Curriculum
for
Certificate Programme
in
WELDER
for
Maharaja Ranjit Singh Punjab Technical University,
Bathinda (Punjab)

Prepared By:

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January**, 2017**

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that pass outs from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
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PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind:

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
ii) Director, College Development Council MRSPTU for his support and active involvement in curriculum development.
iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
v) Faculty from different departments of NITTTR, Chandigarh for content updation.
vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Fabrication
2.	Name of the Certificate Programme	:	Welder
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	25 : 75 (Approx.)

2. JOB ROLE AND JOB OPPORTUNITIES OF WELDER

Job Role

A welder is expected to perform following job roles in the industry:

- **Gas welding** – Check and prepare metal (ferrous and non-ferrous) sheets and pipes as per specifications for gas welding; set up oxy-fuel welding equipment and accessories; select and use appropriate filler metal and flux; weld sheets and pipes in different positions using correct and safe procedure and produce welds of acceptable quality standards.
- **Gas cutting** – Check and prepare jobs (M.S.) as per specifications for oxy-fuel gas cutting; set up oxy-fuel cutting equipment and accessories; carry out cutting (straight, circular, bevel) using correct and safe procedure to produce cuts of acceptable quality standards.
- **Brazing –** Check and prepare jobs for brazing as per specifications; set up equipment; select and use consumables and carry out brazing to produce brazed joints of acceptable quality standards; carry out necessary pre- and post welding checks and treatment.
- **Arc welding** – Select and set up different arc welding machines for given jobs; select, store, prepare and use electrodes of appropriate type and size; prepare jobs with appropriate edge preparations; weld jobs in different positions using correct procedure observing safety precautions and produce welds of acceptable quality standards; carry out necessary pre- and post welding checks and treatment.
- **TIG welding** – Set up TIG welding equipment and accessories and consumables including electrode and electrode holder, consumable wire, gas mixture for TIG welding M.S., aluminium, stainless sheets; prepare the jobs and complete TIG welding process using correct and safe procedure to produce welds of acceptable quality; carry out necessary pre- and post-weld checks and treatments.
- **MIG / MAG welding** - Set up MIG / MAG welding equipment and accessories and consumables including electrode holder, consumable wire, gas mixture for MIG / MAG welding M.S. plates; prepare the jobs as per specifications and complete MIG / MAG welding using correct and safe procedure to produce welds of acceptable quality; carry out necessary pre- and post-weld checks and treatments.
- **Testing and inspection** – Prepare post-weld test specimens for different types of destructive tests including tensile, hardness, impact tests; carry out destructive tests and identify defects and causes thereof; set up and use non-destructive test equipment including visual, magnetic particle, dye penetrant and radiography tests, interpret results and identify defects in welds and causes thereof.
- **Communicate** effectively orally and in writing with colleagues and others.
- **Safety -** Select appropriate personal safety equipment and follow general safety practices as applicable to welding and cutting processes and welding shop environment.

Job Opportunities

The welding field is so diverse that it offers a vast array of options for employment and continuing personal development. There is a great demand for qualified and knowledgeable welders in fabrication and construction industries as well as for self employment in small scale enterprises. Aerospace, automobile, electronics are a few

examples of many industries that use welding in a big way. Welding is what holds the majority of structures together--bridges, cars, tractors, cranes, buildings, etc.

On successful completion of this course, students should be able to find gainful job opportunities in industries like those listed below besides exploring possibilities of being an entrepreneur and be self-employed. The list given below is only indicative and not comprehensive.

- Structural fabrication including bridges, building construction, infrastructure, cranes.
- Automobiles and allied industries.
- Aerospace, power plants, electronics
- Ship building
- Railways
- Chemical industries
- Mining sector
- Structural repair and maintenance
- Oil and natural gas sector

3. LEARNING OUTCOMES OF CERTIFICATE PROGRAMME IN WELDER

At the end of the programme, the students will be able to:

- Set components for welding and allied operations.
- Set parameters like welding current / electrodes etc.
- Perform gas welding, gas cutting and brazing operations.
- Perform arc welding operations.
- Perform TIG welding and MIG/MAG welding operations.
- Perform post-welding operations.
- Perform quality checks on welding.
- Prepare and read engineering drawing
- Identify and select material for specific application.
- Communicate effectively with others.
- Follow safety practices, PPE (Personal Protective Equipment), environment regulation and housekeeping.
- Apply concepts of mathematics and science for problem solving.

