**COMPETENCY BASED CURRICULUM**

**FOR THE MODULE OF**

# Arc & Gas welder

# (FABRICATION SECTOR)

**UNDER**

**MODULAR EMPLOYABLE SKILLS (MES)**

**BY**

GOVERNMENT OF INDIA
MINISTRY OF LABOUR & EMPLOYMENT
DIRECTORATE GENERAL OF EMPLOYMENT & TRAINING

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# 1. INTRODUCTION

The Directorate General of Employment & Training (DGE&T) in Ministry of Labour 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. DGE&T 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 module testing are the responsibility of the DGE&T. But, day-to-day administration of employment Exchanges and Industrial Training Institutes rests with the State Governments/ Union.

Some of the flagship schemes run by DGE&T are Craftsmen Training Scheme (CTS), Apprenticeship Training Scheme (ATS), Craft Instructor Training Scheme (CITS) and Skill Development Initiative Scheme (SDIS) in Modular Employable Skills (MES) format. The CTS courses are delivered through Industrial Training Institutes which are under the administrative and financial control of State Governments or Union Territory Administrations. The ATS courses are delivered by Industrial establishment as per Apprenticeship Act, 1961. CITS course are meant for training of Trainers & are delivered through DGE&T field institutes.

Skill Development Initiative Scheme (SDIS) in Modular Employable Skills (MES):

Skill Development based on Modular Employable Skills (MES) developed by DGE&T to impart demand driven Short term training courses. The need for giving emphasis on the Skill Development, especially for the less educated, poor and out of school youth has been highlighted in various forums. The skill level and educational attainment of the work force determines the productivity, income levels as well as the adaptability of the working class in changing environment. Large percentage of population in India is living below poverty line. One of the important causes is lower percentage of skilled persons in the workforce

The skill development at present is taking place mostly in the informal way, i.e. persons acquire skill at the work-place when they help their parents, relatives and employers etc. Such persons do not have a formal certificate and thus earn lower

wages and are exploited by employers. They have come through informal system due to socio-economic circumstances of the family and the compulsions of earning a livelihood rather than attending a formal course. While their productivity is low, their contribution to the national GDP cannot be ignored. If the country can create a system of certification which not only recognizes their skills but also provides education and training in a mode that suits their economic compulsions, it will not only benefit the workforce to earn a decent living but also contribute to the national economy by better productivity of this workforce.

Another related problem to be tackled is large number of students drop outs (About 63% of the school students drop out at different stages before reaching Class-X).

Very few opportunities for skill development are available for the above referred groups (out of school youth & existing workers especially in the informal sector). Most of the existing Skill Development programmes are long term in nature. Poor and less educated persons cannot afford long term training programmes due to higher entry qualifications, opportunity cost etc. Therefore, a new frame work for Skill Development for the Informal Sector has been evolved by the DGET to address to the above mentioned problems. The key features of the new frame work for skill development are:

- Demand driven Short term training courses based on modular employable skills decided in consultation with Industry
- Flexible delivery mechanism (part time, weekends, full time)
- Different levels of programmes (Foundation level as well as skill upgradation) to meet demands of various target groups
- Central Government will facilitate and promote training while Vocational Training Providers (VTP) under the Govt. and Private Sector will provide training
- Optimum utilisation of existing infrastructure to make training cost effective.
- Testing of skills of trainees by independent assessing bodies who would not be involved in conduct of the training programme, to ensure that it is done impartially.
- Testing & certification of prior learning (skills of persons acquired informally)

The concept for the MES is:

- Identification of "minimum skills set" which is sufficient to get an employment in the labour market
- It allows skills upgradation, multiskilling, multi entry and exit, vertical mobility and lifelong learning opportunities in a flexible manner.
- It also allows recognition of prior learning (certification of skills acquired informally) effectively.
- The modules in a sector when grouped together could lead to a qualification equivalent to National Module Certificate or higher.

- MES would benefit different target groups like :
  - ✓ Workers seeking certification of their skills acquired informally
  - ✓ workers seeking skill up gradation
  - ✓ early school drop-outs and unemployed
  - ✓ previously child labour and their family

## 2. JOB ROLES: Reference NOS & NCO

Brief description of Job roles:

**Arc & Gas Welder** fuses metal parts together using welding rod and oxygen acetylene flame. Examines parts to be welded, cleans portion to be joined and, holds them together by some suitable device. Selects correct type and size of welding rod, nozzle etc. and tests welding, torch. Wears 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. Guides flame along joint and heats it to melting point, simultaneously melting welding rod and spreading molten metal along joint shape, size etc. While doing gas cutting**,** cuts metal to require shape and size by gas flame either manually or by machine. Examines material to be cut and marks it according to dimensions. Fits required size of nozzle in welding torch. Releases and regulates flow of gas in nozzle, ignites and adjusts flame. Guides flame by hand along cutting line at required speed and cuts metal to required size. While doing 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 torch to melt filler rods into joint. Allows it to cool down. Clean and examines the joint. While doing Arc welding, 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. Allows it to cool down. Clean and examines the joint

Communicate with required clarity. Understand and practice soft skills, time management, OSH&E, work with Computer. Sensitive to environment, self-learning.

