

ME-108 – MANUFACTURING ENGINEERING LAB-I

Course Title	Manufacturing Engineering Lab-I	Course Code	ME-108
Semester	I Year	Course Group	Practical
Teaching Scheme in Periods (L: T: P)	30:00:60	Credits	2
Methodology	Lecture+ Practice	Total Contact Periods :	90 Periods
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic skills of handling workshop tools; this course also requires the basic knowledge of applied science and mathematics at secondary school level.

Unit No	Unit name	Periods	Questions for CIE			Marks Weightage	% Weightage
			Handling	Manipulation	Precision		
1	Fitting shop	15	10	15	15	40	100
2	Forging shop	15	10	15	15	40	100
3	Carpentry shop	15	10	15	15	40	100
4	Sheet metal shop	15	10	15	15	40	100
	Total	60					

Note:

1. Practical training in the Fitting, Forging, Carpentry, and Sheet Metal trades shall be conducted only up to Mid Semester-II. Accordingly, Mid Semester-I and Mid Semester-II practical examinations shall be evaluated exclusively based on these four trades.
2. After the completion of Mid Semester-II, practical training shall be imparted only in the Turning, Welding, and Foundry trades. Accordingly, the Semester-End Examination (SEE) shall be conducted exclusively based on these three trades

On completion of course the student should be able to;

CO1	Identify workshop tools, equipment, materials, and safety practices used in fitting, forging, carpentry, and sheet metal shops, and demonstrate their safe handling and proper application.
CO2	Perform basic fitting, forging, carpentry, and sheet metal operations to fabricate simple components and joints by following standard workshop practices, dimensional accuracy, and safety procedures.
CO3	Identify and operate basic workshop tools, machines, equipment, and safety practices in the turning, welding, and foundry shops while following standard operating procedures and workplace safety regulations.
CO4	Perform basic machining, welding, and foundry operations to produce simple components and joints using appropriate tools, machines, materials, and standard workshop practices.

COURSE CONTENTS (MID – 1 & 2)

1.FITTING SHOP

1. Introduction to fitting shop and identification of tools
2. Cutting of M.S. Flats of 6 mm thick with hack saw
3. Marking and chipping on Mild – steel flat 12 mm thick.
4. Marking, cutting, drilling, Chamfering and tapping on a M.S. Flat 12 mm thick.
5. Assembling of two pieces, Matching by filing (L/V Shape)

2.FORGING SHOP

1. Introduction to forging shop and identification of tools
2. Conversion of round to square.
3. Conversion of round to Hexagon.
4. Preparation of chisel from round rod.
5. Preparation of ring and hook from M.S. round.

3.CARPENTRY SHOP

1. Introduction to carpentry shop and identification of tools
2. Cutting, Planning of wood with hand saw.
3. Chiseling of wood and Lap joint
4. T- Joint
5. Preparation of Dovetail joint.

4.SHEET METAL SHOP

1. Introduction to sheet metal and identification of tools
2. Practice on cutting of sheet
3. Formation of joints like grooved joints, locked groove joint
4. Preparation of a rectangular open type tray and hollow cylinder
5. Preparation of funnel

Unit No	Unit name	Periods	Questions for SEE			Marks Weightage	% Weightage
			Handling	Manipulation	Precision		
5	Turning	12	10	15	15	40	100
6	Welding	09	10	15	15	40	100
7	Foundry	09	10	15	15	40	100
	Total	30					

COURSE CONTENTS (SEE)

5.TURNING SECTION – List of Experiments (Beginner Level)

1. Identification of parts of a lathe, safety practices and operational controls like ON/OFF, feed controls, and setting of spindle RPM
2. Demo and practice on holding the work piece in three-jaw and four-jaw chucks
3. To demonstrate and practice fixing an HSS single-point cutting tool in the tool post by adjusting its height to coincide with the lathe axis.
4. Facing operation: To reduce the length of the workpiece by 5–10 mm using successive cuts of 1 mm depth of cut for each pass.
5. Plain (straight) turning: To reduce the diameter of the workpiece by 5 mm using successive cuts of 0.5 mm depth of cut for each pass
6. Practice of step turning and grooving on a lathe machine.

