

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Engineering Workshop Practice
(Code: 3301901)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering	First Semester
Ceramic Engineering, Fabrication Technology, Mining Engineering, Printing Technology, Textile Manufacturing Technology, Textile Processing Technology	Second Semester

1. RATIONALE

Workshop practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technician working in the various engineering industries and workshops. This course intends to impart basic know-how of various hand tools and their use in different sections of manufacturing. Irrespective of branch, the use of workshop practices in day to day industrial as well domestic life helps to dissolve the problems.

The workshop experiences would help to build the understanding of the complexity of the industrial job, along with time and skills requirements of the job. Workshop curricula build the hands on experiences which would help to learn manufacturing processes and production technology courses in successive semesters. Workshop practice is also important since only practice can make the man perfect.

The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each shop.

2. LIST OF COMPETENCIES

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies.

- i. **Prepare simple jobs in fitting, carpentry, pipefitting and metal joining shop while following safe working and good housekeeping practices.**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
0	0	4	4	0	0	40	60	100

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit;
ESE - End Semester Examination; PA - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Topics and Sub-topics
UNIT – 1 INTRODUCTION TO WORKSHOP	1.1 Sketch general workshop layout. 1.2 Follow preliminary safety rules in workshop.	1.1 Workshop layout. 1.2 Importance of various sections/shops of workshop. 1.3 Types of jobs done in each shop. 1.4 General safety rules and work procedure in workshop.
UNIT – 2 FITTING	2.1 Select appropriate fitting tools for the required application. 2.2 Prepare the simple jobs as per specification using fitting tools.	2.1 Sketch, specification and applications of fitting work holding tools-bench vise, V-block with clamp and C-clamp. 2.2 Sketch, specification, material, applications and methods of using fitting marking and measuring tools-marking table, surface plate, angle plate, universal scribing block, try-square, scriber, divider, centre punch, letter punch, calipers, vernier caliper, etc. 2.3 Types, sketch, specification, material, applications and methods of using of fitting cutting tools-hacksaw, chisels, twist drill, taps, files, dies. 2.4 Types, sketch, specification, material, applications and methods of using of fitting finishing tools-files, reamers. 2.5 Sketch, specification and applications of miscellaneous tools-hammer, spanners, screw drivers sliding screw wrench. 2.6 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping. 2.7 Preparation of simple and male- female joints. 2.8 Safety precautions. <i>Note: See List of Major Equipments/ Instruments at serial no. 8B.</i>
UNIT – 3 TIN SMITHY	3.1 Select appropriate tin smithy tool for the required application. 3.2 Prepare the simple job as per specification using tin smithy tools.	3.1 Concept and conversions of SWG and other gauges in use.. 3.2 Use of wire gauge. 3.3 Types of sheet metal joints and applications. 3.4 Types, sketch, specification, material, applications and methods of using tin smithy tools-hammers, stakes, scissors/snips, etc. 3.5 Demonstration of various tin smithy tools and sheet metal operations such as shearing, bending and joining. 3.6 Preparation of tin smithy job. 3.7 Safety precautions. <i>Note: See List of Major Equipments/ Instruments at serial no. 8B.</i>

<p>UNIT – 4 CARPENTRY</p>	<p>4.1 Select appropriate carpentry tool for the required application. 4.2 Prepare the simple job as per specification using carpentry tools.</p>	<p>4.1 Types, sketch, specification, material, applications and methods of using of carpentry tools-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule, etc. 4.2 Types of woods and their applications. 4.3 Types of carpentry hardwares and their uses. 4.4 Demonstration of carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining, etc. 4.5 Preparation of wooden joints. 4.6 Safety precautions.</p> <p><i>Note: See List of Major Equipments/ Instruments at serial no. 8B.</i></p>
<p>UNIT – 5 PIPE FITTING</p>	<p>5.1 Select appropriate pipe fitting tool for the required application. 5.2 Prepare the simple job as per specification using pipe fitting tools.</p>	<p>5.1 Types, specification, material and applications of pipes. 5.2 Types, specification, material and applications of pipe fittings. 5.3 Types, specifications, material, applications and demonstration of pipe fitting tools. 5.4 Demonstration of pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling, etc. 5.5 Types and application of various spanners such as flat, fix, ring, box, adjustable, etc. 5.6 Preparation of pipe fitting jobs. 5.7 Safety precautions.</p> <p><i>Note: See List of Major Equipments/ Instruments at serial no. 8B.</i></p>
<p>UNIT – 6 METAL JOINING</p>	<p>6.1 Select appropriate equipment and consumables for required application. 6.2 Prepare the simple jobs as per specification using proper metal joining and cutting method.</p>	<p>6.1 Types, specification, material and applications of arc welding transformers. 6.2 Types, specification, material and applications of arc welding accessories and consumables. 6.3 Demonstration of metal joining operations- arc welding, soldering and brazing. Show effect of current and speed. Also demonstrate various welding positions. 6.4 Demonstrate gas cutting operation. 6.5 Preparation of metal joints. 6.6 Safety precautions.</p> <p><i>Note: See List of Major Equipments/ Instruments at serial no. 8B.</i></p>

