Government of Karnataka
Department of Collegiate and Technical Education
Board of Technical Examinations, Bangalore

Course Code	20ME21P	**Semester**	II
Course Title	**MECHANICAL WORKSHOP PRACTICE-I**	**Course Group**	Core
No. of Credits	4	**Type of Course**	Lecture& Practice
Course Category	PC	**Total Contact Hours**	6 Hrs Per Week
			78 Hrs Per Semester
Prerequisites	Drawing/Creativity	**Teaching Scheme**	(L: T:P)-1:0:2
CIE Marks	60	**SEE Marks**	40

1. COURSE SKILL SET

The aim of the course is to help the student to attain the following industry identified competency through various teaching learning experiences

Perform Repairing Work of Utility Jobs in the Mechanical Engineering Workshops

2. INSTRUCTIONAL STRATEGY

1. Instructor should expose to different tools used in respective shops, Operational safety and Procedure to be followed for prepare the model. Emphasis should be given on marking, operational sequence.
2. Focus should be on proper selection of tools and their proper use.

3. COURSE OUT COMES

On successful completion of the course, the students will be able to demonstrate industry-oriented Cos associated with the above-mentioned competency:

CO1	Select hand tools and Machinery in different shops according to job
CO2	Understand job drawing and complete jobs as per specifications in allotted time.
CO3	Inspect the job for the desired quality and dimensions and position
CO4	Operate, control different machines and equipment's adopting safety practices.

4. COURSE CONTENT

The following topics/subtopics is to be taught and assessed in order to develop Unit Skill sets for achieving CO to attain identified skill sets

SHOP	Unit skill set (In cognitive domain)	Topics/Subtopics	Hours L-T-P
UNIT-1 INTRODUCTION	Importance of trade Training. - General discipline in the Institute - Elementary First Aid. - Importance ofcarpentry /Fitter/Welding in Industry - Safety precautions to be followed in while doing wood working/fitting operations/ Shielded Metal Arc Welding, and Oxy- Acetylene Welding operations/,Oxy-acetylene cutting operations	1. Demonstration of Machinery used in the trade. 2. Identification to safety equipment and their use etc. 3. Hack sawing, filing square to dimensions. 4. Marking out on MS plate and punching.	01-00-02 (01 class of 3 Hr duration)
UNIT-2 BASIC ARTISAN SKILLS-CARPENTARY	1. Interpret given job drawing 2. Select the relevant carpentry tool for making the job 3. Describe the specified operations in the carpentry shop 4. Explain the maintenance procedure of the given tool/Equipment's in carpentry shop	1. Types of woods used in carpentry 2. Various Marking tools used in carpentry 3. Various Holding tools-used in carpentry 4. Various Planning tools-used in carpentry for planning practice 5. Various Cutting tools-saws-Cross cut saw ,Hand saw ,Rip saws,Tennon saw, Chisels-Firmer chisel, dove tail chisel, Mortise chisel in carpentry 6. Prepare two simple job(Male and female assembly type)as per given drawing with joint like mortise and tenon dovetail, bridle, half lap 7. Safe practices	06-00-12 (06 class of 3 Hr duration)

UNIT-3 BASIC ARTISAN SKILLS - FITTING	1. Interpret given job drawing 2. Select the relevant Fitting tool for making the job 3. Select the proper raw material for given condition 4. Describe the specified operations in the Fitting shop 5. Explain the maintenance procedure of the given tools/Equipments in fitting shop	1. Fitting tools-Bench vice-clamp 2. Various Marking & measuring tools-used in fitting practice 3. Various cutting tools used in fitting shop 4. Various finishing tools used in fitting practice 5. Fitting shop machine such as Drilling machine, power hack saw, grinding machine their specification, care and maintenance 6. Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc - safe practices 7. Prepare two simple job (Male and female assembly type) as per given drawing.	06-00-12 (06 class of 3 Hr duration)
UNIT-4 FABRICATION-ARC WELDING	1. Set the Arc welding machine and perform different type of joints on MS in different position observing standard procedure. 2. Arc welding equipment-Power sources for Arc Welding-Transformer 3. Various Arc welding tools 4. Technique of welding-Preparation of work, Striking of an arc, weaving, welding positions, weld joints *[different types of joints- Fillet (T- joint, lap &Corner), Butt (Square &V);different position - 1F, 2F,* 5. welding shop-Arc welding transformer specifications and maintenance 6. Safe practices	1. Describe the safety precautions to be taken for Arc welding activities. 2. Fix/hold the parts which need to be welded together as per Arc welding using a clamp and align them with the electrodes as per the job requirement so that the work pieces do not fall down/turn. 3. Fix the work pieces on the Arc Welding apparatus keeping in mind the electrode distance, contact area, 4. Monitor the Arc welding process by observing and communicating the readingson, various panels/ meters at the right	05-00-10 (06 class of 3 Hr duration)

