



# Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

## Diploma in Engineering (common to all branch) Semester-I

A) Course Code : 2000A01AL037

B) Course Title : Engineering Workshop Lab

C) **Rationale:** Mechanical Workshop practice is an essential requirement to understand the working and execution of jobs in industrial environment. This course intends to impart basic know-how of various tools, methods and their use at different stages of manufacturing. This course will develop skills in handling tools, instruments, equipments used in the workshop and perform operations in various shops and enhance relevant technical skills required to work in an industry along with the understanding of the complexity of the industrial job.

### D) Course Outcomes:

CO-1 Use measuring devices and hand tools effectively.

CO-2 Perform wood working and pattern making operations economically and safely.

CO-3 Perform various joining operations using welding, brazing and soldering methods.

CO-4 Perform different types of fitting, plumbing and sheet metal operations.

CO-5 Prepare simple jobs using lathe and drilling machine.

CO-6 Perform different types of smithy operations

CO-7 Prepare a green sand mould and cast a product.

### E) Scheme of Studies:

S.N.	Board of study	Course code	Course Title	Scheme of Studies (Hours/Week)			
				L	P	T	Total Credits (C)
1.	Mechanical Engineering	2000A01AL037	Engineering Workshop	-	4	-	2

L: Classroom Instruction (Includes different instructional strategies i.e. Lecture and others), P: Laboratory Instruction (Includes Practical performances in laboratory workshop, field or other locations using different instructional strategies), T- Tutorial includes Sessional Work (SW) (assignment, seminar, mini project etc.) and Self Learning (SL), C: Credits

### F) Scheme of Assessment:

S.N.	Board of study	Course code	Course Title	Scheme of Assessment (LAB)			
				ESE	CT	TA	Total Marks
1.	Mechanical Engineering	2000A01AL037	Engineering Workshop	40	-	20	60

**G) Course-Curriculum Detailing:** This course curriculum detailing depicts learning outcomes at course level and session level and their attainment by the students through Classroom Instruction (L), Laboratory Instruction (P), T-Tutorial Includes Sessional Work (SW) and Self-Learning (SL). Students are expected to demonstrate the attainment of Session Outcomes (SOs) and finally Course Outcomes (COs) upon the completion of course.

**CO- 1 Use measuring devices and hand tools effectively.**

(Approx. Hrs: L+P+T = 10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self-Learning (SL)
SO1.1 Identify various measuring tools and instrument. SO1.2 Describe measuring units and its conversion. SO1.3 Select suitable measuring devices in a given situation. SO1.4 Identify workshop hand tools. SO1.5 Describe Safety procedure in different workshops.	LE1.1 Identify different type of measuring tools available in workshop. LE1.2 Use suitable Marking and hand tools in a given situation. . LE1.3 Perform mock drill session in group of minimum 15 students for extinguishing fire.	<b>Unit- 1.0 Measurement, Types of Hand tools and workshop safety.</b> 1.1 Engineering Measurement: definition, importance and Types of measurements. 1.2 Measuring instruments: linear measurement and angular measurement instruments. 1.3 Measuring devices: Linear measurement and angular measurement devices. 1.4 Workshop hand tools: List the various hand tools used in workshops. 1.5 Workshop Safety –Hazards, Safety Practices, Causes of accidents, General safety rules, Safety signs and symbols. Firefighting equipment, fire extinguishers, and their types and First Aid	· Collect the information related to various hand tools listed.

SW-1 Suggested Sessional Work (SW):

**Assignments:** Select any engineering object / part / drawing and perform the measurement using suitable measuring device.

**Mini Project:** Visit nearby mechanical workshop and collect information about operation performed and prepare the list of tools and equipment along with specification.