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

S. No.	Unit No.	Practical Exercises	HOURS
1	I	Prepare carpentry and fitting shop layout.	02
2	II	Demonstrate use of different fitting tools –like work holding, marking, measuring, cutting, finishing and miscellaneous. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.	04
3	II	Prepare one simple and another male-female type fitting jobs as per given drawings- 2 jobs.	10
4	III	Demonstrate use of different tin smithy tools. Student will also prepare the report with sketch, specifications and applications of tin smithy tools demonstrated.	02
5	III	Prepare one tin smithy job as per drawing having shearing, bending, joining and riveting.	04
6	IV	Demonstrate use of different carpentry tools. Student will also prepare the report with sketch, specifications and applications of carpentry tools demonstrated.	04
7	IV	Prepare two wooden joints as per given drawings.	08
8	V	Demonstrate use of different pipe fitting tools. Student will also prepare the report with sketch, specifications and applications of pipe fitting tools demonstrated.	02
9	V	Prepare pipe fitting jobs as per drawings-two jobs.	04
10	VI	Demonstrate use of different welding transformers and consumables. Also demonstrate arc welding, gas cutting, soldering and brazing operations. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.	04
11	VI	Prepare jobs using arc welding, gas cutting, spot welding, brazing and soldering process- three jobs.	08
12	I to VI	PROBLEM BASED LEARNING: Group of 6 students will take rejected workpieces in workshop practice (at least two in each fitting, carpentry, tin smithy, pipe fitting and welding). Group will draw the workpieces, will identify type of defects and will discuss the reasons of such defects. Outcome of discussion has to be written in logbook and report.	02
13	I to VI	SCHOOL WITHIN SCHOOL: i: Each student will demonstrate and explain at least one tool (to be assigned by teacher) to all batch colleagues. ii: Each student will share his/her student activities outcome. He/she will also share the experience for the student activities he/she has carried out.	02

NOTES:

- a: It is compulsory to follow safety norms of workshop.
- b: Workshop log-book is compulsory. Record of activities performed by student in each period is also compulsory and must be duly certified by concerned instructor and teacher in routine log book.
- c: Keep your all tools duly resharpened/ready.

- d: It is compulsory to submit reports, student activities and workshop logbook. Students activities are compulsory to perform.
- e: For 40 marks Practical marks ESE, students are to be examined for competencies achieved. Students are to be asked to prepare job/s.

7. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of student activities.

S. No.	STUDENT ACTIVITY
1	Prepare student reports as asked in experiments.
2	Visit the nearer timber merchant. Collect the information on types and appearance of wood being sold by them.
3	Visit the nearer plywood merchant. Collect the information on type and thickness being sold by them.
4	Visit nearer fabricator. Collect the information on welding electrodes, transformers and accessories being used by them.
5	Down load movies showing correct practices for fitting, carpentry and welding.
6	List at least two questions for each of following. Material of centre punch. Use of rough file. Metal joining by welding and adhesives. Shearing machine. Wooden joints.

8. SUGGESTED LEARNING RESOURCES

A. List of Books:

Sr.No.	Title of Books	Author	Publication
1	Mechanical workshop practice.	K.C. John	PHI.
2	Workshop familiarization.	E.Wilkinson	Pitman engineering craft series.
3	Workshop Technology-I.	Hazra and Chaudhary	Media promoters & Publisher private limited.
4	Workshop Technology-I.	W.A. J. Chapman	Taylor & Francis.
5	Comprehensive Workshop Technology (Manufacturing Processes).	S.K. Garg	Laxmi publications.
6	I.T.B. Handbook.	-	Engineering industry Training Board.
7	Workshop practice manual.	K.Venkata Reddy	B.S.Publications.

B. List of Major Equipments/ Instruments

FITTING:

- (i): Bench vices 50/100/150 mm.
- (ii): Hand vice, Machine vice
- (iii): Marking table.
- (iv): Surface plate.
- (v): Angle plate.
- (vi): Universal scribing block.
- (vii): Scriber.
- (viii): Marking gauge.
- (ix): Fitting tables.

- (x): Tri square.
- (xi): Right angle.
- (xii): Combination set.
- (xiii): V block with clamps.
- (xiv): C clamps.
- (xv): Set of needle files.
- (xvi): Ball pane Hammer - 750 Gms.
- (xvii): Pair of outside spring caliper- 250 mm.
- (xviii): Pair of Inside spring caliper 150 mm.
- (xix): Vernier caliper.
- (xx): Micrometer outside & inside
- (xxi): Bevel protractor
- (xxii): Odd leg caliper
- (xxiii): Files (smooth & rough)-round, flat, safe edge, square, knife edge, triangular, half round.
- (xxiv): One pair of divider.
- (xxv): Hacksaw frame with blade 12" * 300 mm.
- (xxvi): Centre punch.
- (xxvii): Dot punch.
- (xxviii): Prick punch.
- (xxix): Letter punch-Number punch.
- (xxx): Flat chisel 20 mm.
- (xxxi): Set of sorted twist drills, taps and dies (with holders/wrench).
- (xxxii): Set of spanners-Fix, Ring, box, Allen and adjustable.
- (xxxiii): Set of screw drivers-sorted.
- (xxxiv): Scraping tool.
- (xxxv): Set of pliers.
- (xxxvi): Filler and radius gauge