6.WELDING PRACTISE – List of Experiments (Beginner Level)

1. Study of welding shop safety rules, Personal protective equipment (welding helmet, gloves, apron etc.), fire safety, and first-aid practices
2. Identification of welding equipment, tools, accessories, and consumables
3. Identification and selection of welding electrodes.
4. Arc striking practice on MS plate
5. Straight bead laying on MS plate
6. Weaving bead practice on MS plate
7. Prepare edge preparation
8. Lap joint (fillet weld) in flat position

7.FOUNDRY SHOP List of Experiments (Beginner Level)

1. Study and identification of foundry tools and appliances (hand tools, moulding tools, flasks, patterns, ladles).
2. Preparation of moulding sand and testing of its properties (moisture content, green strength – demonstration level).
3. Green sand mould preparation using a single-piece pattern.
4. Green sand mould preparation using a split pattern
5. Demonstrate the procedure for cutting a gating system in a mould and explain the importance of each component, pouring basin, sprue, runner, gate, and riser.

SUGGESTED LEARNING OUTCOMES

1. FITTING SHOP

After completing the fitting shop experiments, the student will be able to:

1. Identify and select appropriate fitting tools and equipment used in bench work.
 2. Cut mild steel flats to required dimensions using a hand hacksaw safely and accurately.
 3. Perform marking and chipping operations on mild steel flats as per given layout.
 4. Carry out marking, cutting, drilling, chamfering, and tapping operations on mild steel flats following standard practices.
 5. Assemble and match two components by filing to produce L-shape and V-shape fits with proper accuracy.
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2.FORGING SHOP

After completing the forging shop experiments, the student will be able to:

1. Identify forging tools and equipment and explain their functions.
 2. Convert a round bar into a square section using basic forging operations.
 3. Forge a round bar into a hexagonal section maintaining dimensional accuracy.
 4. Prepare a chisel from a round rod using appropriate forging techniques.
 5. Fabricate simple forged components such as rings and hooks from mild steel round bars.
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3.CARPENTRY SHOP

After completing the carpentry shop experiments, the student will be able to:

1. Identify carpentry tools and machines used for wood working operations.
 2. Perform cutting and planning operations on wood using hand saws and planes.
 3. Prepare lap joints using chiselling and fitting techniques.
 4. Construct T-joints with proper alignment and finishing.
 5. Prepare a dovetail joint demonstrating accuracy, strength, and craftsmanship.
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4.SHEET METAL SECTION

After completing the sheet metal shop experiments, the student will be able to:

1. Identify sheet metal tools and materials used in sheet metal operations.
2. Perform cutting operations on sheet metal using hand tools safely.
3. Form different sheet metal joints such as grooved joints and locked groove joints.
4. Fabricate sheet metal components like a rectangular open tray and hollow cylinder.
5. Prepare a funnel using layout, cutting, bending, and joining operations.

5.LATHE PRACTICE (Beginner Level)

1. Identify the main parts of a lathe machine and operate basic controls such as ON/OFF switch, feed controls, and spindle speed selector while following standard safety practices.
2. Select and mount workpieces correctly in three-jaw and four-jaw chucks ensuring proper alignment and secure clamping.
3. Fix and adjust an HSS single-point cutting tool in the tool post by setting the tool height accurately at the lathe centre axis.
4. Perform facing operation to reduce the length of a workpiece by 5–10 mm using successive cuts of 1 mm depth of cut while maintaining dimensional accuracy.
5. Carry out plain (straight) turning operation to reduce the diameter of a workpiece by 5 mm using successive cuts of 0.5 mm depth of cut as per given specifications.
6. Perform step turning and grooving operations on a lathe machine according to the given drawing and specifications.

6.WELDING PRACTICE (Beginner Level)

1. Follow welding shop safety rules and use appropriate personal protective equipment (PPE) while observing fire safety and first-aid practices in the welding shop.
2. Identify welding equipment, tools, accessories, and consumables used in arc welding and state their basic functions.
3. Select suitable welding electrodes based on the work material and basic welding requirements.
4. Strike and maintain a stable arc on an MS plate using proper arc-striking technique.
5. Lay uniform straight beads on an MS plate by maintaining correct arc length, electrode angle, and travel speed.
6. Perform weaving bead welding on an MS plate with controlled bead width and proper heat input.
7. Prepare the edges and surfaces of workpieces for a lap joint prior to welding.
8. Produce a sound lap joint (fillet weld) in flat position as per given specifications and basic weld quality requirements.

7.FOUNDRY SHOP (Beginner Level)

1. Identify various foundry tools and appliances such as hand tools, moulding tools, flasks, patterns, and ladles, and state their functions.
2. Prepare moulding sand and observe the testing of its properties such as moisture content and green strength at demonstration level.
3. Prepare a green sand mould using a single-piece pattern and split pattern by following standard moulding procedures.
4. Demonstrate the procedure for cutting a gating system in a mould and explain the function and importance of pouring basin, sprue, runner, gate, and riser.

