Course Curricula for

Short Term Courses based on Modular Employable Skills (MES)

in

Fabrication Sector

DIRECTORATE GENERAL OF EMPLOYMENT AND TRAINING

MINISTRY OF LABOUR & EMPLOYMENT

GOVERNMENT OF INDIA

CONTENTS

Skill Development based on Modular Employable Skills (MES)

Background

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).

Frame work for Skill Development based on 'Modular Employable Skills (MES)'

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 can not 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 (VT) Providers 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 Short Term courses would be based on 'Modular Employable Skills (MES)'.

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 up-gradation, multi-skilling, multi entry and exit, vertical mobility and life long 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 Trade Certificate or higher.
- Courses could be available from level 1 to level 3 in different vocations depending upon the need of the employer organisations.
- MES would benefit different target groups like :
  - *Workers seeking certification of their skills acquired informally*
  - *workers seeking skill upgradation*
  - *early school drop-outs and unemployed*
  - *previously child labour and their familly*

Age of participants

The minimum age limit for persons to take part in the scheme is 14 years but there is no upper age limit.

Curriculum Development Process

Following procedure is used for developing course curricula

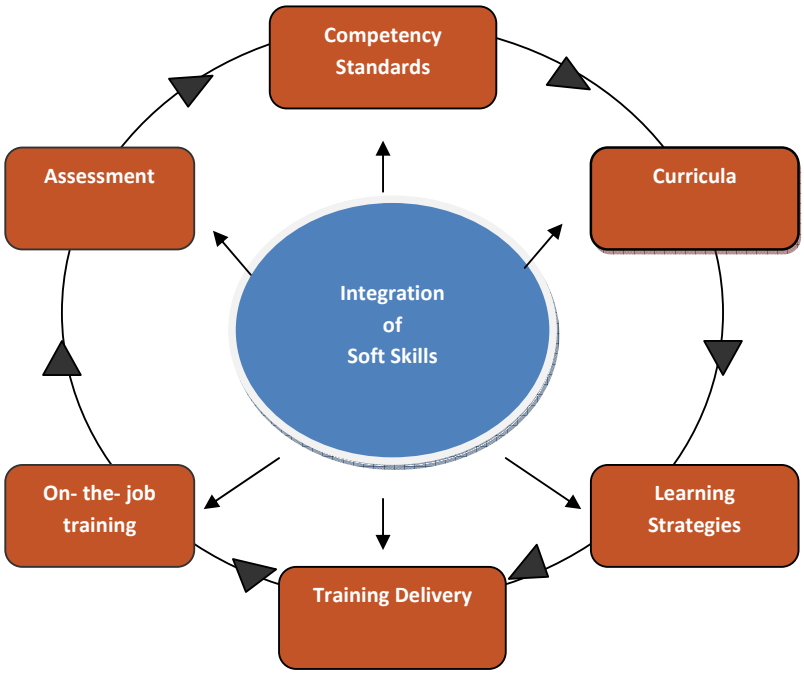
- Identification of Employable Skills set in a sector based on division of work in the labour market.
- Development of training modules corresponding to skills set identified so as to provide training for specific & fit for purpose
- Organization of modules in to a Course Matrix indicating vertical and horizontal mobility. The course matrix depicts pictorially relation among various modules, pre requisites for higher level modules and how one can progress from one level to another.
- Development of detailed curriculum and vetting by a trade committee and by the NCVT

(Close involvement of Employers Organizations, State Governments, experts, vocational training providers and other stake holders is ensured at each stage).

Development of Soft Skills/ Core Competencies

Soft skills refer to a cluster of personality traits, social graces, facility with language, and personal habits that make someone a good employee and a compatible co-worker. Soft skills are also sometimes referred to as employability skills, generic skills, key or core competencies. Soft skills complement hard skills, which are the technical requirements of a job.

Soft Skills are integral to workplace competency and, as such, must be considered in the design, customisation, delivery and assessment of vocational training programmes in an integrated and holistic way, as represented diagrammatically below.



Soft skills are very important in business. Soft skills are now recognised as key for making businesses more profitable and better places to work. Increasingly, companies aren't just assessing their current staff and future recruits on their technical skills but also on a whole host of soft skills. Especially, Service economy and the ascendance of work teams in large organizations put a new premium on people skills and relationship-

building. It is essential to be technically sound, but one should also have the ability to convey the idea to the masses in the simplest possible manner.

Hence, systematic efforts should be made to develop soft skills during the training programme. Positive attitudes have to be developed in the trainees by properly guiding them and setting up examples of good attitudes by demonstrated behaviors and by the environment provided during training.

Some important **soft skills / core competencies** to be developed are:

1. Punctuality, discipline and honesty
2. Cordial relationship and Cooperation with co-workers and team Work
3. Positive attitude and behavior
4. Work ethics and dependability
5. Self esteem and confidence
6. Self-motivation and initiative
7. Flexibility/ adaptability
8. Communication Skills
9. Respect for rules and regulations
10. Concern for quality
11. Concern for health and hygiene
12. Responsibility and accountability
13. Care of equipment and tools
14. Safety consciousness and safe working practices
15. Learn continuously
16. Concern for environment and waste disposal
17. Ability to bear stress and work under pressure

Following competencies should also be developed during level-II and higher courses:

1. Ability for planning, organizing and coordinating
2. Creative thinking, problem solving and decision making
3. Leadership, delegating, appraising, motivating
4. Negotiation
5. Time management ability

In addition to above**, livelihood skills** like how to apply for a job, facing an interview, opening/ operating an bank account may also be covered.