		time to prevent any harm to the work pieces due to overheating, burning and over melting. 5. Remove extra material by using chippers, grinders etc. 6. Shape the Arc welded work pieces as per requirement by hammering the bulges.	
UNIT-5 FABRICATION-GAS WELDING	1. Introduction and definition of gas welding. Gas Welding terms and definitions Various Gas welding tools and equipments 2. Setting of oxy-acetylene welding equipment, lighting and setting of flame. 3. Various Welding Processes and its applications. 4. Technique of Gas welding-Preparation of work, welding positions, weld joints 5. Perform fusion run without filler rod on MS sheet 2mm thick in flat position. 6. Set the gas welding plant and join MS sheet in different position. *[Different position: - 1F, 2F, 3F, 1G, 2G,3G.]*	1. Describe the safety precautions to be taken for gas welding activities. 2. Fix/hold the parts which need to be welded together as per gas welding using a clamp and align them with the electrodes asper the job requirement so that the work piecesdo not fall down/turn. 3. Fix the work pieces on the Gas Welding apparatus keeping in mind the fame distance, contact area, 4. Monitor the Gas welding process by observing and communicating the readings on various panels/ meters at the right time to prevent any harm to the work pieces due to overheating, burning and over melting. 5. Remove extra material by using chippers, grinders etc. 6. Shape the Gas welded work pieces as per requirement by hammering the bulges	05-00-10 (05 class of 3 Hr duration)
UNIT-6 GAS CUTTING	1. Common gases used for welding & cutting, flame temperatures and uses. 2. Chemistry of oxy-acetylene flame.	1. Setting up of oxy-acetylene and make straight cuts (freehand) 2. Perform marking and straight line cutting of MS	03-00-06 (03 class of 3 Hr duration)

	3. Types of oxy-acetylene flames and uses. 4. Oxy-Acetylene Cutting Equipment principle, parameters and application.	plate 10 mm thick by gas. Accuracy within ±2mm. 3. Beveling of MS plates 10 mm thick, cutting regular geometrical shapes and irregular shapes, cutting chamfers by gas cutting. 4. Circular gas cutting on MS plate 10 mm thick by *profile cutting machine.* 5. Marking and perform radial cuts, cutting out holes using oxy-acetylene gas cutting. 6. Identify cutting defects viz., distortion, grooved, fluted or ragged cuts; poor draglines; rounded edges; tightly adhering slag	

Sl.No.	Practical Out Comes/Practical exercises	Unit No.	PO	CO	L:T:P Hrs.
1	1. Demonstration of Machinery /tools used in the trade. 2. Identification to safety equipment and their use etc 3. Identification of tools according to use. 4. Marking out on job and punching.	1	1,4	1-4	0:0:2
2	Identification of different wooden sample piece i.e. - soft wood & hard wood Demonstration of different wood working tools / machines. and ask students to write the wood working tools used in carpentry in work shop dairy (Do this exercise).	I	1,4	1-4	0:0:2
3	Demonstration of different wood working processes, like plaining, marking,(Do this exercise) by issuing two wooden pieces	I	1,4	1-4	0:0:2
4	Demonstration of different wood working processes, like, chiseling, grooving and ask the students to do these process on issued wooden pieces (Do this exercise by issuing two wood pieces to student).	I	1,4	1-4	0:0:2
5	Does the female piece of wooden joint like any one joint (mortise and tenon dovetail, bridle, half lap (Not all) of issued one wooden piece and make the only one Female joint	I	1,4	1-4	0:0:2
6	Does the male piece of wooden joint like any one joint (mortise and tenon dovetail, bridle, half lap (Not all) of issued another wooden piece and make the only one male joint	I	1,4	1-4	0:0:2
7	Prepare Carpentry job(male and female assembly type)as per given drawing ,check the correctness of fit of mating parts (For Job Drawing models you can refer model question bank)	I	1,4	1-4	0:0:2