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN WELDER

FIRST SEMESTER

CODE	UNITS	STUDY SCHEME Total Hours		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
CMEE1-101	*Communication Skills	8	-	1	25	-	25	25	1	-	-	25	50
CMEE1-101P	*Communication Skills Lab.	-	24	1	-	25	25	-	-	50	3	50	75
CMEE1-102	Gas Welding, Gas Cutting and Brazing	32	-	2	25	-	25	50	2	-	-	50	75
CMEE1-102P	Gas Welding, Gas Cutting and Brazing Lab.	-	144	5	-	100	100	-	-	100	4	100	200
CMEE1-103	Arc Welding	32	-	2	25	-	25	50	2	-	-	50	75
CMEE1-103P	Arc Welding Lab.	-	144	5	-	100	100	-	-	100	4	100	200
CMEE1-104	Engineering Drawing (Welder)	-	-	1	-	-	-	75	3	-	-	75	75
CMEE1-104P	Engineering Drawing (Welder) Lab.	-	64	1	-	50	50	-	-	-	-	-	50
CMEE1-105	Engineering Materials	32		2	25	-	25	25	1	-	-	25	50
CMEE1-105P	Engineering Materials Lab.	-	32	1	-	50	50	-	-	50	3	50	100
CMEE1-106P	#Student Centred Activities (SCA)	-	48	2	-	25	25	-	-	-	-	-	25
CMEE1-107P	+4 Weeks Industrial Training (during vacation)	-	-	4	-	-	-	-	-	100	3	100	100
Total		**104**	**456**	**27**	**100**	**350**	**450**	**225**	**-**	**400**	**-**	**625**	**1075**

* Common with other certificate programmes

\# SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment, energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

\+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per semester = 16, Total working days per week = 5, Total hours/day = 7

Total hours in a semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

CODE	UNITS	STUDY SCHEME Total Hours		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
					INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
CMEE1-208	*Basic Sciences	48	-	3	25	-	25	75	2	-	-	75	100
CMEE1-209	TIG Welding	32	-	2	25	-	25	50	2	-	-	50	75
CMEE1-209P	TIG Welding Lab.	-	160	5	-	100	100	-	-	100	4	100	200
CMEE1-210	MIG/MAG Welding	32	-	2	25	-	25	50	2	-	-	50	75
CMEE1-210P	MIG/MAG Welding Lab.	-	144	5	-	100	100	-	-	100	4	100	200
CMEE1-211	Inspection and Testing of Weldment	32	-	2	25	-	25	25	1	-	-	25	50
CMEE1-211P	Inspection and Testing of Weldment Lab.	-	64	2	-	50	50	-	-	75	3	75	125
CMEE1-212P	#Student Centred Activities (SCA)	-	48	2	-	25	25	-	-	-	-	-	25
CMEE1-213P	+4 Weeks Industrial Training	-	-	4	-	-	-	-	-	100	3	100	100
Total		**144**	**416**	**27**	**100**	**275**	**375**	**200**	**-**	**375**	**-**	**575**	**950**

* Common with other certificate programmes

\# SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment, energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

\+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)

ii. 5 Marks for attendance as per following:
(by the trainers of the department)

a)	75%	Nil
b)	75 - 80%	2 Marks
c)	80 - 85%	3 Marks
d)	Above 85%	5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	National Level participation or inter-University competition
b)	10	-	Participation in two of above activities
c)	5	-	Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1
Subject Code: CMEE1-101
COMMUNICATION SKILLS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical (24 Hours)	**Theory (08 Hours)**
	Basics of Communication • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication (1 hour)
• Looking up words in a dictionary (meaning and pronunciation) (2 hours)	Functional Grammar and Vocabulary • Parts of speech • Tenses • Correction of incorrect sentences (2 hours)
• Self and peer introduction • Greetings for different occasions (1 hour)	Listening • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking • Importance • Methods to improve speaking • Manners and etiquettes (2 hours)
• Newspaper reading (1 hour)	Reading • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading (1 hour)
• Vocabulary enrichment and grammar exercises	Functional Vocabulary - One-word substitution

• Exercises on sentence framing accurately (6 hours)	- Commonly used words which are often misspelt - Punctuation - Idioms and phrases (2 hours)
• Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours)	
• Write a short technical report • Letter writing (3 hours)	
• Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours)	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 1.2
Subject Code: CMEE1-102
GAS WELDING, GAS CUTTING AND BRAZING

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Set components for welding and allied operations
- Carry out hacksawing, filing, punching and marking
- Perform gas welding, gas cutting and brazing

Practical (144 hrs)	**Theory (32 hrs)**
• Importance of Trade Training • Machinery used in trade • Hacksawing, filing square to dimension. • PPE, Safety Practices . **(12 hrs)**	• Discipline in institute and first aid • Safety precautions in gas welding and gas cutting • Introduction to gas welding, gas cutting and brazing **(2hrs)**
• Marking and punching on M.S. Plate • Setting of oxyacetylene gas welding equipments • Lighting and setting of flame . **(12 hrs)**	• Gas welding and Gas cutting equipments tools and accessories • Marking practice using of steel rule and steel tape (metric and inches) • Introduction to gas welding tools **(2 hrs)**
• Fusion run without filler rod on M.S. sheet 2mm thick in Flat position • Fusion Run with filler rod on M.S. sheet 2mm thick in Flat position **(8 hrs)**	• Common gases used in gas welding and gas cutting. **(2 hrs)**
• Flange edge joint without filler rod on M.S. sheet 2mm in Flat Position. • Square butt joint with filler rod on M.S. sheet 2mm in Flat Position. . **(8 hrs)**	• Types of oxyacetylene flames, their temperature and uses. . **(2 hrs)**
• Lap joint on M.S. sheet 2mm in Flat Position. . **(8 hrs)**	• Gas welding terms and definitions **(2hrs)**
• Marking and straight line cutting on M.S. plate 10-mm thick by gas welding . **(8 hrs)**	• Gas welding techniques (Leftward and Rightward) • Identification of material for gas welding (by weight, colour and spark) **(2 hrs)**

