

**SYLLABUS FOR THE TRADE OF MOULDER
UNDER
CRAFTSMAN TRAINING SCHEME**

PERIOD OF TRAINING : 1 YEAR

COURSE OBJECTIVE :

Upon completion of one year training the trainee shall be able to :

- 1) 1) Understand the purpose of the trade and appreciate the value of technician training in the vocational trades.
- 2) 2) Prepare all types of sand mixtures used in ferrous, non ferrous & special purpose foundries.
- 3) 3) Prepare all types of moulds for ferrous & non ferrous metal casting.
- 4) 4) Operate all types of common melting furnaces and melt metal as per desired composition and properties.
- 5) 5) Repair and reline the common melting furnaces with refractory materials.
- 6) 6) Clean and fettle castings with hand , power and pneumatic tools
- 7) 7) Handle molten metal in crucible, ladle and pouring the same in moulds.
- 8) 8) Prepare all types of gating, risering and feeding system for all types of metals.

WEEK NO.	PRACTICAL	THEORY	W/S CAL & SCI	ENGG. DRG.
1. 1.	Introduction the trainee to the institution	Explaining the course objective & introduction to trg. Necessity of safety fire fighting equipment's. Safety in Foundry shop.		
2. 2.	Sand sieving- mixing & tempering by shovel and mixer Muller. Sieving the sand by an autoriddle or sieve shaker screen vibrator etc. Sand sampling by quartering method.	Occurance of moulding sand in India- common types of natural and synthetic moulding sand IS specs. For natural moulding sand IS : 3343-1965. Importance of sand sieving and grain fineness analysis	Applied w/s problems involving multiplication and division. Common fractions addition subtraction multiplication and division application of fraction to shop problems.	Free hand sketching of straight lines rectangles squares circles polygons etc.
3. 3.	Ramming practice in moulding boxes	Importance of hardness. Various mould hardness	Properties and uses of cast iron & plain	Free hand sketching with dimension

	with hand rammers obtaining desired green hardness such as 60, 70, 80, 90 on green hardness tester.	required for various metals, to be cast, ingredients in moulding sand.	carbon steel.	scale & proportionate sketching.
4. 4.	Use of hand tools cutting of channels on rammed boxes with cross sections such as square cross section semi circular, trapezoid and triangular and finishing with double enders clearers etc.	Various terms used in foundry & use of IS glossary of foundry practice. Use of various channels in gating and necessity of practice to cut them. Name of hand tools their construction use & manipulation.	Applied w/s problems as in week no. 2	Reading of simple blue print of geometrical models.
5. 5.	Preparing backing sand and facing sand for CI ramming a box and cutting a cube cavity without the use of pattern.	Hand tools continued ingredients of moulding sand , sand grains, clay & water additives of moulding sand	Properties & use of copper, zinc, lead tin aluminum.	Reading of simple blue print of geometrical models.
6. 6.	Preparation of sand bed on floor. Preparation of open mould & mould with block gates.	Chemical composition of natural moulding sand. Advantages and disadvantages of natural moulding sand & synthetic moulding sand.	Decimals addition subtraction , multiplication, conversion of decimals to common fractions shop problems.	Free hand sketching with dimensions of simple solids such as cubes, rectangular blocks, cylinders etc.
7. 7.	Levelling of floor with spirit level and straight edges. Preparation of mould on floor with parting line gates.	Parts of a mould parting line gating system basic principle of risering.	Brief description of manufacturing process of pig iron and cast iron.	Sketching of views of simple solid as mentioned above when viewed perpendicular to their surface and axes.
8. 8.	Preparation of closed moulds with natural moulding sand in two boxes	Equipment uses for moulding. Crucible furnace and melting of aluminum in a	Reduction of common fractions to decimal fractions shop	Sketching of views of simple solid bodies mentioned

	melting of aluminum in crucible furnace and pouring the same into moulds.	crucible furnace. Basic material handling equipment as related to foundry shop.	problems.	above when viewed perpendicular to their surface and axes.
9. 9.	Prepare moulds with self's cored patterns preparation of moulds with split patterns	Types of patterns their constructions and use patterns materials colouring and marking system of pattern equipment's (ISI 1513-1971)	Metric system metric weights and measurements units conversion factors	sketching of views of simple solid bodies as mentioned above when viewed perpendicular to their surface and axes.

ACHIEVEMENT :

After completion of 8 weeks training the trainee shall be able to :-

- 1) 1) appreciate the value of foundry trade in the engg. Industry.
- 2) 2) Prepare moulding sand for cast iron and aluminum (facing & backing)
- 3) 3) Prepare simple closed mould on floor and boxes with specified green hardness and cut parting line gates.
- 4) 4) Use common hand tools.
- 5) 5) Melt aluminium in crucible furnace and pour the same in moulds.

10	Preparation of moulds with simple split pattern having vertical & horizontal core prints. Preparation core sand.	Cores and their composition on reinforcing of cores. Types of core boxes, corevents and setting of cores on.	Brief description of manufacturing process of pig iron and cast iron.	Free hand sketching of nuts & bolts with dimensions from samples.
11	Preparation moulds for cast iron preparation & operation of pit type/ tilting oil fired furnace and melting cast iron and pour the same in moulds . fettling of CI castings.	Cast iron types, melting procure of CI in crucible furnaces, construction of crucible type furnace. Simple fettling tools & basic equipments. Safety while fettling.	Brief description of manufacturing process of cast iron and pig iron.	Free hand sketching of rivets and washers with dimensions from samples.
12	Preparation of moulds with draw back methods. Preparation of moulds in 3 boxes.	Moulding joints, loose pieces, draw backs, draw back plates stop off pieces. Types of	Shop problems on metric system of weight and measurement.	Free hand sketching of keys and screw threads with dimensions