**Reference NCO & NOS:**

i) **NCO-2004:** 7212.10

**ii) NCO-2004:** 7212.20
**iii) NCO-2004:** 7212.40
**iv) NCO-2004:** 7212.50

**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

## 3. NSQF LEVEL COMPLIANCE

NSQF level for Arc & Gas Welder Under MES: 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 Arc & Gas Welder under MES mostly matches with the Level descriptor at Level- 3.

. The NSQF level-3 descriptor is given below:

| LEVEL | Process required | Professional knowledge | Professional skill | Core skill | Responsibility |
|---|---|---|---|---|---|
| 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 Some Responsibility for own work within defined limit. |

## 4. Learning outcome

The following are minimum broad learning outcome after completion of the Arc & Gas Welding Course of 800 hrs. Duration (including Soft & Entrepreneurship Skills of 100 hrs.):

A. GENERIC OUTCOME

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and practice soft skills, OSH&E, working with Computer and communicate with required clarity.
3. Demonstrate knowledge of concept and principles of basic arithmetic calculation and apply knowledge of specific area to perform practical operations.
4. Explain time management, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.

B. SPECIFIC OUTCOME

5. Carry out routine jobs of setting the machine and components for cutting, welding, brazing and allied operations.
6. Perform practical skills to cut/ weld metal pieces in different positions by using, Gas welding, with appropriate equipments/ consumables and ensure quality weld joints.
7. Perform manual Gas cutting operation for carrying out repair works or stock removal.
8. Perform joining of metals by brazing process to the required quality.
9. Perform practical skills to prepare and weld metal pieces in different positions by using Arc welding, with appropriate equipments/ consumables and ensure quality weld joints.
10. Perform inspection of welded joint by visual inspection, and measure weld parameters using weld gauges.

***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 AND COURSE STRUCTURE

1. **Qualification** **: Arc and Gas Welder**
2. MES **Code No.** : FAB701
3. **NSQF Level** : Level-2
4. **Duration of Modular Training** **:** 700 hrs. + 100* hrs.
5. **Entry Qualification** : Passed 8th Class
6. **Trainees per unit** :20

**Distribution of training on Hourly basis:**

| Sl. No. | Broad Practical components to be covered | Duration (in Hrs) |
|---|---|---|
| 1. | OSH & Safety Practices | 40 |
| 2. | Setting up of Arc & Gas welding plant | 60 |
| 3. | Gas welding in Flat, Horizontal & Vertical Positions | 200 |
| 4. | Gas cutting | 80 |
| 5. | Arc welding in Flat, Horizontal & vertical Positions | 200 |
| 6. | Visual Inspection & correction | 80 |
| 7. | Dimensional Inspection | 40 |
| 8. | Soft & Entrepreneurship Skills | 100 |

***Note:** Any candidate completed training for 100 hrs. Soft & Entrepreneurship skills under MES in any module need not to repeat the same.

## 6. General Training Plan, Assessment & Certificate

### 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).

### Assessment

DGE&T will appoint assessing bodies to assess the competencies of the trained persons. The assessing body will be an independent agency, which will not be involved in conducting the training programmes. This, in turn, will ensure quality of training and credibility of the scheme. Keeping in view the target of providing training/testing of one million persons throughout the country and to avoid monopoly, more than one assessing bodies will be appointed for a sector or an area.

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

1. 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 and soft skills & entrepreneurship while performing the task.
4. check the job for accuracy, identify and rectify errors in job.

The details of the assessment standard are as per section- 9.

### Certification

Successful persons will be awarded certificates issued by National Council for Vocational Training (NCVT).

## 7. ASSESSABLE OUTCOME WITH ASSESSMENT CRITERIA

ASSESSABLE OUTCOME ALONGWITH ASSESSMENT CRITERIATO 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, various observation and viva-voce.

iv) Assessable outcome of Soft skills & entrepreneurship 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 and Assessors.