• Fillet T-Joint on M.S. sheet 2mm in flat position • Fusion Run without filler rod on M.S. sheet 2mm in Horizontal position. **(8 hrs)**	• Welding symbols as per BIS and AWS • Welding position. Flat, Horizontal vertical and overhead, slope and rotation. **(2 hrs)**
• Bevelling of M.S. plate 10mm thick by gas cutting • Square Butt joint on M.S. sheet 2mm in Horizontal position **(8 hrs)**	• Types of welding joint and their edge preparation • Principle of gas cutting **(2 hrs)**
• Fillet T-Joint on M.S. sheet 2mm in Horizontal position • Fusion Run on M.S. sheet 2mm in Vertical position. **(8 hrs)**	• Acetylene gas (D.A.) properties and generating methods. • Acetylene gas purifier and flash back arrestor • Acetylene gas cylinder, Colour code, pressure. . **(2 hrs)**
• Square Butt joint on M.S. sheet in vertical position **(8 hrs)**	• Oxygen gas properties and generating methods. • Oxygen gas Cylinder Colour code of oxygen cylinder and pressure **(2 hrs)**
• Outside corner joint on M.S. sheet 2mm in vertical position . **(8 hrs)**	• Acetylene gas regulator, types and uses. Gas welding torch and their types and nozzles. Oxyacetylene gas welding system. Cutting Torch. (Low pressure and High pressure) **(2 hrs)**
• Butt joint on M.S. pipe of 50mm dia and 3mm wall thickness in 1G position. . **(8 hrs)**	• Specification of pipes, various types of pipe joints, pipe welding positions. (1G,2G,5G,6G), manifold system **(2 hrs)**
• Pipe welding on 45º joint on M.S. pipe dia 50mm and 3mm wall thickness in 1G position. • Pipe flange joint on M.S. plate 3mm with M.S. pipe dia 50mm and 3mm wall thickness. **(16 hrs)**	• Gas welding flux types and functions. Principle of brazing (Hard Brazing) and their uses. **(2 hrs)**
• Single V. Butt joint on M.S. sheet 4mm in Flat position **(8 hrs)**	• Gas welding defects, causes and remedies. **(2 hrs)**

• Brazing on M.S. sheet 2mm in flat position • Square butt joint on brass sheet 2mm in Flat position. **(8 hrs)**	• Distortion and types, methods of control. Importance of preheating, post heating. **(2 hrs)**
• Square butt joint on Aluminum sheet 3mm in Flat position. • Brazing on copper Tube of 10mm in 1G position. **(8 hrs)**	• Gas welding of low carbon steel cast iron, Brass, Copper and aluminum. **(2 hrs)**

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT 1.3
Subject Code: CMEE1-103
ARC WELDING

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Understand basic knowledge of arc welding
- Perform welding operation in all positions on M.S. plate
- Select welding parameters like welding current/electrode etc.

Practical (144 hrs)	**Theory (32 hrs)**
• Hacksawing, filing, squaring, marking and punching **(8 hrs)**	• Introduction to arc welding process, tools, equipment and accessories **(4 hrs)**
• Use of safety tools/equipment during arc welding **(6 hrs)**	• Safety precautions during arc welding **(2 hrs)**
• Setting up of arc welding machine and accessories and striking an arc . **(20 hrs)**	• Welding parameters and their effect on bead geometry • Effect of arc length, polarity on weld bead **(4 hrs)**
• Preparation of butt joint, lap joint, corner joint, T-joint, edge joint on M.S. Plate in flat Position. . **(36hrs)**	• Types of welded joint and their application, edge preparation and fit-up for different thickness . **(4 hrs)**
• Study circuit diagram of a power source used in arc welding . **(4 hrs)**	• Basic electricity applicable to welding, different terms used in arc welding **(4 hrs)**
• Demonstration of various types of power sources used in arc welding. **(4 hrs)**	• Introduction to different power sources used in arc welding like transformer, rectifier, motor generator and inverter **(5 hrs)**
• Preparation of butt, Lap, Tee, Corner joint in horizontal, vertical and overhead position. • Pipe Flange joint on M.S Plate • Pipe welding butt joint on M.S pipe in 1G position **(60 hrs)**	• Introduction to various welding positions. **(2 hrs)**
	• Electrode: types, functions of flux, coating factor, sizes of electrode, coding of electrode as per BIS, AWS.

.	• Storage and drying of electrode **(4 hrs)**
• Identification of surface defects like under cut, over-lap, cracks, blow holes, slag inclusion, by visual inspection. **(6 hrs)**	• Distortion in arc welding and methods employed to minimize distortion • Various types of arc welding defects **(3 hrs)**

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 1.4
Subject Code: CMEE1-104
ENGINEERING DRAWING (WELDER)

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Prepare simple engineering drawings used in current welding practice
- Read technical drawings for cost estimation and manufacturing/fabrication purpose.