8	Demonstration of different fitting tools and drilling machines and power tools used in Fitting shop and ask students to write the fitting tools used in fitting shop in work shop dairy (Do this exercise).	II	1,4	1-4	0:0:2
9	Demonstration of different fitting processes filing, ask the students to do these process on issued metal pieces (Do this exercise by issuing two metal pieces to student).	II	1,4	1-4	0:0:2
10	Demonstration of different fitting processes like, cutting, ask the students to do these process on issued metal pieces (Do this exercise by issuing two metal pieces to student).	II	1,4	1-4	0:0:2
11	Prepare Fitting job(Male assembly type)as per given drawing or job involving different fitting processes drilling, tapping, and cutting ,check the correctness of fit of mating parts JOB1(For models you can refer model question bank)	II	1,4	1-4	0:0:2
12	Prepare Fitting job(Female assembly type)as per given drawing or job involving different fitting processes drilling, tapping, and cutting ,check the correctness of fit of mating parts JOB1(For Job drawing models you can refer model question bank)	II	1,4	1-4	0:0:2
13	Prepare Fitting job(male and female assembly type)as per given drawing or job involving different fitting processes drilling, tapping, and cutting ,check the correctness of fit of mating parts (For models you can refer model question bank)	2	1,4	1-4	0:0:2
14	Straight line beads and Weaved bead on M. S plate 10mm thick in flat position.	2	1,4	1-4	0:0:2
15	Fillet "T" joint on M.S. Plate 10 mm thick in flat position and horizontal position.	2	1,4	1-4	0:0:2
16	Fillet lap joint on M.S. plate 10 mm thick in flat position and vertical position	2	1,4	1-4	0:0:2
17	Open Corner joint on MS plate 10 mm thick in flat position.	2	1,4	1-4	0:0:2
18	Single "V" Butt joint on MS plate 12 mm thick in flat position (1G) .	2	1,4	1-4	0:0:2
19	Straight line beads and multi layer practice on M.S. Plate 10 mm thick in Horizontal position.	2	1,4	1-4	0:0:2
20	Marking and straight line cutting of MS plate. 10 mm thick by gas. Square butt joint on M.S. sheet 2 mm thick in flat Position.	3	1,4	1-4	0:0:2
21	Fillet Lap joint on MS sheet 2 mm thick in flat position	3	1,4	1-4	0:0:2
22	Square Butt joint on M.S. sheet. 2 mm thick in Horizontal position	3	1,4	1-4	0:0:2
23	Structural pipe welding butt joint on MS pipe Ø 50 and 3mm WT in 1G position	3	1,4	1-4	0:0:2
24	Setting up of oxy-acetylene and make straight cuts (freehand) and Perform marking and straight line cutting of MS plate 10 mm thick by gas. Accuracy within±2mm.	4	1,4	1-4	0:0:2
25	Beveling of MS plates 10 mm thick, cutting regular geometrical shapes like rectangle, triangle, pentagon	4	1,4	1-4	0:0:2

26	Marking and perform radial cuts, cutting out holes using oxy-acetylene gas cutting	4	1,4	1-4	0:0:2
Total Hours					**0:0:52 =52**

MAPPING OF CO WITH PO

CO	**Course Outcome**	PO Mapped	Experiment Linked	Cognitive Level **R/U/A**	Tutorial & Practical Sessions in Hrs
CO1	Select hand tools and Machinery in different shops according to job	PO1,PO4	All CO	A	20
CO2	Understand job drawing and complete jobs as per specifications in allotted time.	PO1,PO4	All CO	A	35
CO3	Inspect the job for the desired dimensions and shape.	PO1,PO4	All CO	A	13
CO4	Operate, control different machines and equipment's adopting safety practices.	PO1,PO4	All CO	A	10
					78

Course	CO's	Programme Outcomes (PO's)						
		1	2	3	4	5	6	7
MECHANICALWORK SHOP-I	CO1	3	0	0	3	0	0	0
	CO2	3	0	0	3	0	0	0
	CO3	3	0	0	3	0	0	0
	CO4	3	0	0	3	0	0	0

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

7. SUGGESTED LEARNING RESOURCES:

1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi, 2015.
2. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014.
3. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014.

4. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York.

8. SUGGESTED LIST OF STUDENTS ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 10 marks (Anyone)

1. Each student should conduct different activity and no repeating should occur

1	Take the students for industrial visit for a nearby welding shop; observe the safety practices followed and welding operational activities. Make hand written report
2	Take the students for local industry works observe the Fitting practices followed in the industry.
3	Ask the students to observe the carpentry operations carried out in local vicinity

9.Course Assessment and Evaluation Chart

Sl.No	Assessment	Type	Time frame in semester	Duration	Max marks	Conversion (End weightage)
1	CIE Assessment 1	GRADED EXERCISES	Average of all models evaluated in all shops *(PORTFOLIO EVALUATION)*	At the end of each model completion - At the end of 13th week	20	20
2	CIE Assessment 2	Skill test-1-Carpentary	- At the end of 5th week	3 Hrs	100	Average of three after converting for 20 Marks 20
3	CIE Assessment 3	Skill test-2-Fitter and welding	- At the end of 9th week	3 Hrs	100	
4	CIE Assessment 4	Skill test-3-Welding	- At the end of 13th week	3 Hrs	100	
5	CIE Assessment 5	Student activity	- At the end of 12th week		20	20
	Total Continuous Internal Evaluation (CIE) Assessment					60
	Semester End Examination(SEE) Assessment will be conducted for 100 marks and finally converted for wieghtage of 40 Marks			3Hrs	100	40
	Total Marks					**100**

Note:

1. CIE Skill test is conducted for 100 marks (3 Hours duration) as per CIE scheme of evaluation. The obtained marks are scaled down to 20 marks.
2. SEE is conducted for 40 Marks for practical courses.
3. Each shop model in carpentry/fitting/Welding exclusively kept for skill tes-1,2,3 in CIE

4. In a batch of allotted students' model in carpentry, fitting and welding practice should be equally weighed, in CIE
5. Assessment of assignment and student activity is evaluated through appropriate rubrics by the respective course coordinator. The secured mark in each case is rounded off to the next higher digit.

10. SCHEME for Portfolio Evaluation of Graded Exercise

	Sl No	Parameter Observed	Marks Allotted	Grand Total
Basic Artisan skills-Carpentry	1	Marking	4	20
	2	Tools Used	4	
	3	Operation Performed	4	
	4	Dimensional Accuracy	4	
	5	Finishing	4	
	Total		20	
Basic Artisan skills - Fitting	**Sl No**	**Parameter Observed**	**Marks Allotted**	
	1	Marking	4	
	2	Tools Used	4	
	3	Operation Performed	4	
	4	Dimensional Accuracy	4	
	5	Finishing	4	
	Total		20	
Welding	**Sl No**	**Parameter Observed**	**Marks Allotted**	
	1	Equipment Preparation	4	
	2	Job Preparation	5	
	3	Operation Performed	6	
	4	Finishing	5	
	Total		20	

11. SCHEME for Skill Test Evaluation/SEE for CIE

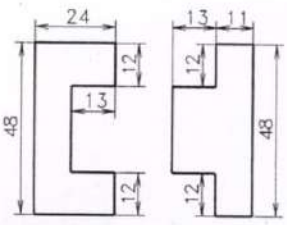
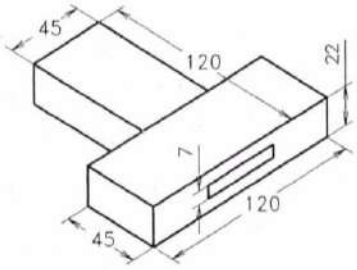
Sl.No	Particulars	Marks
1	Listing of tools & operations required for performing job	15
2	Marking of job	10
3	Operation performed	40
4	Dimensional accuracy of job	10
5	Finishing of job	20
6	Viva	5
Total		100