Duration of the Programmes

Time taken to gain the qualification will vary according to the pathway taken and will be kept very flexible for persons with different backgrounds and experience. Duration has been prescribed in hours in the curriculum of individual module, which are based on the content and requirements of a MES Module. However, some persons may take more time than the prescribed time. They should be provided reasonable time to complete the course.

Pathways to acquire Qualification:

Access to the qualification could be through:

- An approved training programme; **Or**
- A combination of an approved training programme plus recognition of prior learning including credit transfer; **Or**
- The recognition of prior learning that provides evidence of the achievement of the competencies for the qualification.

Methodology

The training methods to be used should be appropriate to the development of competencies. The focus of the programme is on “performing” and not on “Knowing”. Lecturing will be restricted to the minimum necessary and emphasis to be given for ‘hands on training’.

The training methods will be individual centered to make each person a competent one. Opportunities for individual work will be provided. The learning process will be continuously monitored and feedback will be provided on individual basis.

Demonstrations using different models, audio visual aids and equipment will be used intensively.

Instructional Media Packages

In order to maintain quality of training uniformly all over the country, instructional media packages (IMPs) will be developed by the National Instructional Media Institute (NIMI), Chennai.

Assessment

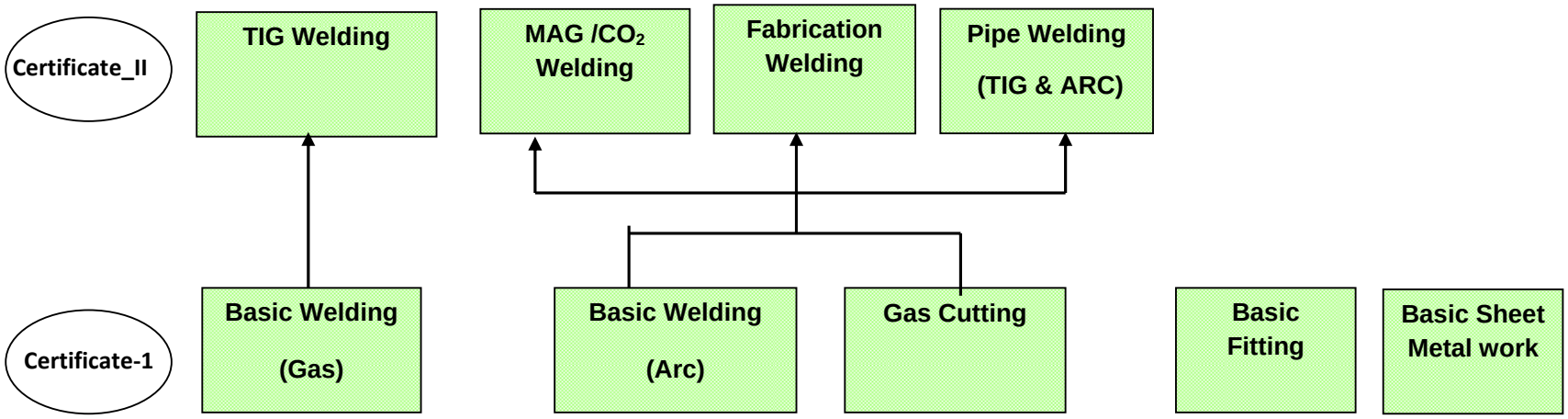
DGE&T will appoint assessing bodies to assess the competencies of the trained persons. The assessing body will be an independent agency, which will not be involved in conducting the training programmes. This, in turn, will ensure quality of training and credibility of the scheme. Keeping in view the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

Certificate

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

Course Matrix in Fabrication Sector

Course Outline/ Pathway



Module - 1

1. Name of the Module : **BASIC WELDING (Gas)**

2. Sector **: FABRICATION**

3. Code **: FAB101**

4. Entry Qualification : Minimum 8th std. and 14 years above

5. Terminal Competency : After completion of this training, the participants would be able to

a. join metals by oxy-fuel gas welding, brazing process
b. repair components/parts used in household & industrial appliances

6.Duration : 120 Hrs.

7.Contents :

Practical Competencies	Underpinning Knowledge (Theory
• Use of protective safety devices on shop floor • Safe working practice to be observed during welding • Identification of tools and accessories used for Gas welding • Setting up of Gas Welding Plant • Lighting and adjustment of Oxy-Acetylene flame & operation • Beading practice on MS sheet with and without filler rod • Produce oxy-acetylene gas welded joints in mild steel sheets a. Edge joint b. Square butt joint c. Fillet joint • Practice brazing with Oxy-Acetylene flame on MS Sheets • Practice Tube joint by Oxy-Acetylene welding / Brazing • Identification of defects by Visual inspection & correction of defects	• Reading of fabrication drawing. • Introduction to welding • Safety precautions. • Types of welding processes and application • Nomenclature of Fillet and groove welds • Welding terms,symbols and definitions • Description operating procedures of oxy-Acetylene welding . • Description and safe operating procedures of oxy-acetylene regulators • Description & maintenance of oxy Acetylene welding blow pipes • Types of Oxy-Acetylene flames and their uses. • Filler rods and fluxes for brazing • Welding & Brazing Procedure and technique • Welding defects causes and remedy • Distortion and methods of control • Inspection & testing of weldments