Practical (64 hrs)	**Theory**
• Practical demonstration with the help of blue prints/computer prints. **(3 hrs)**	Engineering drawing and its importance
• Drawing board, T-square, mini-drafter, set squares, protractor, drawing instrument box, pencils of different grades, erasing shield • Learn methods of folding of blue print/drawing prints as per BIS SP: 16-2003 • Size of drawing sheets and designation of sheets. • Preparation of A3/A2 sheet for preparing drawings. **(4 hrs)**	Introduction to drawing instruments
• Practice construction of different types of lines (horizontal and vertical) **(3 hrs)**	Fundamentals of engineering drawings: • Types of lines
• Construction of triangle, rectangle, rhombus, parallelogram circle quadrilateral and ellipse. **(3 hrs)**	Triangle and types of triangles, rectangle, rhombus, parallelogram, circle, quadrilateral and ellipse
• Practice writing alphabets and numerals in capital/lower case as per BIS: 9609 in vertical and inclined style: **(3 hrs)**	• Lettering and numbering: Study styles of lettering, spacing of letters standard heights and widths.
• Practice construction of elements dimensioning with the help of a view of an object. • Practice dimensioning of a diameter, radius, angles, holes, chamfers, undercut, functional dimensions,	• Dimensioning Definition, size dimension, location dimensions, dimensioning line, extension line, leader line, termination of dimension line unidirectional and aligned dimensioning systems.

nonfunctional dimensions. **(3 hrs)**	
• Practice of free hand sketch of an object in orthographic and isometric views. **(6 hrs)**	• Introduction of isometric and orthographic views.
• Free hand sketches of orthographic views of an object in first angle and third angle projections. **(6 hrs)**	• Study first angle and third angle projection methods.
• Construction of different points existing in first/second/third and fourth quadrants. • Identification of the position of points w.r.t. their projection drawings. **(6 hrs)**	• Projections of points in all the four quadrants.
• Practice the construction of plan and elevation of lines w.r.t. their different positions such as a line parallel to both V.P. and H.P, line perpendicular to V.P. and parallel to H.P., line perpendicular to H.P. and parallel to V.P., line parallel to H.P. and inclined to V.P., line parallel to V.P. and inclined to H.P. **(9 hrs)**	• Projections of lines in different quadrants
• Practice construction of cone, cylinder, pentagonal prism and hexagonal pyramid. **(6hrs)**	• Introduction to solids: cube cone, cylinder, prism and pyramid.
• Practice on the sheets showing all conventions as mentioned **(3 hrs)**	• Conventions as graphical symbols for materials and equipment/instruments/engineering components cast iron, aluminum audits alloys, steel, brass, bronze, copper etc. concrete, glass, plastic/rubber/insulating material/pack material (Marble, Slate, Porcelain and stone wares) Liquids, Woods
• Practice on the sheets showing the different mild joints **(3 hrs)**	• Conventions used for welded joints as Butt, square butt, single V-Butt, single bevel butt weld, single U-Butt, single J-Butt, backing run, fillet meld, plug meld, spot meld, seam weld.

• Practice the construction of views of the riveted joints. **(3 hrs)**	• Riveted Joint Convention
• Practice of sign convention of D.C. A.C. Positive, Negative, Single Phase, Three Phase, AC/DC, 3-Phase, Neutral line. **(3 hrs)**	• Conventions used for Electrical and electronic components.

Note: Theory part should be covered along with drawing practicals.

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Sketching
- Drawing

UNIT - 1.5
Subject Code: CMEE1-105
ENGINEERING MATERIALS

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Identify the materials on the basis of properties of materials
- Perform heat treatment of ferrous metals
- Estimate the cost of a given fabricated job

Practical (32 hrs)	**Theory (32 hrs)**
• To draw Stress-strain curve of ductile materials by using UTM **(4 hrs)** • To compare the hardness of various ferrous metals **(8 hrs)**	**Introduction:** Stress-strain curve, comparison of engineering properties of ceramics, plastics and metals. **Ferrous metals**: Carbon steel: low carbon, medium carbon, high carbon steel. Application and properties. • Cast Iron: Types, applications and properties. • Stainless steel: Types, applications and properties • Comparison of weldability of various ferrous metals **(10 hrs)**
• Comparison of hardness of various non-ferrous metals **(8 hrs)**	**Non-ferrous Metals:** • Aluminium, zinc, copper and its alloys: applications and properties. **(6 hrs)**
• Comparison of hardness before and after annealing, • Comparison of hardness before and after normalizing, • Comparison of hardness before and after hardening **(8 hrs)**	**Heat treatment:** • Iron and iron-carbide diagram, principles of heat treatment, annealing, normalizing, hardening and tempering. • Stress-relieving of the weldment, pre-weld and post-weld heating **(10 hrs)**
• Estimating the cost of the given fabricated job **(4 hrs)**	**Costing and Estimation:** • Cost accounting, elements of cost, prime cost, factory cost, total cost, selling price. Estimation, maintenance and repair cost estimation of welded joints **(6 hrs)**

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce

Subject Code: CMEE1-107
INDUSTRIAL TRAINING – I (140 hrs)

4 weeks on- the- job training in some industrial unit.
The purpose of the industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first-hand experience to enable them to use and apply institute based knowledge and skills to perform industrial activities.
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one-year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.
An external assessment of 100 marks has been provided in the study and evaluation scheme of 1st semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.
The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 20%
b) Industrial training report 50%
c) Presentation and viva-voce 30%

UNIT – 2.1
Subject Code: CMEE1-208
BASIC SCIENCES

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Apply the basic principles of maths in solving the basic problems of the trade.
- Apply the basic principles of physics in solving the basic problems of the trade.