**GENERIC ASSESSABLE OUTCOME:**

| ASSESSABLE OUTCOMES | ASSESSMENT CRITERIA |
|---|---|
| 1. Recognize & comply safe working practices, environment aspect and housekeeping. | 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 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures. |
| | 1.3 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. |
| | 1.4 Identify Personal Productive Equipment (PPE) and use the same as per related working environment. |
| | 1.5 Identify basic first aid and use them under different circumstances. |
| | 1.6 Take opportunities to use energy and materials in an environmentally friendly manner |
| | 1.7 Avoid waste and dispose waste as per procedure |
| | 1.8 Recognize different components of 5S and apply the same in the working environment. |
| 2. Understand and | |

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| practice soft skills, working with Computer and communicate with required clarity. | 2.1 Recognize & practice soft skills in day to day work. |
| | 2.2 Conduct appropriate discussions with within the team and report to higher authority. |
| | |
| | 2.3 Present facts and circumstances and use appropriate terminology related to work. |
| | 2.4 Conduct written communication. |
| | 2.5 Use computers and access internet for day to day activity |
| 3. Demonstrate knowledge of concept and principles of basic arithmetic calculation, co-ordinate system and apply knowledge of specific area to perform practical operations. | 3.1 Apply basic arithmetic calculations for arriving dimensional parameters as per drawing. |
| | 3.2 Use co-ordinate system for part programming. |
| 4. Explain time management, entrepreneurship and manage/organize related task in day to day work for personal & social growth. | 4.1 Ascertain appropriate time for the assigned task. |
| | 4.2 Execute the assigned task within time frame. |
| | 4.3 Manage own work within specified time. |
| | 4.4 Explain importance & factors affect the development of entrepreneurship. |
| | 4.5 Identify service providers for developing Entrepreneur /business establishment. |

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## SPECIFIC ASSESSABLE OUTCOME:

| OUTCOME | ASSESSABLE ASSESSMENT CRITERIA |
|---|---|
| 5. Carry out routine jobs of setting the machine and components for cutting, welding, brazing and allied | 5.1 Acquaintance of Arc & Gas welding plants parts, operational features hand tools, safety devices and its uses. |
| | 5.2 Ascertain and select tools and materials for the welding job and make this available for use in a timely manner. |
| | 5.3 Set and check arc welding machine connections. |
| | 5.4 Check gas welding cylinders, Regulators and welding & cutting torches for leak proof operation |

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| operations. | 5.5 Plan and perform the job as per drawing. |
| 6. Perform practical skills to weld metal pieces in different positions by using, Gas welding, with appropriate equipments/ consumables and ensure quality weld joints. | 6.1 Plan and select the nozzle size, set working pressure of gases, set type of flame, select filler rod as per requirement. |
| | 6.2 Prepare, set and tack the pieces as per drawing. |
| | 6.3 Set up the tacked joint in specific position. |
| | 6.4 Deposit the weld following proper welding technique and safety aspect. |
| | 6.5 Carry out visual inspection to ascertain quality weld joint. |
| 7. Perform manual Gas cutting operation for carrying out repair works or stock removal. | 7.1 Plan and mark on MS plate surface for straight/bevel cutting. |
| | 7.2 Select the nozzle size and working pressure of gases as per requirement. |
| | 7.3 Set the marked plate properly on cutting table. |
| | 7.4 Perform the cutting operation maintaining proper techniques and all safety aspects. |
| | 7.5 Clean the cutting burrs and inspect the cut surface for soundness of cutting. |
| 8. Perform joining of metals by brazing process to the required quality. | 8.1 Plan and select the nozzle size, set working pressure of gases, set type of flame, select filler rod & Fluxes per requirement. |
| | 8.2 Prepare, set, apply flux and tack the pieces as per drawing. |
| | 8.3 Set up the tacked joint in specific position. |
| | 8.4 Deposit the brazing filler rod following proper brazing technique and safety aspect. |
| | 8.5 Carryout quality check |
| 9. Perform practical skills to prepare and weld metal pieces in different positions by using Arc welding, | 9.1 Plan and select the type welding power source, Polarity, welding current, & type & size of electrode, type of edge preparation etc. as per requirement. |
| | 9.2 Prepare, set and tack the pieces as per drawing. |
| | 9.3 Set up the tacked pieces in specific position. |
| | 9.4 Deposit the weld maintaining appropriate arc length, |

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| with appropriate equipments/ consumables and ensure quality weld joints. | electrode angle, welding speed, weaving technique and safety aspects. |
| | 9.5 Clean the welded joint thoroughly. |
| | 9.6 Carry out visual inspection for appropriate weld joint. |
| | 9.7 Inspect the weld using weld gauge. |
| 10. Perform inspection of welded joint by visual inspection, and measure weld parameters using weld gauges. | 10.1 plan and perform visual inspection with appropriate gauges |
| | 10.2 Plan and perform dimensional Inspection using appropriate gauges |
| | 10.3 Record the values in the check sheet. |