8. Tools & Equipment:

Sl.No.	Description of tools	QTY
List of Hand Tools		
1	Gloves pair leather	As required
2	Apron leather	As required
3	Goggles pair welder	As required
4	Hammer scaling 0.25 kg. With handle	As required
5	Centre punch	As required
6	Dividers	As required
7	Caliper outside	As required
8	Steel rule	As required
9	Wire brush (M.S)	As required
10	Spark lighter	As required
11	Scriber	As required

12	Tongs holding	As required
List of Shop Outfit		
13	Hammer ball pen	As required
14	Hacksaw frame	As required
15	Steel tape	As required
16	File half round bastard & flat	As required
17	Welding & Cutting torches with nozzles	As required
18	Spanner set	As required
19	Outfit spanner & spindle key	As required
20	D E grinder 30 cm wheel motorized Pedestal type	As required
21	Vice bench	As required
22	Bench shear hand capacity up to 5mm	As required
23	Pressure regulators (Oxygen & Acetylene)	As required
24	Gas welding table with fire bricks	As required
25	Gas cylinders with trolley	As required
List of General Installation		
26	Gas welding & cutting plant with complete accessories	1 unit
27	Fire Fighting equipment	As required
28	Consumables, Gases and raw materials	As required.

Module - 2

1. Name of the Module : **BASIC WELDING (Arc)**

2. Sector : **FABRICATION**

3. Code : **FAB102**

4. Entry Qualification : Minimum 8th std. and 14 years above

5. Terminal Competency : After completion of this training, the participants would be able to

   a. join metals by arc welding process

   b. repair components/parts used in household & industrial appliances

6.Duration : 120 Hrs.

7.Contents :

Practical Competencies	Underpinning Knowledge (Theory
• Use of protective safety devices on shop floor • Safe working practice to be observed during welding • Identification of tools and accessories used for Gas welding • Setting up Arc Welding plant • Striking an arc and depositing straight and wearing beads on MS in Flat position • Preparation of joints, edge operations. • Produce arc welded joints in mild steel in flat position a. Fillet Lap & T joints b. Inside corner joint c. Square butt joint d. Single 'V' but joint • Identification of defects by Visual inspection & correction of defects	• Reading of fabrication drawing. • Introduction to welding • Safety precautions. • Types of welding processes and application • Nomenclature of Fillet and groove welds • Welding terms and definitions • Principles of Manual Metal Arc Welding (MMAW) • Advantages and limitations. • Basic Electricity applicable to welding • Arc welding power source, AC Transformers, DC welding rectifier, DC generators • Types of welding joints and edge preparation • Welding electrodes and selection • Coding of MMAW electrodes • Arc welding procedure and technique • Welding defects causes and remedy • Distortion and methods of control • Welding symbols

	• Inspection & testing of weldments

8. Tools & Equipment:

Sl. No.	Description of tools	QTY
List of Hand Tools		
1	Gloves pair leather	As required
2	Apron leather	As required
3	Screen welding helmet type	As required
4	Screen welding hand	As required
5	Goggles pair welder	As required
6	Hammer scaling 0.25 kg. With handle	As required
7	Chisel cold flat	As required
8	Centre punch	As required
9	Dividers	As required
10	Caliper outside	As required
11	Steel rule	As required
12	Wire brush (M.S)	As required
13	Spark lighter	As required
14	Tongs holding 30 cm	As required
List of Shop Outfit		
15	Hammer ball pen	As required
16	Hacksaw frame	As required
17	Weld measuring gauge fillet and butt	As required

18	File half round bastard & flat	As required
19	Gas Cutting torches with nozzles	As required
20	Hammer sledge double faced	As required
21	Steel tape	As required
22	Electrode holder 400 amps	As required
23	Filter Glasses coloured and white	As required
24	Outfit spanner & spindle key	As required
25	Gas cylinders with trolley	As required
26	D E grinder 30 cm wheel motorized Pedestal type	As required
27	Vice bench	As required
28	Power hacksaw	As required
29	Electrode drying oven Temp. range 0-250^0 C, 10Kg cap.	As required
30	AG 7 Grinder & AG4	As required
31	Bench shear hand capacity up to 5mm	As required
32	Pressure regulators (Oxygen & Acetylene)	As required
List of General Installation		
33	Transformer welding set with all accessories 300 A	1 unit
34	Arc welding set Rectifier type 400 Amps with all accessories.	1 unit
35	Gas welding & cutting plant with complete accessories	1 unit
36	Fire Fighting equipment	As required
37	Consumables Electrode, Gas and raw materials	As required.

Module - 3

1. Name of the Module : **GAS CUTTING**

2. Sector : **FABRICATION**

3. Code **: FAB103**

4. Entry Qualification : Minimum 8th std. and 14 years above

5. Terminal Competency : After completion of this training, the participants would be able to

   a. cut metals by oxy fuel cutting process

   b. prepare metals to required size

6.Duration : 120 Hrs.

7.Contents :

Practical Competencies	Underpinning Knowledge (Theory
• Use of protective safety devices on shop floor • Safe working practice to be observed during welding. • Identification of tools and accessories used for Gas cutting • Setting up of Gas Cutting Plant • Lighting and adjustment of Oxy-Acetylene flame & operation • Practicing cutting on M.S. plate • Cutting in flat horizontal and vertical positions • Cutting nozzle selections (straight and angle cutting) for different thickness • Practice on Circular Cutting • Produce joints according to required size. • Identification of defects by Visual inspection & correction.	• Reading of fabrication drawing. • Description & use of measuring & marking tools • Safety precautions. • Types of welding joints and edge preparation • Types of Oxy-Acetylene flames and their uses. • Description operating procedures of oxy-Acetylene cutting plant. • Description and safe operating procedures of oxy-acetylene regulators • Description & maintenance of oxy Acetylene cutting torches • Principles of Oxy Acetylene cutting process • Principles of Template & Profile cutting • Cutting defects causes and remedy • Inspection.