**CO-2 Perform wood working and pattern making operations economically and safely.**

(Approx. Hrs: L+P+T = 10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self-Learning (SL)
<p>SO2.1 Identify various wood working tools with major specifications.                      SO2.2 Select wood working tools as per given job.                      SO2.3 Demonstrate various wood working operations.                      SO2.4 Explain procedure to prepare given type of joint.                      SO2.5 Explain procedure to prepare given type of pattern.</p>	<p>LE2.1 Prepare one simple job of wood working comprising of marking, cutting, planing and finishing as per given drawing/sketch.                      LE2.2 Prepare any two wooden joints safely as per given drawing.                      LE2.3 Prepare a job using Wood Turning Lathe machine.                      LE2.4 Prepare any two types of patterns as per drawing.</p>	<p><b>Unit- 2.0 Wood Working and Pattern making</b>                      2.1 Types of woods and artificial woods and their applications.                      2.2 wood working tools –bench vice, hammers, chisel, files, hacksaw, wood saw, surface planer, punch, v block, try square , steel rule , twist drill, marking block, reamers, tap set, mallet and their Specification.                      2.3 Wood working operations – Marking ,Cutting , reaming , filing, drilling, joining,                      2.4 Types of wood working joint – Butt joint , lap joint, Bridle joint , Dowel joint, Mitre joint , finger joint , dovetail joint , Dado joint, Groove joint, Cross lap, splice joint.                      2.5 Wood Turning Lathe Machine, various types of curving chisels used in wood turning lathe.                      2.6 Pattern: single piece, split pattern, loose piece etc.</p>	<p>Collect the information on various types and appearance of wood being used in packaging of industrial products using internet facility.</p>

**SW-2 Suggested Sessional Work (SW):**

**Assignments:** Select (Minimum 3 finished jobs) different wood working / carpentry jobs and prepare list of different types of woods and joints used in selected objects.

**Mini Project:** Make a wooden job as per given drawing and specifications of material

**CO-3 Perform various joining operations using welding, brazing and soldering methods.**

(Approx. Hrs: L+P+T =10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self-Learning (SL)
<p>SO3.1 Identify different types of welding machine, tools and personal protective equipments.</p> <p>SO3.2 Select suitable welding method as per job requirement.</p> <p>SO3.3 Explain arc welding and gas welding procedure.</p> <p>SO3.4 Explain soldering and Brazing process.</p>	<p>LE3.1 Operate gas welding apparatus to generate different types of flames.</p> <p>LE3.2 Prepare lap joint using gas welding as per given drawing safely.</p> <p>LE3.3 Prepare butt joint using arc welding as per given drawing safely.</p> <p>LE3.4 Join the given aluminum sheet by using brazing</p>	<p><b>Unit- 3.0 Joining Methods</b></p> <p>3.1 Joining methods- Various types of Joining Methods and their field of applications and types of welding joint.</p> <p>3.2 Arc welding: Arc welding process, equipment with necessary accessories, Welding electrode, tools and consumables</p> <p>3.3 Personal protective equipment like safety glasses, welding gloves etc and safe practices in welding shop.</p> <p>3.4 Gas welding: Gas welding process, Equipment with necessary accessories, Types like Carburizing, oxidizing and neutral flame.</p> <p>3.5 Soldering and brazing: specification, filler material, flux, heating methods, temperature range, advantages, and comparison.</p>	<p>Collect the information on various types of welding electrodes and their industrial applications.</p>

SW-3 Suggested Sessional Work (SW):

**Assignments:** Select any two joining method and write their engineering field of application.

**Mini Project:** Prepare any utility job like lab stool structure by using suitable welding process with list of tools and equipment along with specifications.

**CO-4 Perform different type of fitting, plumbing and sheet metal operation.**

(Approx. Hrs: L+P+T =10 )