## 8. SYLLABUS CONTENT WITH TIME STRUCTURE

### 8.1 SYLLABUS CONTENT FOR PROFESSIONAL SKILL & KNOWLEDGE

# SYLLABUS FOR THE MODULE OF ARC & GAS WELDER

## (Module Code no. FAB701)
## Duration : 700 hrs.

**LEARNING OBJECTIVES:**

1. Apply safe working practice
2. Gas welding in Flat, Horizontal and Vertical positions
3. Oxy acetylene gas cutting in down hand position.
4. Gas brazing in down hand position
5. Manual Metal Arc Welding in Down hand, Horizontal and Vertical positions

| Professional Skills | Professional Knowledge |
|---|---|
| **Practical Competencies** | **Underpinning Knowledge (Theory)** |
| **OSH & Safety Practices: (40 hours)**<br>• Use of protective safety devices on shop floor.<br>• Safe working practice to be observed during welding.<br>• Introduction to safety equipment and their uses. | • Introduction of MES scheme<br>• Job /employment opportunity<br>• Introduction to welding.<br>• Safety precautions. |
| **SETTING UP OF ARC & GAS WELDING PLANT (10 hours)**<br>• Identification of tools and accessories used for Gas welding, Gas cutting and Arc welding.<br>• Setting up of Oxy Acetylene Gas welding plant and making fusion runs on MS sheet in flat position<br>• Setting up Arc Welding plant and depositing straight and weaving beads on | • Types of welding processes and application.<br>• Metals and weldability-Mild Steel, Alloy Steel, Cast iron, Copper and Brass.<br>• Linear measurement metric and inches<br>• Angular measurement.<br>• Marking practice using Steel rule using metric and inches scale<br>• Nomenclature of Fillet and groove welds<br>• Welding terms and definitions<br>• Weld symbol and reading of fabrication |

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| MS in Flat position. | drawing. |
| **Gas welding in Flat, Horizontal & Vertical Positions: (200 hours)**<br>• Produce following welded joints in mild steel sheet in Flat positions by Gas welding<br>a. Fillet Lap<br>b. Fillet T joints<br>c. Outside corner joint<br>d. Square butt joint<br>• Produce following welded joints in mild steel sheet in Horizontal positions by Gas welding<br>a. Fillet Lap<br>b. Fillet T joints<br>c. Outside corner joint<br>d. Square butt joint<br>• Produce following welded joints in mild steel sheet in Vertical positions by Gas welding<br>a. Fillet Lap<br>b. Fillet T joints<br>c. Outside corner joint<br>d. Square butt joint<br>• Produce Square but, lap and T joint on MS sheet by Brazing | • Description and operating procedures of oxy-Acetylene welding and cutting equipments.<br>• Description and safe operating procedures of oxy-acetylene regulators<br>• Description & maintenance of oxy Acetylene welding and cutting blow pipes<br>• Types of Oxy-Acetylene flames and their uses<br>• Gas Welding parameters - selection of Nozzle size and Oxy acetylene gas pressure to cut different thickness of metals<br>• Gas welding filler rods and fluxes and welding techniques.<br>• Brazing principles, selection of nozzle size, filler metals and fluxes. |
| **Gas Cutting: (80 hours)**<br>• Setting up of Oxy Acetylene Gas Cutting plant and cutting M.S Flats to the given size.<br>• Marking and punching the required shapes by using different shapes and sizes by using templates on M.S plates.<br>• Cutting circular work pieces to the given size by Gas cutting.<br>• Practice to cut different thickness of plates.<br>• Beveling and preparation of joint edges by Gas Cutting. | • Gas cutting parameters - selection of Nozzle size and Oxy acetylene gas pressure to cut different thickness of plates<br>• Gas Welding, brazing and cutting defects, their causes and remedy. |

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| **Arc Welding in Flat, Horizontal & Vertical Positions: (200 hours)**<br><br>Produce arc welded joints:<br><br>• Fillet „T" joint on M.S. flat by MMAW in 1F, 2F, 3F and 4F positions<br>• Fillet lap joint on M.S. by MMAW in flat position<br>• Outside corner joint on MS by MMAW in flat position<br>• Single „V" but joint on MS by MMAW in 1G, 2G, 3G and 4G position | • Principles of Manual Metal Arc Welding (MMAW), advantages and limitations.<br>• Basic Electricity applicable to welding.<br>• Arc welding power source, AC Transformers, DC welding rectifier, DC generators.<br>• Types of weld joints and edge preparation and fit up.<br>• Arc Welding electrodes and selection<br>• Coding of MMAW electrodes.<br>• Arc welding procedure and technique |
| **Visual Inspection & Correction: (80 hours)**<br><br>• Identification of defects MMAW welded joints by Visual inspection & correction of defects | • Welding defects in MMAW, causes and remedy |
| **Dimensional Inspection: (40 hours)**<br><br>Measurement of weld using gauges. | • Distortion and methods of control<br>• Inspection and Testing of Welds |

**Note:**

1. Minimum testing for Gas Welding:-
   a. Square butt joint in vertical position
   b. Fillet T joint in vertical position.