8. Tools & Equipment*:*

Sl. No.	Description of tools	QTY
List of Hand Tools		
1	Gloves pair leather	As required
2	Apron leather	As required
3	Goggles pair welder	As required
4	Hammer scaling 0.25 kg. With handle	As required
5	Chisel cold flat	As required
6	Centre punch	As required
7	Dividers	As required
8	Caliper outside	As required
9	Steel rule	As required
10	Spark lighter	As required
11	Scriber	As required
12	Tongs holding 30 cm	As required
List of Shop Outfit		
13	Hammer ball pen	As required
14	Gas Cutting torches with nozzles	As required
15	Spanner set	As required
16	Steel tape	As required
17	Outfit spanner & spindle key	As required
18	Vice bench	As required
19	AG 7 Grinder & AG4	As required
20	Pressure regulators (Oxygen & Acetylene)	As required
21	Gas cylinders with trolley	As required

List of General Installation		
22	Gas welding & cutting plant with complete accessories	1 unit
23	Fire Fighting equipment	As required
24	Consumables Electrode, Gas and raw materials	As required.

Module - 4

1. Name of the Module : **TIG WELDING**

2. Sector : **FABRICATION**

3. Code : **FAB204**

4. Entry Qualification : Minimum 8th std. and 14 years above.

MES modules on 'BASIC WELDING (Gas)'

5. Terminal Competency : after completion of this training, the participants would be able to

a. fabricate Aluminium structure using TIG welding
b.Stainless steel metal fabrication by TIG welding
c .do precision job welding

6.Duration : 90 HRS.

7.Contents :

Practical Competencies	Underpinning Knowledge (Theory
• Introduction to safety equipment and their use • Identification of Tools and Equipments • Setting up of AC and DC TIG Welding Plant • Beading practice on plate on MS sheet Welding • Produce TIG welding Jobs a. Square butt and corner joint on MS sheet down hand position b. T joint on MS sheet • Bead on practice on SS • Produce TIG welding Jobs a. Square butt and corner joint on SS b. Welding of SS with back purging Technique. • Beading practice on Aluminium welding sheet • Produce TIG welding Jobs a. Butt, T and Corner joint on Aluminium sheet b. Single V butt joint on Aluminium sheet • Identification of defects by Visual inspection & correction of defects	• Introduction to welding • Safety precautions. • Types of welding processes and application • Nomenclature of Fillet and groove welds • Welding terms and definitions • Introduction to TIG welding & its application • Advantages of TIG welding process • Power source – Types, polarity and application • Accessories - HF unit and DC suppressor. • Tungsten electrode, Types, sizes, and uses. • Type of shielding gases • Advantages of root pass welding of pipes by TIG welding • Purging Methods • Tables / Data relating to TIG welding. • Trouble shooting • Types of weld defects, causes and remedy

	• Welding Symbols • Inspection and testing of weldments

8. Tools & Equipment:

Sl. No.	Description of tools	QTY
List of Hand Tools		
1	Gloves pair cotton	As required
2	Screen welding helmet type with filter glasses	As required
3	Wire brush S.S & M.S.	As required
4	Hammer scaling	As required
5	Centre punch	As required
6	Scriber 15 cm	As required
List of Shop Outfit		
7	Screw Driver set	As required
8	Hacksaw frame adjustable	As required
9	Hammering blocks 5 cm thick 60 sq	As required
10	File different size	As required
11	Spanner set	As required
12	Spindle key	As required
List of General Installation		

13	TIG welding set complete 300 amps AC / DC with water cooled torch	1 unit
14	Argon Gas cylinders	As required
15	Shearing Machine	As required
16	Fire fighting equipment	As required
17	Consumables and raw materials	As required

Module - 5

1. Name of the Module : **MAG /CO2 WELDING**

2. Sector : **FABRICATION**

3. Code : **FAB205**

4. Entry Qualification : Minimum 8th std. and 14 years above.

MES modules on 'BASIC WELDING (Arc)'

and 'Gas Cutting'

5. Terminal Competency : After completion of this training, the participants would be able to

a. fabricate steel structure using CO_2 welding
b. perform sheet metal work by CO_2 welding
c. produce radiographic quality work

6.Duration : 90 HRS.

7.Contents :

Practical Competencies	Underpinning Knowledge (Theory
• Introduction to safety equipment and their uses • Identification of Tools and Equipments • Setting up of MAG/CO_2 Welding • Straight line beads on MS plate by CO_2 welding • Produce CO_2 welding joints a. Lap T & corner joint on MS plate in down hand position b. Single 'V' butt joint in down hand position c. Single 'V' joint by Flux cored Arc welding d. Lap, T & corner joint on MS sheet in vertical down ward position by CO_2 welding e. Lap, T & corner joint on MS sheet in horizontal position by CO_2 welding • Identification of defects by Visual inspection & correction of defects	• Introduction to welding • Safety precautions. • Types of welding processes and application • Nomenclature of Fillet and groove welds • Welding terms and definitions • Introduction to MAG/ CO_2 welding • Power source & accessories • Wire Feed unit • Welding Gun & its parts • Modes of metal transfer – Dip, Globular, spray • Welding wire types and specification • Types of shielding gases & its importance • Principles & applications of Flux cored arc welding • Trouble shooting in MAG/CO_2 welding • Data and Tables related to CO_2 welding • Types of weld defects, causes and remedy • Welding Symbols • Inspection & testing of weldments