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self-Learning (SL)
<p>SO4.1 Identify various tools used in fitting, plumbing and sheet metal shop.</p> <p>SO4.2 Select relevant tools as per given job in fitting, plumbing and sheet metal shop.</p> <p>SO4.3 Perform various fitting operations.</p> <p>SO4.4 Perform various sheet metal operations.</p> <p>SO4.5 Perform various plumbing operations.</p>	<p>LE4.1 Prepare one simple Job of fitting shop as per given drawing and instruction.</p> <p>LE4.2 Prepare one male – female type Fitting Job as per given Drawing.</p> <p>LE4.3 Prepare one sheet metal job using cutting, bending, edging and joining operations as per given drawing.</p> <p>LE4.4 Prepare an elbow joint and T joint in plumbing shop as per drawing.</p>	<p><b>Unit- 4.0 Fitting, Plumbing and Sheet metal Shop.</b></p> <p>4.1 Fitting tools – Hand tools used in fitting shop, holding tools, Marking and measuring tools, cutting tools.</p> <p>4.2 Fitting Operation –Sawing, Chipping, Filling, Taping, Reaming and Drilling.</p> <p>4.3 Sheet metal tools-Types of sheet metal tools.</p> <p>4.4 Sheet metal operation- Shearing, Bending, Drawing, Hemming Squeezing, Snipping, riveting, Grooving.</p> <p>4.5 Plumbing- types of pipe, types of pipe joint, plumbing hand tools, pipe vice, pipe bending tools, pipe wrenches, dies.</p> <p>4.6 Pipe fitting- bends, elbows, tees, cross, coupler, socket, reducer, cap, plug, nipple.</p>	<p>Using internet facility and collect the information related to field applications of sheet metal.</p>

SW-4 Suggested Sessional Work (SW):

**Assignments:** Collect the information from nearby sheet metal shop regarding manufacturing of cooler, trunk etc.

**Mini Project:** Prepare file stand by using by suitable material and sheet metal operation.

**CO-5 Prepare jobs using lathe and drilling machine.**

(Approx. Hrs: L+P+T = 10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self-Learning (SL)
<p>SO5.1 Explain various components of lathe machine.</p> <p>SO5.2 Describe job and tool holding devices.</p> <p>SO5.3 Calculate speed, feed, depth of cut of lathe machine.</p> <p>SO5.4 Perform simple lathe operations.</p> <p>SO5.5 Perform Drilling, reaming and boring operation.</p>	<p>LE5.1 Prepare one simple turning job as per given drawing.</p> <p>LE5.2 Perform step turning, threading operation to prepare job as per given drawing.</p> <p>LE5.3 Perform drilling, reaming and boring operation on pillar drill machine as per drawing.</p>	<p><b>Unit- 5.0 Lathe Machine and Drilling machine</b></p> <p>5.1 Concept, Working principle, constructional details and major components of lathe machine with their functions.</p> <p>5.2 Job and tool holding devices and lathe attachment – head stock, tail stock, tool post, Lathe tools, chucks( 3 and 4 Jaw), name and advantages of lathe attachment.</p> <p>5.3 Lathe operations – Plain turning, Facing, taper turning, Knurling, stepturning Threading etc.</p> <p>5.4 Drilling machine- classification, specification, constructional features.</p> <p>5.5 Drilling machine operations- Drilling, reaming, boring, counter sinking, counter boring.</p>	<p>Collect data on various applications of lathe machine for engineering applications.</p>

SW-5 Suggested Sessional Work (SW):

**Assignments:** . Visit the institute workshop and prepare a report comprises of names of different machine tools / tools their specifications and manufacturer’s name.

**Mini Project:** Visit the nearby workshop /machine shop and prepare the field report comprises of the following

- a. Product(s) name
- b. List of machine tools with associated accessories,
- c. List of lathe tools with relevant accessories
- d. List major clients.

**CO-6 Perform different types of smithy operations.**

(Approx. Hrs: L+P+T = 10)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self-Learning (SL)
SO6.1 Identify various holding, striking, cutting, forming tools used in smithy shop. SO6.2 Perform various forming operations as per drawing.	LE6.1 Perform Upsetting, drawing out, fullering, Bending operation. LE6.2 Perform forge welding operation.	<b>Unit 6 Smithy shop</b> 6.1 Safety measures, Heating and fuel handling tools: black smith forges blower, shovel, and poker. 6.2 Holding and supporting tools: tongs, anvil, swage block. 6.3 Striking tools: Ball peen, cross peen, straight peen, sledge hammer. 6.4 Cutting tools: Hot and cold chisel, shear set. 6.5 Punching, Bending and forming tools. 6.6 Forging operations: upsetting, drawing out, fullering, swaging, bending, punching, bending, forge welding.	Collect the information about power press used in forging.