REFERENCE BOOKS:

- 1.Manufacturing Technology (Vol-I) by P N Rao (McGraw Hill)
- 2.Mechanical Workshop & Laboratory Manual By K. C. John

Competencies and Key competencies to be achieved by the student.

FITTING SHOP – Competencies & Key Competencies

Experiment / Activity	Competency	Key Competencies
Introduction to fitting shop and tools	Identify and select fitting tools for bench work	Tool identification, safe handling, workplace discipline
Cutting MS flats with hacksaw	Cut MS flats to specified dimensions	Measurement accuracy, hacksaw handling, safety practices
Marking and chipping on MS flat	Perform marking and chipping as per layout	Use of marking tools, precision, surface finish
Marking, cutting, drilling, chamfering, tapping	Execute basic fitting operations following standard procedures	Process sequencing, drill and tap handling, quality control
Filing and assembling (L/V shape)	Assemble and match components by filing	Fit accuracy, dimensional control, inspection skills

FORGING SHOP – Competencies & Key Competencies

Experiment / Activity	Competency	Key Competencies
Introduction to forging shop and tools	Identify forging tools and explain their functions	Tool knowledge, heat safety, workshop discipline
Round to square conversion	Convert round bar into square section	Hammer control, temperature judgment, dimensional accuracy
Round to hexagon conversion	Forge round bar into hexagonal section	Shape control, symmetry, quality of forging
Preparation of chisel	Manufacture a chisel using forging operations	Tool shaping, heat treatment awareness, finishing
Ring and hook preparation	Fabricate simple forged components	Material handling, forming skills, inspection

CARPENTRY SHOP – Competencies & Key Competencies

Experiment / Activity	Competency	Key Competencies
Introduction to carpentry shop and tools	Identify carpentry tools and machines	Tool recognition, safety practices, housekeeping
Cutting and planing of wood	Perform cutting and planing operations	Measurement skills, surface finishing, tool control
Chiseling and lap joint	Prepare lap joints accurately	Joint alignment, chiseling technique, accuracy
T-joint preparation	Construct T-joints with proper fit	Assembly skills, finishing quality, precision
Dovetail joint preparation	Produce dovetail joints with strength and accuracy	Craftsmanship, attention to detail, quality workmanship

SHEET METAL SHOP – Competencies & Key Competencies

Experiment / Activity	Competency	Key Competencies
Introduction to sheet metal and tools	Identify sheet metal tools and materials	Tool handling, material identification, safety
Cutting of sheet metal	Perform sheet metal cutting operations	Hand tool usage, accuracy, edge finishing
Formation of sheet metal joints	Form grooved and locked groove joints	Joint formation skills, alignment, quality control
Tray and hollow cylinder fabrication	Fabricate basic sheet metal components	Layout skills, bending accuracy, dimensional control
Funnel preparation	Prepare a funnel using sheet metal operations	Process planning, joining techniques, product inspection

TURNING

S. No.	Activity	Competency	Key Competency
1	Identification of lathe parts, safety practices, and operational controls	Identify the main parts of a lathe machine and operate basic controls while following safety rules	Workshop safety awareness, machine familiarization, operational discipline
2	Holding workpiece in three-jaw and four-jaw chucks	Select and mount the workpiece correctly in three-jaw and four-jaw chucks ensuring proper alignment	Work holding skill, accuracy in setup, manual dexterity
3	Fixing HSS single-point cutting tool in tool post	Fix and adjust the HSS cutting tool at correct centre height in the tool post	Tool setting skill, precision adjustment, attention to detail
4	Facing operation	Perform facing operation to reduce workpiece length by 5–10 mm using specified depth of cut	Machining accuracy, dimensional control, surface finishing skill
5	Plain (straight) turning operation	Carry out plain turning to reduce diameter by 5 mm using successive cuts of 0.5 mm	Process control, measurement skill, consistency in operation
6	Step turning, and grooving operations	Perform step turning, and grooving as per drawing and specifications	Multi-operation machining skill, interpretation of drawings, time management

WELDING

S. No.	Activity	Competency	Key Competency
1	Study of welding shop safety rules, PPE, fire safety, and first-aid practices	Follow welding shop safety rules and use appropriate PPE while working in the welding shop	Safety consciousness, risk awareness, discipline at workplace
2	Identification of welding equipment, tools, accessories, and consumables	Identify welding machines, tools, accessories, and consumables used in arc welding	Equipment familiarity, technical awareness, shop readiness
3	Identification and selection of welding electrodes	Select suitable welding electrodes based on material and welding requirements	Material knowledge, decision-making, process understanding
4	Arc striking practice on MS plate	Strike and maintain a stable arc on MS plate using correct technique	Hand–eye coordination, arc control, basic welding skill
5	Straight bead laying on MS plate	Lay uniform straight beads on MS plate maintaining correct arc length and travel speed	Bead control, consistency, manual skill development
6	Weaving bead practice on MS plate	Perform weaving bead welding on MS plate with proper width and penetration	Weld pattern control, heat management, operator skill
7	Edge preparation	Prepare workpieces for lap joint welding by cleaning, aligning, and securing them as per standard procedures.	Preparation of surface and edge before performing joint
8	Lap joint (fillet weld) in flat position	Produce a sound lap joint (fillet weld) in flat position as per given specifications	Joint preparation skill, weld quality awareness, dimensional accuracy