Practical	Theory (48 Hours)
	Mathematics • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	Physics • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours) • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and

	insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2
Subject Code: CMEE1-209
TIG WELDING

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Perform TIG (Tungsten Inert Gas) welding operation on flat (horizontal) as well as pipe joints
- Select TIG welding process and process parameters for different materials and thicknesses
- Use different type of power sources and accessories of TIG welding
- Perform spot and seam welding
- Select parameters for spot and seam welding machine for different materials and thick nesses.
- Follow safety precautions for above welding processes, PPE (Personal Protective Equipment)

Practical	**(160 hrs)**	**Theory**	**(32 hrs)**
• Depositing bead on aluminium sheet 2mm thick in flat position	**(12 hrs)**	• Introduction to TIG (Tungsten Inert Gas) welding	**(2 hrs)**
• Square butt joint on aluminium sheet 1.6 mm thick in flat position	**(18 hrs)**	• TIG welding components and process, different power sources, Types of TIG welding, Difference between AC and DC TIG welding	**(4 hrs)**
• Fillet weld – T joint on aluminium sheet 1.6 mm thick in flat position	**(18 hrs)**	• Uses of oscillator in the TIG welding (pulsed TIG welding, Pulse parameter slope up and slope down)	**(2 hrs)**
• Fillet weld – Outside corner joint on aluminium sheet 2 mm thick in flat position	**(18 hrs)**	• TIG welding torches and their uses	**(2 hrs)**
• Butt weld – Square butt joint on stainless steel sheet 1.6 mm thick in flat position with purging gas	**(18 hrs)**	• Tungsten electrodes, types and uses and selection criterion.	**(2 hrs)**
• Filter weld – T joint on stainless steel sheet 1.6 mm thick in flat position	**(18 hrs)**	• TIG welding parameters. Argon gas and Helium gas properties and uses.	**(4 hrs)**

• Pipe but joint on aluminium pipe of 50mm x 3mm WT in flat position **(18 hrs)**	• Selection of parameters for different materials and thickness **(2 hrs)** • Types of stainless steel, aluminium and its alloys for TIG welding
• Pipe butt joint on MS pipe of 5mm thickness (**8 hrs)**	• Defects in TIG welding and remedies **(2 hrs)**
• T-joint on MS Pipe 50mm OD x 3 mm WT position – Flat (**12 hrs)**	• Introduction to spot welding and its types **(2 hrs)**
• Lap joint on stainless steel sheet by resistance spot welding (**8 hrs)**	• Components of spot welding and accessories, spot welding process and parameters. **(4 hrs)**
• MS sheet joining by resistance spot welding **(6 hrs)**	• Introduction to seam butt welding and types **(2 hrs)**
• MS sheet Joining by resistance seam welding (**6 hrs)**	• Equipment and accessories of seam butt welding. Seam butt welding process and its applications. **(2 hrs)** **(2 hrs)**

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 2.3
Subject Code: CMEE1-210
MIG/MAG WELDING

LEARNING OUTCOMES:
After undergoing this unit, students will be able to:

- Perform MIG (Metal Inert Gas)/MAG (Metal Active Gas) Welding operation
- Carry out quality check of MIG weld

Practical (144) hrs)	**Theory (32 hrs)**
• Setting of MIG (Metal Inert Gas) / MAG (Metal Active Gas) plants **(4 hrs)** • Straight beading practice of MS plate in flat position **(9 hrs)** • Lap joint in MS flat by MIG/MAG welding in flat position **(10 hrs)** • Open corner joint in MS plate by MIG/MAG welding in flat position **(10 hrs)** • T-Joint in MS plate by MIG/MAG in flat position **(10 hrs)** • Butt joint in MS plate by MIG/MAG in flat position **(10 hrs)** • Straight beading practice in MS plate by MIG/MAG in horizontal position **(9 hrs)** • Close square but joint in MS plate by MIG/MAG in horizontal position **(9 hrs)** • T- joint in MS plate by MIG/MAG in horizontal position **(10 hrs)** • Lap- joint in MS sheet in horizontal position by MIG/MAG welding **(9 hrs)** • Straight beading practice in vertical position by MIG/MAG welding (down ward/up-ward) **(9 hrs)** • Single V butt joint on MS plate in vertical position by MIG/MAG **(9 hrs)** • T- joint on MS plate in vertical position on MS plate by MIG/MAG welding **(9 hrs)** • Corner joint on MS plate in vertical position by MIG/MAG welding **(9 hrs)** • Straight beading practice in overhead position on MS plate by MIG/MAG welding **(9 hrs)** • Close square butt joint in overhead position by MIG/MAG welding **(9 hrs)**	• Introduction of MIG/MAG welding tools and equipment **(4 hrs)** • Safety precaution used in MIG/MAG welding **(2 hrs)** • MIG/MAG welding- advantages and limitations **(6 hrs)** • Power source and accessories, wire feed units **(4 hrs)** • Types of shielding gases and advantages **(4 hrs)** • Welding wires, types and specifications **(4 hrs)** • Types of welding defects, causes and remedy in MIG/MAG welding **(4 hrs)** • Application of MIG/MAG welding **(4 hrs)**

