                                                                                                                                                          |
| 4         | <ul style="list-style-type: none"> <li>- Definition of Energy: Potential Energy and Kinetic Energy</li> <li>- Law of Conservation of Energy, S.I. Unit of Energy</li> <li>- Simple Problems in P.E. and K.E.</li> </ul>                              | 3         | <ul style="list-style-type: none"> <li>• Finding the capacity in Litres of Square, Rectangular, Hexagonal, Conical and Cylindrical Shaped Vessels</li> </ul>                                                                                                                                                                                       |
| 2         | <ul style="list-style-type: none"> <li>- Linear motion – Speed, velocity, acceleration, retardation</li> </ul>                                                                                                                                       | 3         | <ul style="list-style-type: none"> <li>• Finding the lateral Surface Area and Total Surface Area of Square, Rectangular, Hexagonal, Conical and Cylindrical Shaped Vessels by using simple calculator</li> </ul>                                                                                                                                   |
| 4         | <ul style="list-style-type: none"> <li>- Definition and units of Stress, Strain. Ultimate stress &amp; breaking stress.</li> <li>- Explanation of terms shear force and bending moment.</li> <li>- Simple problems on stress &amp; strain</li> </ul> | 2         | <ul style="list-style-type: none"> <li>• Trigonometrical ratios. Trigonometrical tables. Basic trigonometrical calculations by using scientific calculator</li> </ul>                                                                                                                                                                              |
| <b>20</b> | -                                                                                                                                                                                                                                                    | <b>22</b> |                                                                                                                                                                                                                                                                                                                                                    |

**Total hours: 20 hours (Science) + 22 hours (Calculation) = 42 hours.**

# **11. Employability Skills**

## **11.1 GENERAL INFORMATION**

- |                                    |   |                                                                                                                           |
|------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------|
| 1. <b>Name of the subject</b>      | : | <b>EMPLOYABILITY SKILLS</b>                                                                                               |
| 2. <b>Applicability</b>            | : | <ul style="list-style-type: none"><li>• CTS- Mandatory for all trades</li><li>• ATS- Mandatory for fresher only</li></ul> |
| 3. <b>Hours of Instruction</b>     | : | 110 Hrs.                                                                                                                  |
| 4. <b>Examination of</b>           | : | The examination will be held at the end semesters.                                                                        |
| 5. <b>Instructor Qualification</b> | : |                                                                                                                           |

**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**

- |                      |   |                                                                                                                                                                                                                 |
|----------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6. <b>Instructor</b> | : | <ul style="list-style-type: none"><li>• One full time instructor is required for 1000 seats and above</li><li>• For seats less than 1000, the instructor may be out sourced/ hired on contract basis.</li></ul> |
|----------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 11.2 DISTRIBUTION OF TOPICS BETWEEN SEMESTERS FOR EMPLOYABILITY SKILL

| <b>Course<br/>Duration</b>           | <b>Semester1</b>                                                                | <b>Semester2</b>                                                                                                                                                                       | <b>Examination</b>                                             |
|--------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
|                                      | <b>Topics</b>                                                                   | <b>Topics</b>                                                                                                                                                                          |                                                                |
| <b>01 Year (Two<br/>semesters)</b>   | <b>1. English Literacy<br/>2. I.T. Literacy<br/>3. Communication<br/>Skills</b> | <b>4. Entrepreneurship Skills<br/>5. Productivity<br/>6. Occupational safety , Health<br/>and Environment<br/>Education<br/>7. Labour Welfare<br/>Legislation<br/>8. Quality Tools</b> | <b>Final examination<br/>at the end of second<br/>semester</b> |
| <b>02 Years (Four<br/>Semesters)</b> | <b>1. English Literacy<br/>2. I.T. Literacy<br/>3. Communication<br/>Skills</b> | <b>4. Entrepreneurship Skills<br/>5. Productivity<br/>6. Occupational safety , Health<br/>and Environment<br/>Education<br/>7. Labour Welfare<br/>Legislation<br/>8. Quality Tools</b> | <b>Final examination<br/>at the end of second<br/>semester</b> |