SW-6 Suggested Sessional Work (SW):

**Assignments:** Identify various house hold tools and articles made from smithy operations.

**Mini Project:** Prepare a fan hook from given mild steel piece.

**CO-7 Prepare a green sand mould and cast a product.**

(Approx. Hrs: L+P+T = 08)

Session Outcomes (SOs)	Laboratory Instruction (P)	Class room Instruction (L)	Self-Learning (SL)
SO7.1 Identify various tools used in foundry shop. SO7.2 Explain the properties of moulding sand. SO7.3 Explain the purpose of core, riser and gate. SO7.4 Identify Casting defects and explain their causes.	LE7.1 Prepare green sand for making a mould. LE7.2 Prepare a green sand mould using single piece pattern. LE7.3 Prepare a green sand mould using split pattern. LE7.4 Prepare a non ferrous casting product using previously prepared mould.	<b>Unit 7 Foundry shop</b> 7.1 Safety measures, foundry tools, handling of molten metal. 7.2 Pattern allowances, color code. 7.3 Moulding sand: properties, types, binders, additives, mixing. 7.4 Types of mould, mould making. 7.5 Metal and non metals. 7.6 Melting of metals: pit furnace, cupola furnace. 7.7 pouring of metals: gate, riser. 7.8 Casting and casting defects.	Collect the information about various casting process.

SW-7 Suggested Sessional Work (SW):

**Assignments:** Identify various house hold tools and articles made from casting process.

**Mini Project:** prepare a simple casting product.

**H) Suggested Specification Table (For ESE of Laboratory Instruction\*):**

Laboratory Instruction Number	Short Laboratory Experiment Titles	Assessment of Laboratory Work (Marks)		
		Performance		Viva voice
		PRA	PDA	
LE1.1	Identify different types of Measuring tools available in workshop.	50	25	25
LE1.2	Measuring and Marking in a given situation.	40	40	20
LE1.3	Mock drill session for extinguishing fire.	40	40	20
LE2.1	Preparation of two wooden joints.	50	30	20
LE2.2	Prepare a job using wood turning machine.	50	30	20
LE2.3	Prepare a split pattern as per drawing.	50	30	20
LE3.1	Preparation of lap joint using gas welding.	50	30	20
LE3.2	Preparation of butt joint using arc welding.	50	30	20
LE3.3	Joining of aluminum sheet by using brazing.	50	30	20
LE4.1	Preparation of simple fitting job.	50	30	20
LE4.2	Preparation of 'T' fit or 'V' fit job.	50	30	20
LE4.3	Preparation of sheet metal job.	50	30	20
LE4.4	Preparation of pipe joints.	50	30	20
LE5.1	Perform turning, facing and taper turning operation on lathe machine.	50	30	20
LE5.2	Perform step turning and thread cutting operation on lathe machine.	50	30	20
LE5.3	Perform drilling, boring and reaming operation on pillar drill machine.	50	30	20
LE6.1	Preparation of a simple job in smithy shop.	50	30	20
LE6.2	Perform forged welding operation in smithy shop.	50	30	20
LE7.1	Prepare a green sand mould using single piece pattern.	40	40	20
LE7.2	Prepare a green sand mould using split pattern.	40	40	20
LE7.3	Prepare a non ferrous casting product using previously prepared mould.	50	30	20

**PRA:** Process Assessment, **PDA:** Product Assessment

**Note:** Only one experiment has to be performed at the end semester examination of 50 Marks as per assessment scheme.

**I) Suggested Instructional/Implementation Strategies:**

1. Improved Lecture Method
2. Industrial visits
3. Expert Lecture
4. Field Trips

5. Self-Learning
6. Portfolio Based Learning
7. Observation, Practice and Feedback
8. Classroom, Laboratory, Workshop, Field, Video, Live Demonstrations
9. Real Model
10. Charts
11. Demonstration
12. ICT Based Teaching Learning (Video Demonstration, CBT, Blog, Face book, Mobile) can be integrated with many method.