2.Minimum testing for Gas cutting:-
   a. Straight Cutting in d/h position
   b. Circular cutting in down hand position.
   c. Beveling on 12 mm thickness MS plate

3. Testing position for brazing: -
   a. Square butt and T joints on MS in down hand position.

4. Minimum testing for MMAW :-
   a. Single V butt joint in vertical position.

# 8.2 SOFT & ENTREPRENURESHIP SKILLS

## 8.2.1 GENERAL INFORMATION

1. **Name of the subject** : SOFT & ENTREPRENURESHIP SKILLS
2. **Applicability** : Compulsory with every SDIS module of duration 500 Hrs. or more.
3. **Hours of Instruction** : 100 Hrs.
4. **Examination** :The examination will be held at the .
5. **Instructor Qualification** :

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

**AND**

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

## 8.2.2 SYLLABUS CONTENT OF SOFT & ENTREPRENURESHIP SKILLS

**LEARNING OBJECTIVES:**

1. Communicate with required clarity ensuring that the information communicated is clear and accurate.
2. Understand and apply basic computer working, basic operating system and uses internet services to get accustomed & take benefit of IT developments in the industry.
3. Knowledge of entrepreneurship and identify establishment for supporting the development of businesses/ entrepreneurship.
4. Follow and maintain procedures to achieve a safe working environment in line with occupational health, safety, environment regulations.
5. Comply time management technique in day to day work.

| Sl. No. | Practical | Theory |
|---|---|---|
| | Development Competency / Proficiency in English /Vernacular - 15 Hrs. | |
| 1. | **Development of competency/proficiency in English/vernacular.(Hindi/regional** | |
| | **Language)**<br>Practice on<br>• Oral/spoken communication skill & testing - voice and accent, voice clarity, voice modulation & intonation, word stress etc.<br>• Feedback & questioning technique:<br>• Objectiveness in argument (Both one on one and in groups)<br>• 5 Ws & 1 H & 7 Cs for effective Communication<br>• Development Etiquette and manners<br>Study of different pictorial expression of non-verbal communication and its analysis | |
| | **Effective Communication - 10 Hrs.** | |
| 2. | **Concept of Effective Communication**<br>• Components of Effective Communication- Conviction, confidence & enthusiasm, Listening<br>• Communication Process & Handling them<br>• KISS (keep it short & simple) in communication - composing effective messages<br>• Barriers to Communication- Int. & Ext Barriers Intrinsic Motivation, Perception, Language, Fear Power of speech etc.<br>• Listening -it's importance, Good and bad listening<br>• Non-Verbal Communication - its importance and Nuances Facial Expression, Posture, Gesture, eye contact, Appearance (Dress Code) | |
| | **Self & Time Management - 10 Hrs.** | |
| 3. | **Self Management**<br>• Self Evaluation<br>• Self discipline<br>• Self criticism<br>• Recognition of one's own limits and deficiencies<br>• Independency etc.<br>• Thoughtful & Responsible<br>• Self Awareness | **Self Management**<br>• Identifying one's strength and weakness<br>• Planning & Goal setting<br>• Managing self -emotions, ego, pride |
| | **Time Management Technique**<br>Practice by game play and other learning methodology for achieving targets and getting of right first time | **Time Management concept**<br>• Attendance, Discipline & Punctuality<br>• Act in time on commitment<br>• Quality /Productive time |

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| | **Motivation Techniques - 05hrs.** | |
| 4. | **Motivation/ Inspiration**<br>• Ability to shape and direct working/process methods according to self defined criteria<br>• Motivate customers<br>• Ability to think for oneself<br>• Apply oneself to a task independently with self motivation. | **Motivation techniques**<br>• Motivation technique based on needs and field situation<br>• Idealising |
| | **Interpersonal Skill Development - 05 Hrs.** | |
| 5. | **Interpersonal Skill Development**<br>• Positive Relationship<br>• Positive Attitudes<br>• Empathise : comprehend other opinions points of views, and face them with understanding<br>• Mutuality<br>• Trust<br>• Emotional Bonding<br>• Handling Situations (Interview) | **Interpersonal Skill**<br>Importance of interpersonal skill |
| | **Computer Literacy - 20 Hrs.** | |
| 6. | **Computer Fundamentals _Customize the Desktop Environment e.g.**<br>Desktop, Start Menu, and Taskbar etc. Configuring & Migrating Files, Folders & Settings - Folder Views, Accessibility Settings<br>**MS Word**<br>_Creating, Organizing & Formatting Content Collaborating - Merge, Insert, View, Edit, Track Mode etc.<br>**Formatting & Managing Documents**<br>MS Excel<br>_Creating, Analyzing & Formatting Data & Content<br>Collaborating - Insert, View, Edit etc. Managing Workbooks<br>**MS PowerPoint** | **Computer Fundamentals, MS-Office & Internet**<br>_Introduction to Computers History of Computers Components of Hardware Peripherals<br>**Concept of Operating System -** Windows XP Exploring & Configuring the Windows XP Desktop Environment - Customize the Desktop,<br>Start Menu, and Taskbar etc. Configuring & Migrating Files, Folders & **Settings - Folder Views, Accessibility Settings**<br>Features of Windows XP<br>Understanding concepts of Word processing using MS-Word<br>Understanding concepts of Electronic spreadsheet and various types of entries in it |