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 2.4 Subject Code: CMEE1-211 INSPECTION AND TESTING OF WELDMENT	
LEARNING OUTCOMES: After undergoing this unit, students will be able to: • Identify welding defects • Carry out visual inspection • Perform destructive and non-destructive tests	
Practical (64 hrs)	**Theory (32 hrs)**
• Difference between discontinuity and defect, identification of various weld defects in welded jobs. **(12 hrs)**	• Study various surface defects like undercuts, blow holes, porosity, slag inclusion, cracks, overlap, lack of penetration, pattern of ripples etc. by visual inspection. Their causes and remedies. **(6 hrs)**
• Welding symbols and location of weld on engineering drawings. Preparation of drawing sheets on welding symbols. **(12 hrs)**	• Need for welding symbols, Basic welding symbols, dimensions of welds. **(6 hrs)**
• Preparation and interpretation of WPS • Preparation of a job in accordance with a given WPS. **(12 hrs)**	• Description and detail of WPS (welding procedure specification), WPS form, PQR etc. **(4 hrs)**
• To perform tensile test • To perform impact test • To perform bend test **(12 hrs)**	• Introduction and procedure for mechanical testing of welds like tensile test, impact test, hardness survey and bend test. **(6 hrs)**
• To perform visual inspection • To perform dye penetration test • To perform ultrasonic test • To perform Magnetic particle inspection **(16 hrs)**	• Introduction and description of NDT (non-destructive tests) like visual inspection, dye penetration test, magnetic particle inspection, ultrasonic and radiography**.** **(6 hrs)**
-	• Introduction to 5S and its importance. Study of methodology to implement 5S in industry **(4 hrs)**

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

Subject Code: CMEE1-213
INDUSTRIAL TRAINING – II (140 hrs)

The purpose of the industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first-hand experience to enable them to use and apply institute based knowledge and skills to perform industrial activities.
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one-year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks has been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

a)	Punctuality and regularity	20%
b)	Industrial training report	50%
c)	Presentation and viva-voce	30%

7. RESOURCE REQUIREMENTS

7.1 LIST OF TOOLS AND EQUIPMENT

TOOL KIT FOR TRAINEES

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1	Welding helmet fiber	16 nos.	800/Pcs
2	Welding hand shield fiber	16 nos.	450/pcs
3	Chipping hammer with metal handle 250 Grams	16 nos.	200/pcs
4	Chisel cold flat 19 mm x 150 mm	16 nos.	150/pcs
5	Centre punch 9 mm x 127 mm	8 nos.	100/pcs
6	Dividers 200 mm	8 nos.	280/pcs
7	Stainless steel rule 300mm	16 nos.	90/ps
8	Scriber 150 mm double point	8 nos.	40/pcs
9	Flat Tongs 350mm long	8 nos.	150/pcs
10	Hack saw frame fixed 300 mm	8 nos.	300/pcs
11	File half round bastard 300 mm	16 nos.	400/pcs
12	File flat 350 mm bastard	16 nos.	350/pcs
14	Tip Cleaner	8 nos.	150/pcs
15	Try square 6”	16 nos.	150/pcs
16.	Hammer ball peen 1 kg with handle	10 nos.	180/pcs
17	Neon tester	30 nos.	90/pcs

GENERAL MACHINES/EQUIPMENT

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1.	Spindle key	4	50/pcs
2.	Screw Driver 300mm blade and 250 mm blade	1 each	180/pcs
3.	Number punch 6 mm	2 set	400/pcs
4.	Letter punch 6 mm	2 set	750/pcs
5.	Magnifying glass 100 mm .dia	2 nos	300/pcs
6.	Universal Weld measuring gauge	2 nos	250/pcs
7.	Earth clamp 600A	6 nos	400/pcs
8.	Spanner D.E. 6 mm to 32mm	2 sets	600/set
9.	C-Clamps 10 cm and 15 cm	2 each	250/pcs
10.	Hammer sledge double faced 4 kg	1	450/pcs
11.	S.S tape 5 meters flexible in case	1	150/pcs
12.	Electrode holder 600 amps	6	250/pcs
13.	H.P. Welding torch with 5 nozzles	2 sets	6500/pcs
14.	Oxygen Gas Pressure regulator double stage	2	350/pcs
15.	Acetylene Gas Pressure regulator double stage	2	350/pcs
16.	CO2 Gas pressure regulator, with flow meter	2 set	500/pcs
17.	Argon Gas pressure regulator with flow meter	2 set	500/pcs
18.	Metal rack 182 cm x 152 cm x 45 cm	1	1500/pcs (Self made)
19.	First Aid box	1	1500/pcs
20.	Steel lockers with 8 Pigeon holes	4	6500/pcs
21.	Steel almirah / cupboard	3	8000/pcs
22.	Black board and easel with stand	1	1500/pcs
23.	Flash back arrester (torch mounted)	4 pairs	480/set
24.	Flash back arrester (cylinder mounted)	4 pairs	480/set