8. Tools & Equipment:

Sl. No.	Description of tools	QTY
List of Hand Tools		
1	Gloves pair leather	As required
2	Apron leather	As required
3	Screen welding helmet type	As required
4	Screen welding hand	As required
5	Wire brush (S.S)	As required
6	Chisel cold flat	As required
7	Centre punch	As required
8	Dividers	As required
9	Caliper outside 15 cm	As required
10	Wire brush (M.S)	As required
11	Scriber	As required
12	Tongs holding	As required
List of Shop Outfit		
13	“Tinmans” square	As required
14	Hammer ball pin	As required
15	Hacksaw frame	As required

16	Hammering blocks	As required
17	File different types	As required
18	Spanner set	As required
19	Spindle key	As required
20	Welding Glasses colour & white	As required
List of General Installation		
21	CO_2 welding machine complete 400 amps with torch 300A	1 Unit
22	Co_2 cylinders	As required
23	Gas Cutting Plant Complete set	1 unit
24	Fire Fighting Equipment	As required
25	Consumables and raw materials	As required

Module - 6

1. Name of the Module : **FABRICATION WELDING**

2. Sector **: FABRICATION**

3. Code **: FAB206**

4. Entry Qualification : Minimum 8th std. and 14 years above.

MES modules on 'BASIC WELDING (Arc)'

And 'Gas Cutting'

5. Terminal Competency : After completion of this training, the participants would be able to

a. fabricate sheet metal items independently
b. perform all position structural fabrication work
c. attend repair work

6.Duration : 180 HRS.

7.Contents :

Practical Competencies	Underpinning Knowledge (Theory
• Use of protective safety devices on shop floor • Identification of Tools & Equipments • Practice in Scribing of straight line, Bisection of straight lines with marking tools. • Practice in cutting sheet metal to different shapes using various types of snips • Folding/Bending sheet metal using mallet • Making holes in sheet metal using punching machine • Making hole in sheet metal with a twist drill • Riveting practice using various types of rivet heads • Practice on pipe bending • Setting up of gas welding plant • Opening and closing procedure of gas welding plant • Lighting and adjustment of flame	• Safety in the Workshop. • Importance of Fabrication work in Industry • Safety in Gas welding & manual metal Arc welding • Measuring & Marking Tools – Try square, dividers, trammels, marking block, Scriber, Steel rules, Calipers , SWG etc. • Types of Snips, shears and their uses • Types and uses Sheet metal working Tools – Mallet, Nylon Hammers, etc. Bench vice ,C clamps, Pliers, Bench stokes or sheet formers-. • Cutting methods – straight cutting – circle cutting – Louver cutting, Nibbling, Slot cutting, Notching, • Sheet Metal Works – Folding, Bending &

• Practice for joining welding & brazing by oxy acetylene process on sheet metal in different positions • Setting of Arc welding plant • Produce arc welded joints a. Filler 'T' joint on M.S. flat by MMAW in 1F, 2F, 3F and 4F b. Fillet lap joint on M.S. by MMAW in flat position c. Outside corner joint on MS by MMAW in flat position d. Single 'V' but joint on MS by MMAW in 1G, 2G, 3G and 4G • Practice Grinder, Filing & Fitting • Production jobs as per drawing such as Furniture items, tables, almirah, cabins and structural items such as gate, Grill etc. • Identification of defects by Visual inspection & correction of defects	Flanging • Drilling machines, Drill bits, etc.. • Methods of laying out pattern, Parallel line method, Radius line method, Triangular line method • Laying out pattern of cylinder cut obliquely • Description of roll forming machine types and operators principle • Different process of metal joints – Bolting – Riveting – Soldering – Brazing, & Welding • Oxy-acetylene welding – Principles and applications • Filler rods used in Gas welding • Welding flux & Brazing applications • Principles of Arc welding, tools & accessories • Welding positions and their significance • Spot Welding Principles • Electrodes – Types, Functions of flux • Selection of electrodes • Welding Symbols • Welding defects, Causes and remedy • Distortion and methods of Control. • Inspection & testing of weldments

8. Tools and Equipment

Sl.No.	Description of tools	QTY
List of Hand Tools		
1	Steel Rule	As required
2	Wing Divider	As required
3	Centre Punch	As required
4	Spring Dividers	As required
5	Ordinary Wooden Mallet	As required
6	Cross Peen Hammer	As required
7	Protractor with blade	As required
8	Steel Tape	As required
9	Ballpane Hammer	As required
10	Scriber	As required

List of Shop Outfit		
11	Sheet Metal Gauge	As required
12	Stake Round and Bottom	As required
13	Hammer Peaning with handle	As required
14	Snips straight	As required
15	Hand Shear Universal 250 mm	As required
16	Punch Round	As required
17	Rivet sets snap and Dolly combined	As required
18	Chisel cold flat	As required
19	Punch Letter and Punch Number	As required
20	File flat, round and half round	As required
21	Tripaning tool	As required
22	D.E.Spanner set	As required
23	Hacksaw frame	As required
24	Hand vice	As required
25	Plier Combination	As required
26	Grip Wrench	As required
27	Steel wire Brush	As required
28	H.S.S. Twist Drill 3 mm, 4mm & 6 mm (Parallel Shank)	As required
29	Tongs, Close mouth and pick up (1 each)	As required
30	Portable Electric drill (Single phase)	As required
31	Crow bar	As required
32	Hand Drill 0 to 6 mm, 8mm, 10mm & 12mm	As required
33	Screw Driver	As required
34	Vernier caliper	As required
GENERAL INSTALLATION		
35	Bench lever shears	1 unit
36	Nibbling Machine	1 unit
37	Welding plant Oxy-Acetylene complete	1 unit
38	D.E. Grinder Pedestal motorized 200 mm	1 unit
39	Anvil	1 unit
40	Spot Welding Machine	1 unit
41	Fly press/Ball press	1 unit
42	Buffing and Polishing Machine	1 unit