## 11.3 SYLLABUS CONTENT OF EMPLOYABILITY SKILLS

### SEMESTER-I

#### LEARNING OBJECTIVES OF 1<sup>ST</sup> SEMESTER

1. Read, write and communicate in English language for day to day work.
2. Communicate in written and oral and with required clarity ensuring that the information communicated is clear, concise and accurate.
3. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.

| <b>1. English Literacy</b>           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hours of Instruction: 20 Hrs.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>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<br>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.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>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.                                                                                                                                                                                                                                                                                                         |
|                                      | Basic operating of Word Processing, Creating, opening and closing                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Word processing and Worksheet</b>    | Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document.<br>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),<br>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.<br>Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT – ACT, types of cyber crimes. |

### 3. Communication Skills

**Hour of Instruction: 15 Hrs. Marks Allotted: 07**

| Topic                                       | Contents                                                                                                                  |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction to Communication Skills</b> | Communication and its importance                                                                                          |
|                                             | Principles of Effective communication                                                                                     |
|                                             | Types of communication – verbal, nonverbal, written, email, talking on phone.                                             |
|                                             | Nonverbal 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                                         |

## **SEMESTER-II**

### **LEARNING OBJECTIVES OF 2<sup>ND</sup> SEMESTER**

1. Knowledge of business activities, ability to interact with consumers for development of businesses.
2. Understand and apply productivity, its benefits and factors affecting the productivity.
3. Follow and maintain procedures to achieve a safe working environment in line with occupational health, safety, environment regulations and Labour welfare legislation and requirements.
4. Understand and apply quality concepts as per ISO and BIS system and its importance.
5. Recognize different components of 5S and apply the same in the working environment.

| <b>4. Entrepreneurship skill</b><br><b>Hour of Instruction: 15 Hrs. Marks Allotted: 06</b> |                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Topic</b>                                                                               | <b>Content</b>                                                                                                                                                                                    |
| <b>Business &amp; Consumer:</b>                                                            | Types of business in different trades and the importance of skill, Understanding the consumer, market through consumer behavior, market survey, Methods of Marketing, publicity and advertisement |
| <b>Self Employment:</b>                                                                    | Need and scope for self-employment, Qualities of a good Entrepreneur (values attitude, motive, etc.), SWOT and Risk Analysis                                                                      |

|                                                                                                                   |                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Govt Institutions :</b>                                                                                        | Role of various Schemes and Institutes for self-employment i.e. DIC, SIDBI, MSME, NSIC, Financial institutions and banks                                                                                       |
| <b>Initiation Formalities :</b>                                                                                   | Project Formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment Procedure - Loan Procurement - Agencies - banking Process                                                   |
| <b>5. Productivity</b><br><b>Hour of Instruction: 10Hrs.Marks Allotted: 05</b>                                    |                                                                                                                                                                                                                |
| Productivity                                                                                                      | Definition, Necessity, Meaning of GDP.                                                                                                                                                                         |
| Benefits                                                                                                          | Personal / Workman – Incentive, Production linked Bonus, Improvement in living standard.<br>Industry<br>Nation.                                                                                                |
| Affecting Factors                                                                                                 | Skills, Working Aids, Automation, Environment, Motivation<br>How improves or slows down.                                                                                                                       |
| Comparison with developed countries                                                                               | Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc.<br>Living standards of those countries, wages. |
| Personal Finance Management                                                                                       | Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.                                                                                                            |
| <b>6. Occupational Safety, Health &amp; Environment</b><br><b>Hour of Instruction: 15 Hrs. Marks Allotted: 06</b> |                                                                                                                                                                                                                |
| <b>Safety &amp; Health :</b>                                                                                      | Introduction to Occupational Safety and Health and                                                                                                                                                             |