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| | _Creating & Formatting Content Collaborating - Track, Edit, Add, Delete Comments, Merge<br><br>Managing & Delivering Presentations **Internet**<br><br>**Concepts**<br>Opening websites and downloading data Writing, reading and sending emails, | **Understanding concepts of URL**<br>_Creating and Opening an E-mail account. Receiving and sending emails Searching information on Internet. |
| | **Life Skills - 05 Hrs.** | |
| 07. | | • Knows how to use technology to communicate safely and effectively.<br>• Knows and understands the concept of "community<br>• Knows how to access community resources in case of emergency.<br>• Knows how to obtain copies of personal documents<br>• knows how to book train ticket, Bus Ticket and Air Ticket.<br>• Knows how to get a driver's license. |
| | **Entrepreneurship - 20 Hrs.** | |
| 08. | | **Define the term Entrepreneurship**<br>Definition of entrepreneurship from different perspectives . |
| | | **Outline the importance of entrepreneurship**<br>**Importance of entrepreneurship:**<br>Enhances creativity and innovation<br>builds self confidence in people<br>serves as a tool for nation building<br>serves as the engine of growth for the nation's economy |
| | | **Explain the reasons why entrepreneurship should be developed in a country**<br>Reasons include: employment generation<br>increased national<br>production re-investing national<br>resources harnessing youth vigour, |

| | | |
|---|---|---|
| | | **Describe who an entrepreneur is and who a business person is**<br>An entrepreneur refers to one who undertakes to organize and manage<br>resources and assumes the risk of a business to come out with goods and services. |
| | | **State the characteristics of an entrepreneur**<br>Characteristics of the entrepreneurs Risk taking Need to achieve Innovation and creativity Opportunity Orientation |
| | | **Explain the factors that affect the development of entrepreneurship**<br>Factors that affect the development of entrepreneurial spirit in people<br>i) Environment immediate family and friends),<br>community, national, international<br>ii) Financial<br>iii) Displacement, etc.<br>The role of the<br>i) Government<br>ii) Society<br>iii) Families and friends<br>iv) other stakeholders for example financial institutions play in the development of entrepreneurship in the Country. |
| | | **Define employment**<br>Employment is working to learn a living, payment could be in the form of wages or salaries depending on the nature of work. Describe the types of employment<br>Types of employment<br>(i) Wage employment<br>(ii) Self employment |

| | | |
|---|---|---|
| | | **State the advantage and disadvantage of wage and self employment**<br>Types and characteristics of wage employment and self employment. |
| | | **Outline the reasons why people go into wage or self employment persists**<br>• Self employment<br>• Regain lost image<br>• Exercise control over business<br>• Become boss<br>• Wage employment<br>• Assured income<br>• Commitment may be less. |
| | | **Define small business**<br>Small business are defined based on the number of people and the capital employed<br>**State the characteristics of small business**<br>Characteristics of small businesses:-Labour intensive Small capital outlay, etc. |
| | | **List the areas of small operation**<br>Areas: Trading, Catering, Etc |
| | | **Outline the role of small businesses**<br>The role that small businesses play in the country. They form the:<br>nursery for other entrepreneurs technical base for economic development platform for mobilizing resources for economic development. Etc. |
| | | **Explain the challenges/problems facing small businesses**<br>Challenges/problems facing small businesses include:<br>• Financing<br>• Access to markets |