43	Pipe Bending Machine (Hydraulic type)	As required
44	Beading Machine with 380mm throat clearance (with crimping rollers)	As required
45	Welding Transformer (200 to 400 Amps)	1 unit
46	Bench vice	As required
47	Consumables and raw materials	As required
48	Fire fighting equipments	As required

Module 7

1. Name of the Module : **PIPE WELDING (TIG & Arc)**

2. Sector : **FABRICATION**

3. Code : **FAB207**

4. Entry Qualification : Minimum 8th std. and 14 years above

MES modules on 'BASIC WELDING (Arc)'

And ' Gas Cutting'

5. Terminal Competency : After completion of this training, the participants would be able to

a. Weld pipe joints using root weld as TIG & cover pass by manual metal arc welding
b. Perform pipe welding in 5G & 6G positions

6.Duration : 150 HRS.

7.Contents :

Practical Competencies	Underpinning Knowledge (Theory
• Introduction to safety equipment and their use • Setting up of Arc Welding plants • Striking and making straight and weaving beads in all position by MMAW. • Weld joint preparation on plate • Groove welding on plate in 1G & 2G positions • Groove welding on plate in 3G & 4G positions • Preparation of pipe joint for pipe welding • Welding of pipes in 1G & 2G position • Setting up of Arc Welding and TIG Welding plants • Striking and making straight g beads in all position by TIG. • Root welding of pipes in 5G position by TIG Welding • Intermediate and cover pass welding in 5G position by MMAW • Root welding of pipes in 6G position by TIG • Intermediate and cover pass welding in 6G position by MMAW	• Introduction to welding • Types of welding processes and application • Nomenclature of Fillet and groove welds • Welding terms and definitions • Introduction to pipe welding • Principles of Manual Metal Arc Welding (MMAW) • Types of power source, Polarity and its effects, Arc length • Welding positions and importance • Types of Electrodes and specification as per BIS, AWS, etc • Selection of electrodes • Electrode storage and backing temperature • Introduction to TIG welding • Advantages of TIG welding process • Power source – Types, polarity and application • Accessories - HF unit and DC suppressor. • Tungsten electrode, Types, sizes, and uses.

• Identification of defects by Visual inspection & correction of defects	• Type of shielding gases • Advantages of root pass welding of pipes by TIG welding • Types of pipes and pipe schedule • Basic pipe welding procedure – uphill welding, down hill welding and horizontal welding • Pipe welding position 1G, 2G, 5G & 6G • Procedure for welding heavy wall pipes in 5G position welding • Procedure for welding heavy wall pipes in 6G position welding • Welding Symbols • Inspection & testing of weldments

8. Suggested Tools and Equipment

Sl. No.	Description of tools	QTY
List of Hand Tools		
1	Gloves pair leather	As required
2	Apron leather	As required
3	Screen welding helmet type	As required
4	Screen welding hand	As required
5	Hammer scaling	As required
6	Chisel cold flat	As required
7	Centre punch	As required
8	Dividers	As required
9	Caliper outside	As required
10	Wire brush (M.S)	As required
11	Spark lighter	As required
12	Scriber	As required
13	Tongs holding	As required

List of Shop Outfit		
14	Hammer ball pin	As required
15	Chisel cold cross	As required
16	Screw Driver	As required
17	Leg vice on stand	As required
18	Hacksaw frame adjustable	As required
19	Hammering blocks	As required
20	File half round bastard & File F.lat	As required
21	Leather sleeves	As required
22	Spanner set double ended Outfit spanner	As required
23	Hammer sledge double faced	As required
24	Pipe wrench	As required
25	“Tinmans” square	As required
26	Pipe Cutter	As required
27	Cutting torch Oxy-Acetylene with cutting nozzle	As required
28	Electrode holder 400 amps	As required
29	Spindle key (for opening cylinder valve)	As required
30	Pressure regulator oxygen & acetylene	As required
31	Tip cleaner	As required
32	Shielding Glasses (colour & White)	As required
33	AG 7 Grinder & AG4	As required
34	Electrode drying oven Temp. range 0-250^0 C, 10Kg cap.	As required
35	PUG cutting machine	As required
36	D E grinder 30 cm wheel motorized Pedestal type	As required
37	Vice bench 10 cm	As required
GENERAL INSTALLATION		
38	Transformer welding set with all accessories 300 A	As required

39	Arc welding set Rectifier type 400 Amps with all accessories.	As required
40	Oxygen, Acetylene, and Argon cylinders	As required
41	Gas Cutting Plant Complete set	As required
42	TIG Welding outfit complete set 300 AMPS	As required
43	Fire Fighting equipments	As required
44	Consumables and raw materials	As required

Basic Fitting Work

Name	:	**Basic Fitting Work**
Sector	:	**Fabrication**
Code	:	**FAB108**
Entry Qualification & Age	:	Vth standard, 14 years & above
Duration	:	180 hours
Terminal Competency	:	