|                                                                                               |                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                               | its importance at workplace                                                                                                                                                                                                                      |
| <b>Occupational Hazards :</b>                                                                 | Occupational health, Occupational hygiene, Occupational Diseases/ Disorders & its prevention                                                                                                                                                     |
| <b>Accident &amp; safety :</b>                                                                | 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 provisions of safety, health, welfare under legislation of India                                                                                                                                                                   |
| <b>7.Labour Welfare Legislation</b><br><b>Hour of Instruction: 05 Hrs. Marks Allotted: 03</b> |                                                                                                                                                                                                                                                  |
| <b>Labour Welfare Legislation</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>8.Quality Tools</b><br><b>Hour of Instruction: 10Hrs. 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 Functions of Quality Circles in organisation, 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.5 <b>S</b> Principles of Housekeeping: SEIRI – Segregation, SEITON – Arrangement, SEISO – Cleaning, SEIKETSU – maintenance of Standards, SHITSUKE - Discipline |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 12. INFRASTRUCTURE

1. INSTRUCTORS' QUALIFICATION : Degree in Mechanical / Metallurgy / Production Engineering/Mechatronics with on year experience in relevant field.  
**OR**  
Diploma in Mechanical and allied with two years experience in relevant field.  
**OR**  
10<sup>th</sup> Class Pass + NTC/NAC in the Trade of “Welder” With 3 years post qualification experience in the relevant field.
2. DESIRABLE QUALIFICATION : Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Welder trade.
3. SPACE NORMS : Workshop: 80 Square meters. (5 Sq.m/trainee)
4. POWER NORMS : 16 KW
5. TOOLS, EQUIPMENT & GENERAL MACHINERY : (AS PER ANNEXURE-II)

**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.

## **13. ASSESSMENT STANDARD**

### **13.1 Assessment guideline:**

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration to be given while assessing for team work, avoidance/reduction of scrap/wastage and disposal of scrap/wastage as per procedure, behavioral attitude, sensitive to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude to be considered while assessing competency.

Assessment will be evidence based comprising the following:

- i) Job carried out in labs/workshop
- ii) Record book/ daily diary
- iii) Answer sheet of assessment
- iv) Viva-voce
- v) Progress chart
- vi) Attendance and punctuality
- vii) Assignment
- viii) Project work

Evidence of internal assessment to be preserved until forthcoming semester examination for audit and verification by examination body.

The following marking pattern to be adopted while assessing:

**a)** Weightage in the range of 60-75% to be allotted during assessment under following performance level:

For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.

In this work there is evidence of:

- demonstration of good skill in the use of hand tools, machine tools and workshop equipment
- below 70% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a fairly good level of neatness and consistency in the finish
- occasional support in completing the project/job.

**b)** Weightage in the range of above 75%- 90% to be allotted during assessment under following performance level:

For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.

In this work there is evidence of:

- good skill levels in the use of hand tools, machine tools and workshop equipment
- 70-80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a good level of neatness and consistency in the finish
- little support in completing the project/job

c) Weightage in the range of above 90% to be allotted during assessment under following performance level:

For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.

In this work there is evidence of:

- high skill levels in the use of hand tools, machine tools and workshop equipment
- above 80% tolerance dimension achieved while undertaking different work with those demanded by the component/job.
- a high level of neatness and consistency in the finish.
- minimal or no support in completing the project