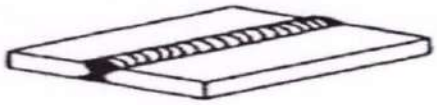
RUBRICS FOR ACTIVITY (10marks)						
Dimension	**Beginning**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	2	**4**	**6**	**8**	**10**	
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	6
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	8
Average / Total Marks: (8+6+8+8)/4						**7.5 = 8 marks**

Model Question Paper (suggestive only)
Semester End Examination

Course &Programme:Semester: I/II		
Subject	: Mechanical Workshop Practice-1	**Max Marks :** 100
Course Code	: 20ME21P	**Duration** : 3Hrs

Instruction to the Candidate: ALL DIMENSIONS ARE IN MM ONLY

Qn.No	Question	CL	CO	PO	Marks
1	Prepare model as per shown figure (Note:Either Male/female joint should be given) **Example** *Make a square joint of the dimensions given in Figure using the given MS flat. The time alloted is 3 hours.*  OR Make a mortise and tenon joint of size shown in Figure using the given wooden piece. Also prepare a dimensioned neat sketch of the joint.  	A	1-3	1,4	40

2	Prepare model as per shown figure  A. BUTT JOINT				60

Note: The model s for respective shops should be given cyclically within the Batch for SEE/Skill test

MODEL QUESTION BANK (SUGGESTIVE ONLY)

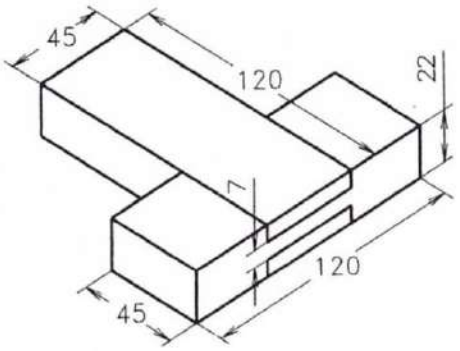
DEPARTMENT OF MECHANIACL ENGG.

COURSE TITTLE:**ENGINEERING WORK SHOP**

FOR CARPENTRY SHOP

1.

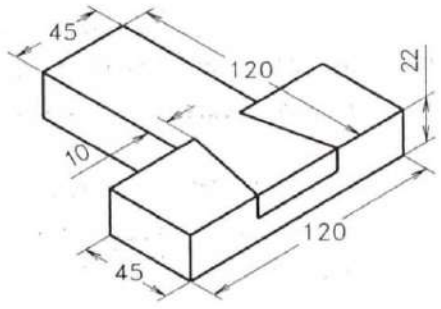
Figure shows drawing of a bridle joint. Copy the figure and make the joint using the given wooden piece.



2.

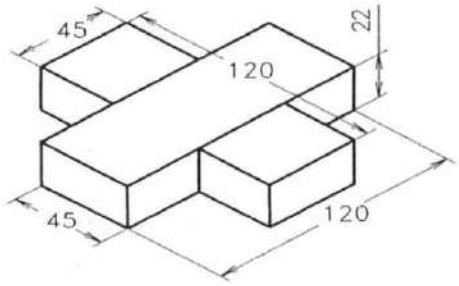
Make the following models, the allotted time is 3 hours:

Figure shows drawing of a dove-tail (halved) joint. Copy the figure and make the joint using the given wooden piece.



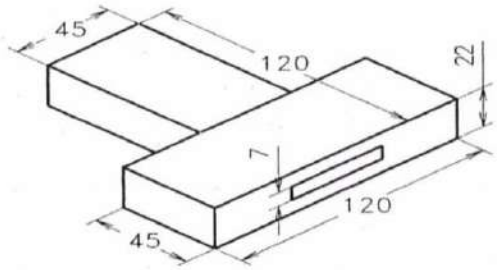
3.

Copy the sketch of the cross (halved) joint given in Figure ` and then make the joint using the given wooden piece.



4.