GENERAL INSTALLATION

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1	Welding Transformer with all accessories (400A, OCV 60–100 V, 60% duty cycle)	2 set	6500/nos
2	Portable arc welding transformer single phase 150 Amps	1 set	4000/nos
3	Welding Transformer (or) Inverter based welding machine with all accessories (300A , OCV 60 – 100 V, 60% duty cycle)	2 set	10500/pcs
4	D.C Arc welding rectifiers set with all accessories (400 A. OCV 60 – 100 V, 60% duty cycle)	1 set	60,000/nos
5	GMAW welding machine 400A capacity with air cooled torch, Regulator, Gas preheater, Gas hose and Standard accessories	2 set	147,000/nos
6	AC/DC GTAW welding machine with water cooled torch 300 A, Argon regulator, Gas hose, water circulating system and standard accessories.	2 set	120,000/nos
7	Air Plasma cutting equipment with all accessories, capacity to cut 12 mm clear cut	01 set	46,200/pcs
8	Air compressor suitable for above air plasma cutting system.	01 no	70,000/pcs
9	Auto Darkening Welding Helmet	2 nos.	14,000/pcs
10	Spot welding machine to 15 KVA with all accessories	01 set	18,000/pcs
11	Portable gas cutting machine capable of cutting Straight & Circular with all accessories	01 set	7000/pcs
12	Pedestal grinder fitted with coarse and medium grain size grinding wheels dia. 300 mm	1	15,000/pcs
13	Bench grinder fitted with fine grain size silicon carbide green grinding wheel dia. 150 mm	1	8000/pcs

14	AG 4 Grinder	2 nos.	3500/pcs
15	Universal testing machine (UTM)	1 set	25,000/pcs
16	Impact testing machine	1 set	9000/pcs
17	Hardness tester	1 set	12,000/pcs
18	Dye penetration set	1 set	1000/set
19	Magnetic testing machine (MPI)	1 set	8000/pcs
20	Ultra sonic testing machine	1 set	5500/pcs
21	Suitable gas welding table with fire bricks	2 Nos	1200/pcs
22	Suitable Arc welding table with positioner	5 Nos.	4500/pcs
23	Trolley for cylinder (H.P. Unit)	2 Nos.	3000/pcs
24	Hand shearing machine capacity to cut 6 mm sheets and flats	1 No.	6000/pcs
25	Power saw machine 14''	1 No.	7500/pcs
26	Portable drilling machine (Cap. 6 mm)	1 No.	6500/pcs
27	Oven, electrode drying 0 to 350°C, 10 kg capacity	1 No.	2500/pcs
28	Work bench 250x120x75 cm with 4 bench vices of 150 mm jaw opening	4 sets	20,000/set
29	Oxy Acetylene Gas cutting blow pipe	2 sets	3500/pcs
30	Oxygen, Acetylene Cylinders	2 each	As on Rental Basis
31	CO_2 cylinder	2 Nos	As on Rental Basis
32	Argon gas cylinder	2 Nos	As on Rental Basis
33	Anvil minimum size 32 sq. inches with stand	2 Nos.	4000/pcs
34	Swage block	1 No.	2500/pcs
35	Die penetrant testing kit	1 set	1000/pcs
36	Magnetic particle testing Kit	1 set	1500/pcs
37	Fire extinguishers (foam type and CO2 type)	1	2500/pcs
38	Fire buckets with stand	4 nos	800/pcs

39	Portable abrasive cut-off machine	1 No	10,000/pcs
40	Suitable Gas cutting table	1 No	2000/pcs (Self made)
41	Welding Simulators for SMAW/GTAW/GMAW	1 each	1 Lac/pcs
42	Butt Seam welding machine	1 no.	-
43	Helium gas cylinder	1 no.	On rental basis
44	Water Buckets	2 nos.	200/pcs
45	Swage kit for copper tube (additional)	1 no.	-
46	Plier Insulated 150 mm	2 nos.	250/pcs
47	Electrical wire dia 4 mm with extension board	50 meter	300/pcs

ENGINEERING DRAWING

Sr. No.	**Name of Item**	**Quantity**	**Price in ` (Approx)**
1	Drawing Board 100 x 60 cms	30	500/pcs
2	Set Square 90º, 30º, 60º	30 set	400/set
3	Stand for drawing board	30	450/pcs
4	Stool for trainees	30	350/pcs
5.	T-square/Mini drafter	30	250/pcs
6	White Board 240 x 120 cm.	01	600/pcs
7	Trainer's Table	01	500/pcs
8	Trainer's Chair	01	800/pcs
9	Drafting machine	02	500/pcs

CLASSROOM FURNITURE

Sr. No.	Names of Item	Quantity	Price in ` (Approx)
1	Instructor's table and Chair (Steel)	1 set	1000/set
2	Students chairs with writing pads	16	700/pcs
3	White board size 1200 mm X 900 mm	1	1500/pcs
4	Instructors lap top with latest(vista & above) configuration pre-loaded with operating system. and MS Office package.	1	30,000/pcs
5	LCD projector with screen.	1	20,000/pcs
6	Welding Process, Inspection & codes DVD/ CDs	1 set each (optional)	300/pcs