FOUNDRY

S. No.	Activity	Competency	Key Competency
1	Study and identification of foundry tools and appliances (hand tools, moulding tools, flasks, patterns, ladles)	Identify various foundry tools and appliances and state their functions	Tool identification skill, process awareness, shop familiarization
2	Preparation of moulding sand and testing of its properties (moisture content, green strength – demonstration level)	Prepare moulding sand and observe testing of its properties such as moisture content and green strength	Material handling skill, basic testing awareness, quality consciousness
3	Green sand mould preparation using a single-piece pattern	Prepare a green sand mould using a single-piece pattern following standard moulding procedure	Mould preparation skill, manual dexterity, process sequencing
4	Green sand mould preparation using a split pattern	Prepare a green sand mould using a split pattern following standard moulding procedure	Mould preparation using two mould boxes skill, manual dexterity, process sequencing
5	Demonstration of cutting a gating system and explanation of its components	Identify and demonstrate cutting of gating system components and explain the function of pouring basin, sprue, runner, gate, and riser	Understanding of metal flow, casting quality awareness, analytical thinking

CO–PO Mapping Matrix

COs ↓ / POs → PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11

CO1	3	2	1	3	3	–	2	2	1	1	2
CO2	3	3	3	3	3	1	2	2	2	1	2
CO3	3	2	2	3	3	1	2	2	2	1	2
CO4	3	3	3	3	3	2	2	2	2	2	2

PO Descriptions

CO-PO MATRIX

Below is the corresponding CO–PO Mapping Matrix expanded to the 11 Program Outcomes (PO1–PO11) while maintaining the same mapping philosophy as your original 7-PO table.

COs ↓ / POs →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	Mapped POs
CO1	3	2	2	3	–	–	1	–	–	1	2	PO1, PO2, PO3, PO4, PO7, PO10, PO11
CO2	3	2	3	3	–	–	1	–	1	1	2	PO1, PO2, PO3, PO4, PO7, PO9, PO10, PO11
CO3	3	2	3	3	–	–	1	1	1	1	2	PO1, PO2, PO3, PO4, PO7, PO8, PO9, PO10, PO11
CO4	3	2	3	3	–	–	1	1	2	2	2	PO1, PO2, PO3, PO4, PO7, PO8, PO9, PO10, PO11

BOARD DIPLOMA EXAMINATIONS(C-26)

Model Paper

Mid Sem-I & II

C-26, ME-108: Manufacturing Engineering Lab-I

Time: 1 Hour

Total Marks: 20 MARKS

1. Plane the given wooden piece and cut it as per the given figure/drawing.
2. Prepare a lap joint as per the given specifications.
3. Prepare a dovetail joint with proper fit and finish.
4. Prepare a groove joint using sheet metal as per standard practice.
5. Prepare a locked groove joint using standard sheet metal techniques.
6. File the given mild steel plate and cut it according to the given drawing.
7. Convert the given round bar into a square section using forging operations.
8. Prepare a T-joint with proper alignment and finish.
9. Prepare an open tray using sheet metal as per the given dimensions.
10. Prepare a hollow cylinder using sheet metal as per the given specifications.
11. File the given mild steel plate and drill a 6 mm diameter hole as per the given drawing.
12. Convert the given round bar into a hexagonal section using forging operations.

BOARD DIPLOMA EXAMINATIONS(C-26)
Model Paper
Semester end exam
C-26, ME-108: Manufacturing Engineering Lab-I

Time: 2 Hour

Total Marks: 40 MARKS

1. Prepare a step turning job on the lathe machine as per the given drawing and specifications.
2. Prepare a lathe job consisting of taper turning and grooving operations as per the given drawing.
3. Prepare a lathe job consisting of taper turning and knurling operations as per the given drawing.
4. Prepare a lap joint (fillet weld) on MS plates as per the given dimensions with proper edge preparation.
5. Prepare a green sand mould using a single-piece pattern and provide a suitable gating system.
6. Prepare a green sand mould using a split pattern and provide a suitable gating system.