| | | |
|---|---|---|
| | | • Government policies<br>• Inadequate managerial skills |
| | | **Define the business environment**<br>Definition of the terms:<br>• Business<br>• Environment<br>• Business environment |
| | | **Business development service providers in India.**<br>DIC,MSME,NSIC,SIDCO, Financial Institutions and Banks. |
| | | **Describe the procedure for registering a business**<br>**Define Business Idea**<br>Definition of business idea., source of business idea. Programmes/ procedure and available schemes. |
| | | **Describe how to generate Business Plan**<br>Generation of business ideas Consider talents, skills and knowledge required Identify problems and find innovative solutions to them, market survey Etc. |
| | | **Mention the sources of Business Ideas Sources of ideas**<br>• Needs and wants of the community<br>• External environment<br>• Hobbies and interest. |
| | | **State the process of starting a New Enterprises**<br>**Process**<br>mobilize resources reorganize resources |
| | | **Assess the suitability of the various sources/uses of fund**<br>The advantages and disadvantages of the various sources of funds . |
| | | **Distinguish between: Money, cash and cheques, Notes, coins and currency** .<br>Detail description of money, cash, cheques, notes, coins, currency.<br>How to open bank account?<br>How to fill up Cheque?<br>How to deposit cheque in the bank?<br>What is PAN Card?<br>Why it is mandatory? Explain on-line banking. |
| | | **Explain source Documents Source Documents**<br>receipts , honour certificate, invoice. |
| | | **List the Basic Books kept by Small Business Basic books :**<br>• Cash record<br>• Stock |

| | | |
|---|---|---|
| | | • Credit purchase (Creditors<br>• Account Record)<br>• Credit sales book (customers<br>• Accounts Record)<br>• Record Books (Ledger)<br>• Trial balance. |

| **09. Occupational Safety, Health and Environment Education - 10 Hrs** | |
|---|---|
| **Safety & Health** | Introduction to Occupational Safety and Health importance of safety and health at workplace. |
| **Occupational Hazards** | Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards.<br>Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention. |
| **Accident & safety** | Basic principles for protective equipment. |
| | Accident Prevention techniques - control of accidents and safety measures. |
| **First Aid** | Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person |
| **Basic Provisions** | Idea of basic provision of safety, health, welfare under legislation of India. |
| **Ecosystem** | Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance. |
| **Pollution** | Pollution and pollutants including liquid, gaseous, solid and hazardous waste. |
| **Energy Conservation** | Conservation of Energy, re-use and recycle. |
| **Environment** | Right attitude towards environment, Maintenance of in - house environment |

**Methodolgy :-**

Above practices may be imparted by using

1. Movie clips, games, examples, story / sharing questionnaire /role play/ exercise/Task, Video / Audio recording, group discussion, role play etc.

# 9. INFRASTRUCTURE

| | | |
|---|---|---|
| 1. INSTRUCTORS' QUALIFICATION | : | Degree in Mechanical Engineering with one year experience.<br>OR<br>Diploma in Mechanical Engineering with two years experience.<br>OR<br>NTC/NAC in the Trade of "Welder" With 3 years Experience. |
| 2. DESIRABLE QUALIFICATION | : | Preference will be given to a candidate with CIC (Craft Instructor Certificate) in Welder module. |
| 3. SPACE NORMS | : | 80 Sq.m |
| 4. POWER NORMS | : | 12 KW |
| 5. TOOLS, EQUIPMENT& GENERAL MACHINERY | : | (AS PER ANNEXURE-I) |

# 10. ASSESSMENT STANDARD

## 10.1Assessment 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 scarp/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 above75%- 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

## 10.2 EXTERNAL ASSESSMENTS

| NO. | ASSESSABLE OUTCOME | ASSESSMENT RESULT |
|---|---|---|
| | GENERIC | |
| 1. | Recognize & comply safe working practices, environment aspect and housekeeping | |
| 2. | Understand and practice soft skills, working with Computer and communicate with required clarity. | |
| 3. | Demonstrate knowledge of concept and principles of basic arithmetic calculation, co-ordinate system and apply knowledge of specific area to perform practical operations. | |
| 4. | Explain time management, entrepreneurship and manage/organize related task in day to day work for personal & social growth. | |
| | **SPECIFIC** | |
| 5. | Square butt joint by Gas welding in vertical position | |
| 6. | Fillet T joint by Gas welding in vertical position. | |
| 7. | Straight Cutting in d/h position Gas cutting | |
| 8. | Circular cutting in down hand position by Gas cutting | |
| 9. | Beveling on 12 mm thickness MS plate by Gas cutting | |
| | Square butt joints by Brazing on MS in down hand position. | |
| 10. | T joints by Brazing on MS in down hand position. | |
| 11. | Single V butt joint in vertical position by MMAW | |
| | **Assessment Result** | |