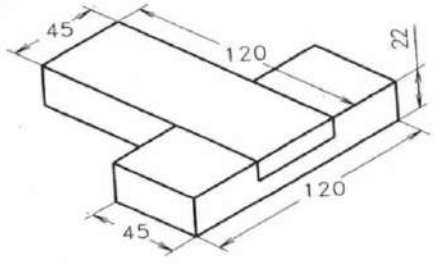
Make a mortise and tenon joint of size shown in Figure using the given wooden piece. Also prepare a dimensioned neat sketch of the joint.



5.

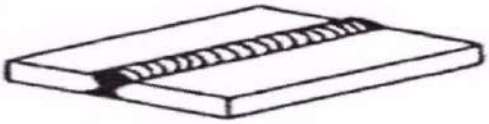
Example

Make a Tee (halved) joint of the dimensions given in Figure using the given wood piece. The time allotted is 3 hours.

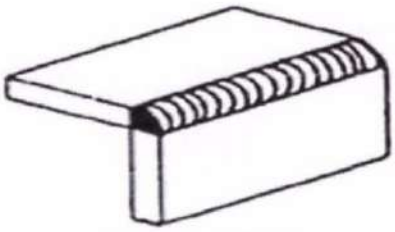


WELDING SHOP

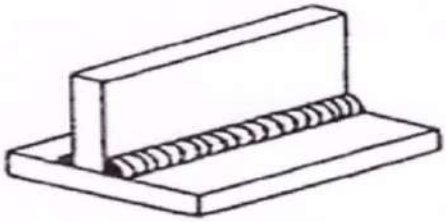
Copy the given sketch of the joint, then make the joint using the given MS flat piece.



A. BUTT JOINT



B. CORNER JOINT

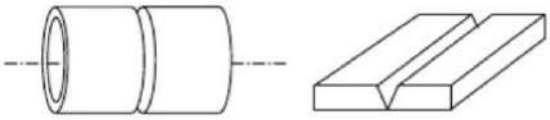
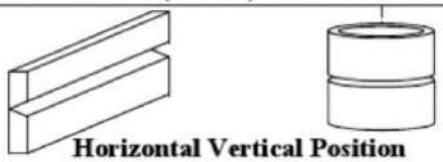
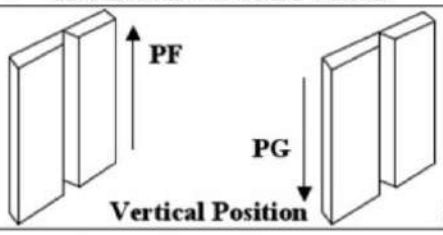
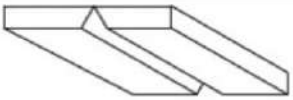
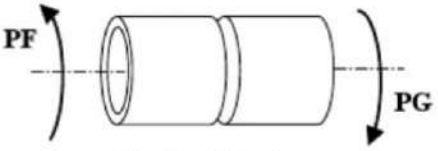
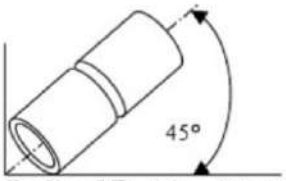