7.2 LIST OF CONSUMABLES

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1	Electrodes (different size)	As required	400/pkt
2	Filler wire	As required	300/kg
3	Flux	As required	250/box
4	Gas (O_2, Dissolved acetylene., Argon, CO_2)	As required	440/cyl
5	Leather Hand Gloves 14”	16 pairs	180/pcs
6	Cotton hand Gloves 8”	16 pairs	80/pcs
7	Leather Apron leather	16 nos.	200/pcs
8	S.S Wire brush 5 rows and 3 rows	16 nos. each	70/pcs
9	Leather hand sleeves 16”	16 pairs	80/pcs
10	Safety boots for welders	16 pairs	500/pcs
11	Leg guards leather	16 pairs	80/pcs
12	Rubber hose clips 1/2"	20 nos	1200
13	Rubber hose oxygen 8 mm dia X 10 Mts long as per BIS	2 nos	1200
14	Rubber hose acetylene 8 mm dia X 10 Mts long as per BIS	2 nos	1200
15	Arc welding cables multi cored copper 400/ 600 amp as per BIS	As required	150/ft
16	Arc welding single coloured glasses 108 mm x 82 mm x 3 mm.	34 nos.	90/pcs
17	Arc welding plain glass 108 mm x 82 mm x 3 mm.	68 nos	2/pcs
18	Gas welding Goggles with colour glass	34 nos	80/pcs
19	Safety goggles plain	34 nos	40/pcs
20	Spark lighter	6 nos	30/pcs
21	AG 4 Grinding wheels	As required	80/pcs

7.3 LIST OF RECOMMENDED BOOKS

1. Welder Fabrication, Trade Theory by National Instructional Media Institute, Chennai
2. Welder Fabrication, Trade Practical by National Instructional Media Institute, Chennai
3. Welder Trade Theory And Assignment / Test (Solved) by G.S. Sethi; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
4. Welding Technology by OP Khanna; Dhanpat Rai and Sons, Delhi
5. Welding Engineering and Technology by RS Parmar; Khanna Publishers, Delhi
6. Welding Technology by Srinivasan; Khanna Publishers, Delhi
7. Welder Trade Theory and Assignment / Test (Solved) by G.S. Sethi; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
8. Engineering Drawing for Welding by National Instructional Media Institute, Chennai
9. Engineering Drawing by Kapil Dev; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
10. Workshop Calculation and Science by Kapil Dev, G.V. Ramana Murthy; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
11. Fabrication (Fitting And Welding) Theory And Assignment / Test (Solved) by G.S. Sethi, Balbir Singh; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF EXPERTS/CONTRIBUTORS

a) Following experts participated in the workshop to design curriculum of certificate programme in 'Welder' for MRSPTU, Bathinda on 11-12 July, 2016 at NITTTR, Chandigarh.

1.	Prof. Pardeep Gupta, Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
2.	Dr. Kulwant Singh, Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
3.	Prof. J.S. Gill, Associate Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
4.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
5.	Shri G.S. Sethi, A-301, Rishi Apartments, Sector-70, Mohali, Punjab
6.	Shri NM Suri, Associate Professor, PEC University of Technology, Sector-14, Chandigarh
7.	Shri Ashish Pal, YMCA University of Science and Technology, Faridabad, Haryana
8.	Shri Mange Ram, Sr. Tech. Officer, ISTC (CSIO), Sector 30, Chandigarh
9.	Shri Atinder Pal Singh, Govt. Polytechnic College, Khunimajra
10.	Shri Harkesh Kumar, Govt. Polytechnic College, Khunimajra
11.	Shri Viney Kumar, Instructor Welder, Govt. Industrial Training Institute, Patiala, Punjab
12.	Shri Maninder Singh, Instructor Welder, Govt. Industrial Training Institute, Patiala, Punjab
13.	Shri Subhash Chand, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
14.	Shri Rakesh Verma, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
15.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh **Coordinator**

b) Further, a curriculum workshop to finalize the curriculum of certificate programme in 'Welder' was held on 28th July, 2016 at NITTTR, Chandigarh. The following experts participated in the workshop:

1. Shri HS Kalra, Ex-Principal, Govt. ITI, Sector-28, Chandigarh
2. Shri G.S. Sethi, A-301, Rishi Apartments, Sector-70, Mohali
3. Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh

c) Following experts participated in the workshop to review curriculum of certificate programme in "Welder" for MRSPTU, Bathinda held on 6 January, 2017 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU Campus, Bathinda, Punjab
2.	Dr. Balraj Singh, Director, PIT, Rajpura
3.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
4.	Shri GS Sethi, Consultant, IndiaCan, A-301, Rishi App, Sector 70, Mohali
5.	Shri Asheesh Kumar Saini, Centre Head, IL&FS, IIS, Ropar
6.	Shri Jasvir Singh Tiwana, Associate Professor, GZSCCET, Bathinda
7.	Shri Sikander Singh Sidhu, Assistant Professor, GZSCCET, Bathinda
8.	Shri J Ghosh Roy, Aryabhat Polytechnic, Delhi
9.	Shri Jagdeep Singh, Central Tool Room, A-5, Phase-5, Focal Point, Ludhiana
10.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh **Coordinator**