### 13.2 INTERNAL ASSESSMENTS (FORMATIVE ASSESSMENT)

| ASSESSABLE OUTCOME NO. | ASSESSABLE OUTCOME                                                                                                                                                                 | INTERNAL ASSESSMENT MARKS |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 1.                     | Apply safe working practices.                                                                                                                                                      |                           |
| 2.                     | Comply environment regulation and housekeeping                                                                                                                                     |                           |
| 3.                     | Interpret & use Company terminology and technical communication                                                                                                                    |                           |
| 4.                     | Join MS sheets by Gas welding in different positions.                                                                                                                              |                           |
| 5.                     | Join MS plates by SMAW in different positions.                                                                                                                                     |                           |
| 6.                     | Perform straight, bevel & circular cutting on MS plate by Oxy-acetylene cutting process.                                                                                           |                           |
| 7.                     | Perform different type of MS pipe joints by Gas welding (OAW).                                                                                                                     |                           |
| 8.                     | Weld different types of MS pipe joints by SMAW.                                                                                                                                    |                           |
| 9.                     | Weld Stainless steel, Cast iron, Brass & Aluminum by OAW                                                                                                                           |                           |
| 10.                    | Perform Arc gauging on MS.                                                                                                                                                         |                           |
|                        | <b>Sub-Total of Internal assessment for Semester- I</b>                                                                                                                            | <b>100</b>                |
| 20                     | Perform linear and angular measurement and check surface level using specified gauges and carry out marking using marking block.                                                   |                           |
| 21                     | Develop and make different geometrical shapes.                                                                                                                                     |                           |
| 22                     | Study the design drawing related to structural and pressure parts and identify of metals, bars, plates, flats, channels, I section, T section, and box /hollow section etc for the |                           |

|    |                                                                                                                   |     |
|----|-------------------------------------------------------------------------------------------------------------------|-----|
|    | purpose of fabricating structure.                                                                                 |     |
| 23 | Mark, cut and bevel the parts and prepare edges by Oxy acetylene Gas cutting for fabrication of structures        |     |
| 24 | Perform drilling machine operations to steel structures for fabrication of structures                             |     |
| 25 | Mark and cut sheet metals to required size using guillotine shearing machine                                      |     |
| 26 | Perform bending, straightening and edge planning for fabrication of structures                                    |     |
| 27 | Prepare pipe joint for high pressure pipe welding                                                                 |     |
| 28 | Cut Pipe, bend, thread and join fabricate pipe assembly                                                           |     |
| 29 | Marking on curved and bend plates and section<br>- Marking on built up section<br>Usage of pantograph for marking |     |
| 30 | Prepare T,Y&K joints and marking on structures                                                                    |     |
| 31 | Make simple riveted joints, Girder, trusses and lattice structure                                                 |     |
| 32 | Make templates for cutting to size simple objects and gussets and making simple fixtures                          |     |
| 33 | Make pipeline Assembly, welded section and cylindrical Tanks by SMAW                                              |     |
| 34 | Rectify distorted welded structure by flame straightening.                                                        |     |
| 35 | Carry out dimensional inspection of fit ups. Perform Cleaning & Painting on fitted structures                     |     |
|    | <b>Sub-Total of Internal assessment for Semester- II</b>                                                          | 100 |
|    | <b>Total of Internal assessment</b>                                                                               | 200 |

### 13.3 FINAL ASSESSMENT- ALL INDIA TRADE TEST (SUMMATIVE ASSESSMENT)

- There will be a single objective type Examination paper for the subjects Engineering drawing and Workshop Calculation & Science.
- There will be a single objective type Examination paper for the subjects Trade Theory and Employability Skills.

- c) The two objective type Examination papers as mentioned above will be conducted by National Council for Vocational Training (NCVT), whereas examination for the subject Trade Practical will be conducted by the State Government. NCVT shall supply the Question Paper for the subject Trade Practical.

| <b>Marking Pattern</b> |                                    |                                                                                                                                       |
|------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sl. No.</b>         | <b>Subject for the trade test</b>  | <b>Maximum marks for the each subject</b>                                                                                             |
| <b>a)</b>              | Practical                          | <b>300</b>                                                                                                                            |
| <b>b)</b>              | Trade Theory                       | <b>200</b><br>Objective type Written test of 200 marks<br>(Trade Theory 150 marks & Employability Skills 50 marks)                    |
| <b>c)</b>              | Employability Skills               |                                                                                                                                       |
| <b>d)</b>              | Work shop Calculation and Science. | <b>100</b><br>Objective Type Written test of 100 marks<br>(Engineering Drawing 50 marks & Work shop Calculation and Science 50 marks) |
| <b>e)</b>              | Engineering Drawing                |                                                                                                                                       |
| <b>f)</b>              | Internal assessment                | <b>100</b>                                                                                                                            |
| <b>TOTAL:</b>          |                                    | <b>700</b>                                                                                                                            |