# 11. LIST OF MODULE COMMITTEE MEMBERS

| Sl. No | Names & Designation | Organisation | Remarks |
|---|---|---|---|
| **Members of Sector Mentor council** | | | |
| 1 | Dr.G.Buvanashekaran | AGM, WRI, Trichy | Chairman |
| 2 | Dr.K.Ashokkumar | AGM, BHEL, Trichy | Member |
| 3 | Prof. JyothiMukhopadhya | IIT, Ahmedabad | Member |
| 4 | B.Pattabhiraman | MD, GB Engineering, Trichy | Member |
| 5 | Dr.Rajeevkumar | IIT, Mandi | Member |
| 6 | Dr. Vishalchauhan | IIT, Mandi | Member |
| 7 | Shri D.K.Singh | ITI, 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 |
| **Mentor** | | | |
| 1 | Shri. DeepankarMallick | Director of Training, DGE&T Hq, | Mentor |
| **Members of Core Group** | | | |
| 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.Khataokar | TO, 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 | NIMI, Chennai | Member |
| 9 | Shri. Manjunatha B.S | JTO, GITI, K.G.F. Karnataka | Member |
| 10 | Shri. Balachandranachari A.V | Principal Govt,ITI , Kottayam, Kerala | Member |

# Annexure - I

# MODULE: ARC & GAS WELDER

## LIST OF TOOLS & EQUIPMENTS FOR 20 TRAINEES

TOOLS AND EQUIPMENTS FOR Arc & Gas Welder

| Sl.No. | Description of tools | QTY |
|---|---|---|
| **List of Hand Tools** | | |
| 1 | Hand Gloves pair leather | 10 pairs |
| 2 | Apron leather | 10 Nos |
| 3 | Goggles pair with welding coloured glass | 10 pairs |
| 4 | Centre punch | 04 Nos |
| 5 | Dividers | 04 Nos |
| 6 | Caliper outside | 04 Nos |
| 7 | Steel rule 300 mm with metric and inches scale | 04 Nos |
| 8 | Wire brush (M.S & SS) | 08 Nos |
| 9 | Spark lighter | 04 Nos |
| 10 | Scriber | 04 Nos |
| 11 | Tongs holding300 mm | 08 Nos |
| 12 | Welding helmet type with filter glasses | 08 Nos |
| 13 | Chipping hammer | 08 Nos |
| **List of Shop Outfit** | | |
| 14 | Hammer ball pen | 04 Nos |
| 15 | Hacksaw frame | 04 Nos |
| 16 | File flat bastard | 04 Nos |
| 17 | Spanner set | 01 set |
| 18 | Outfit spanner & spindle key for Gas welding outfit | 02 sets |
| 19 | Work bench fitted 4 Bench vices | 02 sets |
| 20 | D E grinder 30 cm wheel motorized pedestal type fitted with Aluminium oxide grinding wheels | 01 No |
| 21 | Bench shear hand capacity up to 5mm thick sheet | 01 No |
| 22 | Screw Driver set | 01 set |
| 23 | Hammering blocks 5 cm thick 60 sq.cm | 1 no |
| 24 | Gas welding table with fire bricks | 1 no |
| 25 | Gas cutting table with debris tray | 1 no |
| 26 | Arc welding table with protected weld filter glass/fire proof screens | 1 no |
| 27 | Oxy-Acetylene Gas welding and cutting plant mounted on trolley with Oxy-Acetylene Gas cylinders, pressure regulators, hose connections, gas welding torch with nozzle No.1 & 2,3 & 5 and Gas cutting torch with 1.2 &1.6 mm nozzles. | 2 units |
| 28 | Transformer welding set with all accessories 300 A | 2 units |
| 29 | Arc welding set DC, Rectifier or Inverter type, 300 Amps with all accessories. | 2 units |
| 30 | Consumables, Oxy-acetylene Gases, raw materials, fluxes and filler wires. | As required. |
| 31 | Fire Fighting equipment | As required |

ANNEXURE-II

**Tools & Equipment for Soft & Entrepreneurship Skills:**

| Sl. No. | Name of the Equipment | Quantity |
|---|---|---|
| | **Hardware:** | |
| 1 | Server Computer (Latest configuration) | 10 Nos for a batch of 20 students. |
| 2 | Multimedia Nodes (Pre-loaded Windows 2000 or latest) | |
| 3 | Inkjet/Laser Printer | 1 no. |
| 4 | UPS | |
| | **Software:** | |
| 1 | Windows 2008 | |
| 2 | Microsoft Office 2010 Professional | |
| 3 | Anti Virus Software (TVD/ Norton/Any popular brand) | |
| 4 | Internet connection 0 | |

Note: 1. The above computers may be used for CNC simulation purpose.

ANNEXURE-III

**GUIDELINES FOR INSTRUCTORS AND ASSESSORS**

1. 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

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. Assessment may be based on following instructions:-

| Sl. No. | Question on different aspect | Weightage in %age |
|---|---|---|
| | | |
| 1 | Knowledge | 15 |
| | | |
| 2 | Understanding | 15 |
| | | |
| 3 | Practical Execution | 70 |

6. Due weightage to be given to all the topics under the syllabus while assessing.