- Identify, select, use and store tools, equipments and materials used in Fitting trade in a safe manner.
- File mild steel surface to an accuracy of ±0.1 mm and make parallel and angular fittings

CONTENTS:

Practical Competencies	Underpinning Knowledge(Theory)
• Use of protective clothing and boots • Identify tools, equipments and materials used in fitting • Apply good house keeping practices, proper handling of materials and disposal of waste, follow statutory regulations. • Store/lay materials at work in safe	• Safety precautions, use of protective clothing and elementary first aid. • Functions and uses of various tools and equipment. • Reasons for carrying out good housekeeping practices • Care and use of tools, equipment and materials used in fitting

Practical Competencies	Underpinning Knowledge(Theory)
manner • Use and store tools and equipments in a safe manner • Select proper tools for a particular task • Take measurements using appropriate measuring tool (**Measuring tools :** Steel rule, inside and outside calipers, vernier caliper, inside and outside micrometer, depth gauge, vernier height gauge, Bevel protector, radius gauge, filler gauge, wire gauge) • Read and interpret simple blue prints and drawings	• Selection and correct use of tools • Criteria for selection of tool for different operation. • Proper handling and correct use of hand tools • Types of measuring tools • Least count and errors • Measurement procedures • Safety precautions related to measuring tools
• Mark and punch on a metal surface as per drawing • Hack sawing and chipping to dimensions • Grind the excess metal • File all surfaces to an accuracy of ±0.1 mm	• Selection of marking media. Proper handling and use of marking and punching tools. • Criteria for selection of grinder. Methods of holding the of tools and job. Safety consideration in grinding operation • Types of files in grade, shape and cut. • Proper handling and correct use of different types of files.
• Drill, ream and bore holes in mild steel material	• Types of drill bit and reamer. Calculation of cutting speed for the above operations. Types proper

Practical Competencies	Underpinning Knowledge(Theory)
• Make internal and external threads • Make parallel and angular fittings	coolant. Safety consideration for each operation. • Types of tools used to make thread Calculation of tap drill size and die blank size. Types of the proper coolant. Safety consideration in tapping and dieing operations. • Knowledge of limits, fits, tolerance. Systematic steps of different operation Safety consideration in each operation

List of Tools and Equipments (for one batch of 20 trainees)

S.NO	DESCRIPTION	QTY
1	Drilling machine (PILLAR)	1 No
2	Grinding machine (Bench)D.E WITH ROUGH AND SMOOTH WHEEL 20CM DIA	1 No
3	Bench vice 125MM	20 Nos
4	Drill Bit STRAIGHT SHANK 1- 12 mm step.05mm, taper shank 13-25 step.1 mm	1 set
5	Flat bastard file 12″	20
6	Flat second cut file 10″	20
7	Flat Smooth file 8″	20
8	Hand File 10″	10
9	Half Round second cut File 10″	10
10	Round Second cut File 8″	10
11	Square Second cut File 8″	10
12	Triangular second cut File 8″	10
13	Knife edge file 6″	5
14	Needle file (second cut)	2 sets
15	Engg Try square 6″	10
16	Out side caliper 6″ (spring)	10
17	In side caliper 6″ (spring)	10
18	Divider 6″ (spring)	10
19	Scriber	10
20	Centre Punch	10
21	Dot Punch	10

22	Number Punch	1 set
23	Ball peen hammer 1/2lb	10
24	Cross peen hammer 1 lb	5
25	Straight peen hammer	5
26	Hack saw frame (fixed) 12″	20
27	Surface plate 400 x 400	1
28	Angle plate 150 x 150 x 100	1
29	'v' Block 75 x 75 x 100	1
30	Universal surface gauge 12″	1
31	Radius gauge	1
32	Flat Chisel 12 mm, 20 mm - 150 mm long	5 each
33	Cross cut chisel 6 mm	5
34	Machine vice 6″ (plain type)	1
35	'C' clamp	1
36	Wheel dresser (star)	2
37	Screw pitch gauge	1
38	Drill gauge 1-12mm, 0.5 mm step 13–25step1mm	1 each
39	Hand Reamer 10mm, 12mm	1 each
40	Taps set M8, M10, M12	1 each
41	Die-split M8, M10, M12	1 each
42	Out side micrometer 0-25, 25-50	1 each
43	Vernier caliper 200mm	1
44	Tap wrench	1
45	Die stock	1
46	Drill Chuck 13mm capacity with key	1
47	Drill Sleeves MT 1-2, 2-3	1 each

48	Drill socket	1
49	Work bench 8'x4'x21/2	2 Nos
50	Steel Almirah	1 No
51	Students locker (9 box)	2 Nos
52	Tool kit box	

Basic Sheet Metal Work

Name	:	**Basic Sheet Metal Work**
Sector	:	**Fabrication**
Code	:	**FAB109**
Entry Qualification & Age	:	Vth standard, 14 years & above
Duration	:	180 hours
Terminal Competency	:	

- Identify, select, use and store tools, equipments and materials used in sheet metal work in a safe manner
- Carry out Shearing, Cutting, Bending, Folding, Seaming, Wire edging of sheet metal
- Join sheets using folding, seaming and riveting

CONTENTS:

Practical Competencies	Underpinning Knowledge(Theory)
• Use of protective clothing and boots • Identify tools, equipments and materials used in fitting • Apply good house keeping practices, proper handling of materials and disposal of waste, follow statutory regulations. • Carry out basic first aid treatment/notifying accident. • Store/lay materials at work in safe	• Safety precautions, use of protective clothing and elementary first aid. • Functions and uses of various tools and equipment. • Reasons for carrying out good housekeeping practices • Care and use of tools, equipment and materials used in fitting