## 14. LIST OF TRADE COMMITTEE MEMBERS

| Sl. No                                  | Names & Designation     | Organisation                     | Remarks     |
|-----------------------------------------|-------------------------|----------------------------------|-------------|
| <b>Members of Sector Mentor council</b> |                         |                                  |             |
| 1                                       | Dr.G.Buvashekar         | AGM, WRI, Trichy - Chairman      | Chairman    |
| 2                                       | Dr.K.Ashokkumar         | AGM, BHEL, Trichy                | Member      |
| 3                                       | Prof. Jyothi Mukhopadhy | IIT, Ahmedabad                   | Member      |
| 4                                       | B.Pattabhiraman         | MD, GB Engineering, Tricgy       | Member      |
| 5                                       | Dr.Rajeev kumar         | IIT, Mandi                       | Member      |
| 6                                       | Dr. Vishalchauhan       | IIT, Mandi                       | Member      |
| 7                                       | Shri D.K.Singh          | IIT, Kanpur                      | Member      |
| 8                                       | Shri. Navneet Arora     | IIT, Roorkee                     | Member      |
| 9                                       | Shri. R. K. Sharma      | Head, SDC, JBM Group, Faridabad  | Member      |
| 10                                      | Shri. Puneet Sinha      | Deputy Director, MSME, New Delhi | Member      |
| <b>Mentor</b>                           |                         |                                  |             |
| 1                                       | Shri. Deepankar Mallick | Director of Training, DGE&T Hq,  | Mentor      |
| <b>Members of Core Group</b>            |                         |                                  |             |
| 1                                       | Shri. M Thamizharasan   | JDT, CSTARI, Kolkata             | Member      |
| 2                                       | Shri. M Kumaravel       | DDT, FTI , Bangalore             | Team Leader |
| 3                                       | Shri. SushilKumar       | DDT, DGE&T Hq,                   | Member      |
| 4                                       | Shri. S.P.Khatokar      | T.O. ATI, Mumbai                 | Member      |
| 5                                       | Shri. V.L. Ponmozhi     | TO, CTI, Chennai                 | Member      |
| 6                                       | Shri. D.Pani            | TO, ATI, Howrah                  | Member      |
| 7                                       | Shri. Amar Singh        | TO, ATI, Ludhiyana               | Member      |
| 8                                       | Shri. Gopalakrishnan    | TO, NIMI, Chennai                | Member      |
| 9                                       | Shri. Manjunatha B.S    | JTO, GITI, K.G.F. Karnataka      | Member      |
| 10                                      | Shri. Venugopal PC      | ITI Chalakudi, Kerala            | Member      |

## Annexure - I

### LIST OF TOOLS & EQUIPMNT FOR SEMESTER I & II

Tools & Equipments for a batch 16 Trainees + one

#### Consumable kit

| Sl.No | Name of the item                                                      | Quantity    |
|-------|-----------------------------------------------------------------------|-------------|
| 1     | Leather Hand Gloves 14 "                                              | 17 Pairs    |
| 2     | Cotton hand gloves 8 "                                                | 17 pairs    |
| 3     | Leather hand sleeves 16 "                                             | 17 pairs    |
| 4     | Leg guards leather                                                    | 17 pairs    |
| 5     | Leather Apron                                                         | 17 Nos      |
| 6     | Gas welding Goggles with filter glass 3A or 4A DIN                    | 17 Nos      |
| 7     | Wire brush (M.S & SS) 5 rows and 3 rows                               | 17 Nos each |
| 8     | Spark lighter                                                         | 6 Nos       |
| 9     | Safety boots for welders                                              | 17 pairs    |
| 10    | Safety goggles with plain glass                                       | 17 Nos      |
| 11    | AG 4 Grinding wheels                                                  | 10 nos      |
| 12    | Welding rubber hose, oxygen and acetylene 8 mm dia. As per BIS        | 30 mtr each |
| 13    | Rubber hose clips ½ "                                                 | 20 nos      |
| 14    | Arc welding filter glasses (108 mm x 82 mm x 3 mm) DIN 9A 11 A & 13 A | 16 each     |
| 15    | Plain glasses for helmets (108 mm x 82 mm x 3 mm)                     | 32 nos      |
| 16    | Ordinary Wooden Mallet 50 mm                                          | 17 Nos      |