TIN SMITHY:

- (i): Tin cutter.
- (ii): Shearing machine
- (iii): Set of sorted hammers and pallets.
- (iv): Set of stakes.
- (v): Set of sorted scissors/snips.
- (vi): Tin smithy tables.
- (vii): Tin smithy vices.
- (viii): Marking table.
- (ix): Surface plate.
- (x): Angle plate.
- (xi): Marking gauge.
- (xii): Tri square.
- (xiii): Right angle.
- (xiv): Tong
- (xv): Square block
- (xvi): Set of chisels.
- (xvii): Scriber.
- (xviii): Punches-sorted including drift.
- (xix): Rivets-sorted.
- (xx): Sheet bending machine.
- (xxi): Trammels.
- (xxii): Wire gauge.
- (xxiii): Hand groover
- (xxiv): Anvil and swage block
- (xxv): Hollow mandrel
- (xxvi): Flatters and cone
- (xxvii): Set of Gouges
- (xxviii): Teflon sheet
- (xxix): Hollow punch set
- (xxx): Snip cutter round and flat

CARPENTRY:

- (i): Carpentry tables.
- (ii): Carpentry vices.
- (iii): Bar cramp.
- (iv): Plane machine-small ("Randha machine").
- (v): Wood and metal Jack planes- 45 mm.
- (vi): Set of sorted wooden jack planes.
- (vii): Smoothing plane.
- (viii): Rebate plane.
- (ix): Cross cut saw.
- (x): Compass saw.
- (xi): Set of sorted saws.
- (xii): Round hole saw
- (xiii): Tenon saw 350 mm.
- (xiv): Set of chisels-Firmer, Dovetail, Paring, Mortise.
- (xv): Adze tool
- (xvi): Auger bit.
- (xvii): Hand drill with set of sorted drill bits.
- (xviii): Gimlet.
- (xix): Small precision brace.
- (xx): Mallet.
- (xxi): Wood rasp file.
- (xxii): Claw hammer.
- (xxiii): Pincer.
- (xxiv): Marking gage 150 mm.
- (xxv): Steel rule 24"
- (xxvi): Measuring Tape 300mm
- (xxvii): C clamps.
- (xxviii): Tri square.
- (xxix): Right angle.
- (xxx): Compass and divider.
- (xxxii): Set of chisels.
- (xxxii): Ball pane Hammer - 750 Gms.
- (xxxiii): Hardwares- nails, screws,etc.
- (xxxiv): Set of screw drivers.
- (xxxv): Wood work punches
- (xxxvi): Set of Gouges

PIPE FITTING:

- (i): Various samples of pipe fittings-like joints, elbows, tees, unions, bend, nipples, couplers, reducers, four way etc. of Metal and PVC.
- (ii): Water taps,plug, farule
- (iii): Pipe bending machine manual/hydraulic
- (iv): Pipe vice
- (v): Pipe wrenches.
- (vi): Pipe spanners.
- (vii): Set of spanners-Fix, Ring, box, Allen and adjustable.
- (viii): Set of screw drivers-sorted.
- (ix): Set of chisels.
- (x): Hammers.
- (xi): Teflon taps, cotton thread
- (xii): Set of dies and holders.
- (xiii): Hacksaw, pipe cutter.
- (xiv): Adhesive for PVC pipe fittings.

METAL JOINING:

- (i): Arc welding transformers.
- (ii): Spot welding machine with necessary accessories, tools and consumables.
- (iii): Welding cables.
- (iv): Electrodes.
- (v): Electrode holders.
- (vi): Ground clamps.
- (vii): Chipping hammer.
- (viii): Wire brush.
- (ix): Oxygen-acetylene cylinders with pressure regulators-torch-hoses, trolley and accessories.
- (x): Filler rods.
- (xi): Solder filler material.
- (xii): Flux for soldering.
- (xiii): Soldering iron.
- (xiv): Brazing/welding torch.
- (xv): Try Square
- (xvi): Hammers, tongs, chisels and anvil
- (xvii): Screw Wrench
- (xviii): Tip Cleaner
- (xix): Swage block.
- (xx): Personal Protective Equipment like safety gloves, face shield /screen

C. List of Software/Learning Websites:

- <http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf>
- <http://www.weldingtechnology.org>
- <http://www.newagepublishers.com/samplechapter/001469.pdf>
- <http://www.youtube.com/watch?v=TeBX6cKKHWY>
- <http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related>
- <http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu>
- <http://www.piehtoolco.com>
- <http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/>

9 COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof .K. S. Patel**, Lecturer, in Mechanical Engineering, Government Polytechnic, Himatnagar.
- **Prof. R. M. Rajaguru**, Lecturer in Mechanical Engineering, Government Polytechnic, Rajkot.

Coordinator and Faculty Member From NITTTR Bhopal

- **Dr. A.K. Sarathe**, Associate Professor, Dept. of Mechanical Engg., NITTTR, Bhopal.