**J) Suggested Learning Resources:**

**(a) Books :**

S. No.	Titles	Author	Publisher	Edition & Year
1	Workshop Practice	Bawa, H.S.	McGraw Hill Education, Noida; ISBN: 978-0070671195	Latest
2	A Textbook of Manufacturing Process (Workshop Tech.)	Gupta, J.K.; Khurmi, R.S.	S.Chand and Co. New Delhi ISBN:81-219-3092-8	Latest
3	Introduction to Basic Manufacturing Process & Workshop Technology	Singh, Rajender	New Age International, New Delhi; 2014, ISBN: 978-81-224-3070-7	Latest
4	Elements of Workshop Technology	Hajra; Choudhary;	Media Promoters and Publishers Mumbai, 2009, ISBN: 10-8185099146	Latest
5	प्रारम्भिक कार्यशाला तकनीकी	K.K. Gupta	Asian publishers	Latest
6	वर्कशॉप टेक्नोलॉजी	शिवदत्त उपाध्याय	स्टैंडर्ड पब्लिशर्स	
7	इंजीनियरिंग वर्कशॉप प्रैक्टिस (प्रैक्टिकल)	अजय कुमार सरथे	खन्ना पब्लिशर्स	
8	वर्कशॉप / मैनुयुफैक्चरिंग प्रैक्टिसेज (प्रैक्टिकल)	वी. डी. केंचक्कनावर	खन्ना पब्लिशर्स	

**(b) List of open source software/learning website :**

1. Measuring device : <https://www.youtube.com/watch?v=3M4rsWBYaIA>
2. Precision measuring device : <https://www.youtube.com/watch?v=IX8gHdNpamk>
3. Angular measuring device : <https://www.youtube.com/watch?v=dgkLbX4cqr4>
4. Workshop hand tools: <https://www.youtube.com/watch?v=4o0tqF0jDdo>
5. Woodworking joint: [https://www.youtube.com/watch?v=UDQ\\_aS8qvaU](https://www.youtube.com/watch?v=UDQ_aS8qvaU)
6. Woodworkingtools: <https://www.youtube.com/watch?v=aCe9dNzCVQU>
7. Joining method : [https://www.youtube.com/watch?v=rFKtP\\_6w4B0](https://www.youtube.com/watch?v=rFKtP_6w4B0)
8. Arc welding: <https://www.youtube.com/watch?v=ZQ7vdwjmX80>
9. Gas welding process:  
[https://www.youtube.com/results?search\\_query=gas+welding+process+animation](https://www.youtube.com/results?search_query=gas+welding+process+animation)
10. Types of flame: <https://www.youtube.com/watch?v=1OLppHw6GRE>
11. Types of welding process: <https://www.youtube.com/watch?v=CCzhT81GrBo>
12. Soldering and brazing : <https://www.youtube.com/watch?v=BplzRtQAMw0>

13. Welding safety equipment : [https://www.youtube.com/watch?v=S1H\\_mV3Webo](https://www.youtube.com/watch?v=S1H_mV3Webo)
14. Fitting shop : <https://www.youtube.com/watch?v=dVxjT5kkhFc>
15. Sheet metal operation : <https://www.youtube.com/watch?v=95rgHM58dgw>
16. Drilling operation : <https://www.youtube.com/watch?v=zf9rgvzjkpY>
17. Shearing operation : [https://www.youtube.com/watch?v=VMu7\\_W0QE3Y](https://www.youtube.com/watch?v=VMu7_W0QE3Y)
18. Drawing operation : <https://www.youtube.com/watch?v=MQwHMebFuZM>
19. Lathe component: <https://www.youtube.com/watch?v=YQznrRi3heQ>
20. Lathe Machine operation : <https://www.youtube.com/watch?v=OgqsjZJwce8>
21. Work holding devices : <https://www.youtube.com/watch?v=jP1-lzLtxRw>
22. Working principle of lathe : <https://www.youtube.com/watch?v=NgbbB1tdmo4>
23. sand moulding : <https://youtu.be/mS-YwaGgNqw?si=a4h3LY3eXlHXVQbS>
24. sand casting: <https://youtu.be/EIBDp6U8bHo?si=Lym5MvH5OIWsP5Eb>

**(c) Others:**

1. Learning Packages.
2. Lab Manuals.
3. Manufacturers' operating Manual