#### Trainees tools kit:

| Sl.No | Name of the item                            | Quantity |
|-------|---------------------------------------------|----------|
| 1     | Welding helmet fibre                        | 17 Nos   |
| 2     | Welding hand shield fibre                   | 17 Nos   |
| 3     | Chipping Hammer with metal handle 250 grams | 17 Nos   |
| 4     | Chisel cold flat 19 mm x 150 mm             | 17 Nos   |
| 5     | Centre punch 9mm x 127 mm                   | 17 Nos   |
| 6     | Dividers 200 mm                             | 17 Nos   |
| 7     | Stainless steel Rule 300 mm                 | 17 Nos   |
| 8     | Scriber 150 mm                              | 17 Nos   |
| 9     | Tongs flat 300 mm                           | 17 Nos   |
| 10    | Hacksaw frame adjustable / fixed 30 cm      | 17 nos   |
| 11    | File half round bastard 30 cm               | 17 nos   |
| 12    | File flat 35 cm rough/bastard               | 17 nos   |
| 13    | Hammer ball peen 1 Kg with handle           | 17 nos   |
| 14    | Try square 150 mm                           | 17 nos   |

|    |                              |        |
|----|------------------------------|--------|
| 15 | Protractor with blade 150 mm | 17 nos |
| 16 | Steel Tape 2 meters          | 17 nos |

**General shop outfit:**

| S.No. | Description of tools                                  | Quantity    |
|-------|-------------------------------------------------------|-------------|
| 1.    | Steel Square 450mm x 600 mm x 50 mm thick             | 4 Nos.      |
| 2.    | Sheet Metal Gauge                                     | 2Nos.       |
| 3.    | Stake Round and Bottom                                | 4 Nos.      |
| 4.    | Tinmans 300 mm                                        | 8 Nos.      |
| 5.    | Snips straight 250 mm                                 | 8 Nos.      |
| 6.    | Right cut snips 250 mm                                | 4 Nos.      |
| 7.    | Left cut Snips 250 mm                                 | 4 Nos.      |
| 8.    | Hand Shear Universal 250 mm                           | 4 Nos.      |
| 9.    | Punch Round 3 mm dia                                  | 4 Nos       |
| 10.   | Rivet set and snap and dolly combined 3 mm ,4 mm, 6mm | 4 Nos each  |
| 11.   | Chisel cold flat 25 mm x 250 mm                       | 4 Nos       |
| 12.   | Punch Letter 4mm                                      | 1 set       |
| 13.   | Punch Number 4 mm                                     | 1 set       |
| 14.   | Hand Groover 3 mm, 4mm, 5mm                           | 4 Nos. each |
| 15.   | Plier Combination 150 mm                              | 2 Nos       |
| 16.   | Grip Wrench 200mm                                     | 2 Nos       |
| 17.   | H.S.S. Twist Drill 3 mm, 4mm & 6 mm (Parallel Shank)  | 3 Nos each  |
| 18.   | Hand Drill 0 to 6 mm, 8mm, 10mm & 12mm                | 2 Nos. each |
| 19.   | Pneumatic rivet gun                                   | 2 Nos.      |
| 20.   | Trammel Point ( with beam 600 mm)                     | 1 No.       |
| 21.   | Vernier caliper ( 0mm –150mm)                         | 1 No.       |
| 22.   | Micrometer outside (0 to 25mm)                        | 1 No.       |
| 23.   | Raspeut file 250 mm                                   | 4 Nos.      |
| 24.   | D.E.Spanner G.P(6mmto32mm)(Setof12spanner)            | 2set        |
| 25.   | Hand vice 50mm                                        | 16 Nos.     |
| 26.   | Raising Hammer with handle                            | 4 Nos       |
| 27.   | Rawl Punch holder and bits ( No.8,10, 12,14)          | 2 sets      |
| 28.   | Hollowing Hammer with handle                          | 4 Nos       |
| 29.   | Tripaning tool 70mm                                   | 1 No.       |
| 30.   | Crow bar 910 x 25mm                                   | 2Nos.       |
| 31.   | Trowel Medium                                         | 1 No.       |
| 32.   | Crow bar 910 x 25mm                                   | 2Nos.       |
| 33.   | Trowel Medium                                         | 1 No.       |