Practical Competencies	Underpinning Knowledge(Theory)
manner • Use and store tools and equipments in a safe manner • Select proper tools for a particular task • Take measurements using appropriate measuring tool (**Measuring tools :** Steel rule, inside and outside calipers, vernier caliper, inside and outside micrometer, depth gauge, vernier height gauge, Bevel protector, radius gauge, filler gauge, wire gauge) • Read and interpret simple blue prints and drawings • Mark layout of object on sheet metal as per drawing	• Selection and correct use of tools • Criteria for selection of tool for different operation. • Proper handling and correct use of hand tools • Types of measuring tools • Least count and errors • Measurement procedures • Safety precautions related to measuring tools
• Perform sheet metal operations ▪ Select appropriate sheet metal hand tools and machine tools (Shearing tools, stakes, Hammers, Cutting tools, Grovers) • Perform appropriate sheet metal operation to make different shapes (Shearing, Cutting, Bending, Folding, Seaming, Wire edging) • Perform sheet metal joining operations • Join sheets using folding and appropriate seaming (Single seam,	• Introduction of marking tools. Application of marking tools. Safety, proper handling and use of marking tools. • Introduction to sheet metal hand tools and machine tools and safety precautions to be observed while using them. • Types of sheet metal and their applications. Different sizes of sheet metal commercially available • Metal joining method

Practical Competencies	Underpinning Knowledge(Theory)
Double seam, Grove seam, Lap seam, Dovetail seam) • Select appropriate rivet for riveting operation (Snap head, Pan head, Countersunk head, Mushroom head, Flat head) ▪ Perform riveting using appropriate joint ▪ Single rivetted lap joint ▪ Double rivetted lap joint ▪ Double zigzag lap joint ▪ Single butt joint ▪ Double butt joint ▪ Check rivet joint for defects ▪ Select pre soldering operations (Cleaning, Heating) ▪ Select appropriate soldering Iron and bit (Soldering Iron :Gas heated, Electrically heated, Blow gun heated) **(Bit :** Point bit, Straight bit, Hatchet bit, Handy bit) • Perform soldering operations • Check joint for defaults	• Types of seams and allowances • Types of flux and selection criteria • Types of rivets and their applications • Types of rivet joints • Defects of riveted joint • Safety precautions • Knowledge of limits, fits, tolerance. • Systematic steps of different operations. Safety consideration in each operation.

TOOLS & EQUIPMENT

S. No.	Items	Quantity proposed for a batch of 20 trainees
01.	Metal Sheet 1mm, 2mm, 3mm GI/MS	5 sheets
02.	Measuring tape 5 mm	5 nos.
03.	Steel rule 300 mm	20
04.	Steel rule 150 mm	20
05.	Vernier Caliper 150 mm/0.02 mm	2
06.	Micrometer 0.25 mm/0.02 mm	2
07.	Thickness gauge set	2
08.	Wire gauge	2
09.	Drawing Instrument box	10
10.	Drawing Board	10
11.	Paper Chip	40
12.	Set Square	10
13.	French Curve	10
14.	Scriber	20
15.	Divider	10
16.	Scratch ant	5
17.	Steel square 8”	5
18.	Center punch	20
19.	Set Hammer	2
20.	Faller	2
21.	Straight Snip	2
22.	Bent Snip	2
23.	Various types of stakes	2 sets
24.	Grooving tool	2
25.	Folder bar	5
26.	C Clamp 4”	8
27.	Rivet Set	2 set

S. No.	Items	Quantity proposed for a batch of 20 trainees
28.	Punch & Drift	5 set
29.	Hand lever shearing machine	1
30.	Fly press	1
31.	Roller forming machine	1
32.	Universal swaging machine	1
33.	Dressing plate	1
34.	Different types of rivet of Al, Copper & Ms	1 kg each
35.	Portable drill machine	1
36.	Piller drill machine ½”	1
37.	Different types of soldering iron	2 sets
38.	Solder	2 kg
39.	Flux	2 kg
40.	Hammers, 500 gm, 200 gm	5 each
41.	Mallet (Various types)	10 each
42.	Bench vice	5
43.	File – rough, medium & smooth of various section	5 sets
44.	Hacksaw Frame	10
45.	Hacksaw blades	100
46.	Paper knife	20
47.	Scissors	10
48.	Glue	20
49.	Blow gun	1
50.	1.5 book of rivets	1
51.	First aid box	1
52.	Cold Chisel flat	5
53.	Set of Drill bit	2 sets

List of Expert/Trade Committee Members

CURRICULUM DEVELOPMENT FOR SHORT TERM COURSES BASED ON MODULAR EMPLOYABLE SKILLS

SECTOR/AREA: FABRICATION

1	C. Sridhar, Director-Technical, AIWT, Guindy, Chennai-32	Chairman
2.	S. Subin, Engineer, G.B. Engineering Pvt.Ltd, Trichy	
3	SDM Rao, Structural Consultant, Maruthi Construction Corporation, Chennai	
4.	T.A. Joseph Director, ATI, Chennai-32	
5.	Ashwani Aggarwal Deputy Director of Training DGET	
6.	K. Vadivelu, Training Officer (Retd.), Directorate of Emp. & Trg., Tamil Nadu	
7.	M. Kumaravel,Convenor Asst.Director, ATI, Chennai-32	
8.	M.Jawaharlal, Secretary, Employers Federation of Southern India	