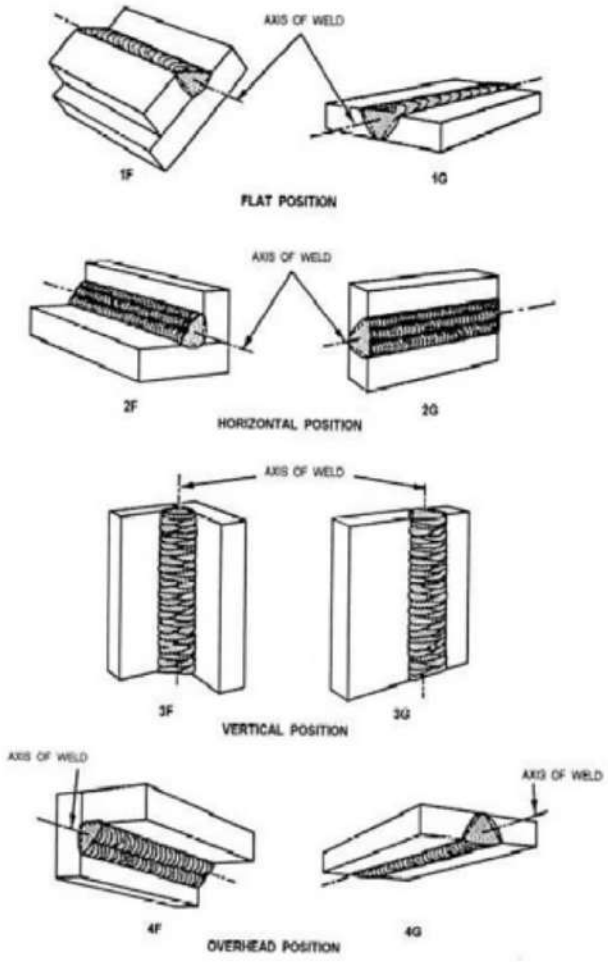
C. TEE JOINT

D. LAP JOINT

TWI
THE WELDING INSTITUTE

Welding Positions: (As extracted from BS 499: Part 1: 1991 Figure 38)

Graphical Representation for Butt Welds	UK (USA)	ISO/BS EN
 1G Flat Position (Rotated) Flat Position 1G	1G	PA
 2G Horizontal Vertical Position 2G	2G	PC
 3G Vertical Position 3G	3G	PF Vertical up PG Vertical down
 4G Overhead Position	4G	PE
(Pipe axis **fixed** horizontal)  5G Vertical Position	5G	PF Vertical up PG Vertical down
 6G Inclined Position (Fixed)	6G	H-LO45


AXIS OF WELD
1F
1G
FLAT POSITION
AXIS OF WELD
2F
2G
HORIZONTAL POSITION
AXIS OF WELD
3F
3G
VERTICAL POSITION
AXIS OF WELD
AXIS OF WELD
4F
4G
OVERHEAD POSITION

EQUIPMENT LIST

FOR CARPENTRY PRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Carpenter bench vice	20	20
02	G or C clamp 6″	20	20
03	Marking gauge	20	20
04	Try square 19mmx4″	20	20
05	Wooden mallet	20	20
06	Firmer chisel 2″	20	20
07	Firmer chisel 3/4″	20	20
08	Mortise chisel 1/2″	20	20
09	Metal jack plane 9″	20	20
10	Beveled square 6″	20	20
11	Hand saw or cross cut saw	20	20
12	Steel scale 12″	20	20

FOR FITTING PRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Flat file 14″ rough bastard file	20	20
02	Try square 6″	20	20
03	Triangular file 10″ rough	20	20
04	Half round file 10″ rough	20	20
05	Hack saw frame solid 12″	20	20
06	Center punch	20	20
07	Ball peen hammer 11/2 Lbs	20	20
08	Flat chisel 6″	20	20
09	Smooth file 10″ flat	20	20
10	Bench vice 8″	20	20
11	Leg vice 6″	20	10
12	Power hack saw	20	01
13	Bench grinding	20	01
14	Bench drilling machine up to 12mm cap	20	01
15	Drill bit up to 12mm straight shunk	20	04
16	Tap set and die set up to 1″	20	01
17	Vernier caliper	20	10
18	Spring divider	20	20
19	Steel scale	20	20
20	Vernier height gauge	20	01
21	Surface plate 2x3 feet	20	02
22	Number punch	20	01
23	Anvil	20	20
24	V block	20	02

FOR WELDING PRACTICE

SL.NO	NAME OF THE EQUIPMENT	NO. OF STUDENTS/BATCH	NO.OF EQUIPMENT REQUIRED
01	Arc welding transformer upto 300Amps	20	03
02	Welding shield	20	20
03	Ball peen Hammer 11/2 Lbs	20	10
04	Chipping Hammer	20	10
05	Wire brush	20	10
06	Anvil	20	01
07	Hand Gloves	20	05
08	Flat tongs	20	10
09	Steel scale	20	10
10	Flat file 14″ rough bastard file	20	10
11	Oxygen cylinder	20	01
12	Acetylene cylinder	20	01
13	Gas welding torch	20	05
14	Spark lighter	20	05
15	Gas welding goggles	20	10
16	Gas cutting torch	20	02
17	Try square 6″	20	10