|     |                                                                       |        |
|-----|-----------------------------------------------------------------------|--------|
| 34. | Pop rivet gun                                                         | 2 Nos. |
| 35. | Screw Driver 250mm                                                    | 2 Nos. |
| 36. | "C' Clamp 6 "                                                         | 6 Nos  |
| 37. | Bench lever shears 250mm Blade x 3 mm Capacity                        | 1 No.  |
| 38. | Air Compressor ( Pressure and displacement of air)                    | 1 No.  |
| 39. | Circle Cutting Machine 300 mm Dia                                     | 1 No   |
| 40. | Pillar type drilling machine 12mm                                     | 1 No.  |
| 41. | Slip roll former 1.6mm x 1000 mm                                      | 1 No.  |
| 42. | D.E. Grinder Pedestal motorized 200 mm                                | 1 No.  |
| 43. | Anvil 50 Kgs with Stand                                               | 1 No.  |
| 44. | Bench vice 120mm, 150mm                                               | 2 each |
| 45. | Fly press Ball press No.4 single body                                 | 1 No.  |
| 46. | Pipe Bending Machine ( Hydraulic type) 12mm to 30mm                   | 1 No.  |
| 47. | Hand Press Brake Capacity ( 0.8mm)                                    | 1 No.  |
| 48. | Tin smiths bench folder 600 x 1.6mm                                   | 1 No.  |
| 49. | Pipe bend machine Manual with Dies                                    | 1 No   |
| 50. | Plate bending machine (Roller type) capacity upto 8 mm thickness      | 1 No   |
| 51. | Pneumatic Screw Driver with 6 mm, 8mm, 10mm, 16 mm &                  | 1 No   |
| 52. | Pneumatic Rivetting machine to depth of 50 mm                         | 1 No   |
| 53. | Pneumatic Drilling machine with bits 4,5,6,8 & 12 mm capacity         | 1 No   |
| 54. | Pneumatic Chips 50mm                                                  | 1 No   |
| 55. | Pentagrap machine for marking 1 mt                                    | 1 No   |
| 56. | Vernier Height gauge range 500 mm                                     | 1 No   |
| 57. | Surface plate with cover 100cm x 100 cm                               | 1 No   |
| 58. | Plums                                                                 | 4 Nos. |
| 59. | Hydraulic Jack 250 mm Capacity 1ton                                   | 2 Nos. |
| 60. | Air compressor capacity 10 bar                                        | 1 No.  |
| 61. | Earth clamps 400A                                                     | 6      |
| 62. | Pipe Cutting machine                                                  | 1      |
| 63. | Oxy Acetylene Gas Welding Torch (H.P) with 5 nozzles                  | 2 sets |
| 64. | Oxy-Acetylene gas cutting torch with cutting nozzle 0.8 mm and 1.2 mm | 2 set  |
| 65. | Electrode holder 400 amps                                             | 6      |
| 66. | Spindle key                                                           | 2      |
| 67. | Pressure regulator oxygen double stage                                | 2      |
| 68. | Pressure regulator acetylene double stage                             | 2      |

|     |                                        |             |
|-----|----------------------------------------|-------------|
| 69. | Tip cleaner                            | 2           |
| 70. | Outfit spanner for Oxy Acetylene       | 2           |
| 71. | Metal Rack (182 cmx152 cmx45 cm)       | 1 no        |
| 72. | Trainees locker (with 8 pigeon holes)  | 3 nos       |
| 73. | Storage shelf/Steel Almirah            | 2 no        |
| 74. | Chalk board                            | 1 no        |
| 75. | Flash back arrester (torch mounted)    | 2 pairs     |
| 76. | Flash back arrester (cylinder mounted) | 2 pairs     |
| 77. | Fire fighting equipment                | As required |
| 78. | First aid box                          | 1 no        |

#### List of General Installation

| Sl  | Description of Tools                                                                           | Quantity |
|-----|------------------------------------------------------------------------------------------------|----------|
| 1.  | Welding Transformer with all accessories ( 400A , OCV 60 – 100 V, 60% duty cycle)              | 2 sets   |
| 2.  | Welding Transformer or Invertors with all accessories ( 300A , OCV 60 – 100 V, 60% duty cycle) | 2 sets   |
| 3.  | D.C .Arc welding rectifiers set with all accessories (400A,OCV 60-100V,60% duty cycle)         | 1 set    |
| 4.  | Welding cables to carry 400 A with flexible rubber as per BIS                                  | 30 mtr   |
| 5.  | Lugs for Cables                                                                                | 20 nos   |
| 6.  | Trolley for cylinders                                                                          | 2 nos    |
| 7.  | Suitable Gas welding table                                                                     | 2        |
| 8.  | Arc welding table/post all metal with positioner                                               | 5        |
| 9.  | Hand shearing machine capacity to cut 6 mm on sheet and flat                                   | 1        |
| 10. | Power hacksaw                                                                                  | 1        |
| 11. | Angle Grinder AG4                                                                              | 2        |
| 12. | Electrode drying oven Temp. range 0-250°C, 10Kg cap.                                           | 1        |
| 13. | Dye penetrant Testing kit                                                                      | 2 set    |
| 14. | Power shearing machine cutting capacity 4 mm on S.S                                            | 1        |
| 15. | Work bench approx. size 340x120x75 cm with 4 bench vices of 150                                | 4        |
| 16. | Anvil 12 square inch working area                                                              | 1        |
| 17. | Portable abrasive cut-off machine                                                              | 1No      |
| 18. | Oxygen and D.A cylinders (may be hired)                                                        | 2 each   |
| 19. | Pantograph 600mm with 30 adjustments                                                           | 1No      |

**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 Configuration Pre Loaded With O.S And Ms Office Package. | 1               |
| 5             | LCD Projector With Screen.                                                               | 1               |

ANNEXURE-II

## GUIDELINES FOR INSTRUCTORS AND PAPER SETTERS

1. All the questions of theory paper for the trade will be in objective type format.
2. Due care to be taken for proper & inclusive delivery among the batch. Some of the following method of delivery may be adopted:

- A) LECTURE
- B) LESSON
- C) DEMONSTRATION
- D) PRACTICE
- E) GROUP DISCUSSION
- F) DISCUSSION WITH PEER GROUP
- G) PROJECT WORK
- H) INDUSTRIAL VISIT

3. Maximum utilization of latest form of training viz., audio visual aids, integration of IT, etc. may be adopted.
4. The total hours to be devoted against each topic may be decided with due diligence to safety & with prioritizing transfer of required skills.
5. Questions may be set based on following instructions:-

| Sl. No. | Question on different aspect | Weightage in %age | Key Words may be like                                 |
|---------|------------------------------|-------------------|-------------------------------------------------------|
| 1       | Information received         | 25                | What, Who, When                                       |
|         |                              |                   |                                                       |
| 2       | Knowledge                    | 50                | Define, Identify, Recall, State, Write, List & Name   |
|         |                              |                   |                                                       |
| 3       | Understanding                | 15                | Describe, Distinguish, Explain, Interpret & Summarize |
|         |                              |                   |                                                       |
| 4       | Application                  | 10                | Apply, Compare, Demonstrate, Examine, Solve & Use     |

6. Due weightage to be given to all the topics under the syllabus while setting the question paper.