	Preparation of mould with loose pieces.	core prints and casting in process.		from samples.
13	Metal working : Sawing & filing of different metals.	Hacksaw frame. Hacksaw blades specifications get used. Files their types specs. Of files use and handling of files (IS : 1931-1962)	Geometry- properties of lines , angles, triangles and circles,.	As in the preceding week.
14	Grinding of different metals chipping & hammering of different metals.	Grind wheels- preparation – specs. Selection of grind wheels for a particular metal. Metal hammer engineers construction and use (IS 841-1957)	Geometry- properties of lines angles triangles and circles.	Free hand sketching of plant and elevation of simple objects like hexagonal bar , square bar, tapered bar and hollow bar etc.
15	Handling of crucible ladle melting in crucible by pits, tilting furnace , ladle lining lifting of crucibles by lifting tongs & ladle carrier.	Types of ladle , lining , methods crucibles IS specs. Capacity as per 1748-1961. Types safety on crucibles use. Safety while handling metals. Types of fractures acidic, basic & neutrals.	Mass- unit of mass force the weight of body unit of weight shop problems.	Free hand sketching of keys- and screw threads with dimensions from samples.
16	Moulds making with special gating and obtaining moulds hardness for preparing aluminum casting. Melting of aluminium, fluxing and degassing.	Aluminum foundry practice fluxing & degassing. Use of hexochlorothene in degassing. Type of plungers use din degassing.	Effects of alloying element such as sulphur, phosphorus, carbon, maganese silicon nickel etc. On properties of cast iron and steel.	Explanation of simple orthographic projecting- 1 st angle.
17	Repairing of furnaces, relining and patching of tilting/ pit furnace preparation of ladle lining by fire clay mixture and CO2 sand.	Method of lining of pit and tilting type furnace types of ladles and lining methods of ladles various refractory mixtures for furnace lining.	----do-----	----do---

Achievements:

AFTER COMPLETION OF THE 17 WEEKS TRAINING, THE TRAINEE SHALL BE ABLE TO :

- 1) 1) PREPARE OF MOULD WITH SELF CORED, SPLIT AND 3 PART PATTERNS.
- 2) 2) DO BASIC MOULDING METHODS SUCH AS MOULD JOINTS DRAW BACKS AND STOP OFFS.
- 3) 3) Perform simple metal working such as sawing, filing grinding, chipping and hammering on different metal..
- 4) 4) Handle crucibles, ladles and other metal carriers and melting of metal in small batch type furnaces.
- 5) 5) Melt aluminium and cast iron in simple batch type furnace.
- 6) 6) Repair all types of pit and oil fired crucibles furnaces.

18.	Preparation of charges for cupola. Preparation of metal spout preparation of cupola such as slag, chipping, daubing & relining of cupola. Preparation of cupola bottom. Operation of cupola metallurgical control over the C.I.	Cupola parts function preparation & operation of cupola. Calculation and melting losses & gains in cupola Fuel and air requirement in cupola. Types of cupolas hot blast cupola and receiver type cupola.	Square root – square charge. Square root and of a perfect square the square. The square root of a whole number and a decimal.	Simple view of hollow and solid bodies with dimensions. Use of different types of lines and symbols for drawings.
19. 19.	Fettling of CI casting knocking chipping cutting cleaning grinding working by hand fettling tools and power pneumatic tools.	Fettling tools & equipment and methods. Types of chisels, hand power and pneumatic tumbling shot plasting and wheel brator.	CGS & FPS systems of units of force weight etc. Their conversion problem.	----do----
20. 20.	Preparation of moulds with stack moulding methods. Preparation dry sand moulds - use of cover core and bottom gate. Cutting of special pouring basin and mould weight calculation.	Moulding, types- stack moulding sweep moulding, moulds with core assembly methods. Special types of cores. Types of pouring basins and their application in various moulds.	Simple ratio and proportion – shop problems.	---do---

21. 21.	Preparation of moulds for cast iron. Preparation of various grades of cast iron in cupola and other furnaces. Preparation of fluidity spiral moulds and chill test wedges.	Types of fuels used in foundry such as solid, liquid and gaseous fuel metal ratio in cupola various grades. Cast iron as per Indian Standard (IS) various test on metal such as chill test and fluidity test.	Work unit of work energy power unit of power applied problems.	Views of simple hollow and solid bodies with dimensions. Use of different types of lines and symbols for drawings.
22. 22.	Preparation of moulds with odd side method. Setting of vertical cores and horizontal cores in mould and getting dimensional accuracy in casting.	Foundry equipment. Types of melting tools- furnaces and metal handling and storing equipment such as receiver and metal holders conveyors and their types. Material handling equipment.	Algebra- algebraic symbols, addition , subtraction, multiplication & division of expression involving algebraic symbols. Simple equations and transposition problems.	Simple isometric drawings- isometric views of simple object such as square, rectangles, cubes, rectangular block etc.
23. 23.	Preparation of a pit mould and large sand mould on floor with sinderbed and vent pipes.	Flooring moulding advantages and dis advantages pit moulds construction advantages & dis advantages material used for constructing large pit moulds.	---do---	----do----
24. 24.	Preparation of moulds with iron gate, preparation of mould with pencil gate spray gates etc.	Various types of gating system bottom gating spray gating . step gating- block gating, risering and feeding breaker case. Feeding aids exothermic pads and compounds.	Standard algebraic formula e.g. $(a+b)^2$ $(a-b)^2$ etc.	Simple isometric drawings isometric views of simple object such as square, rectangles, cubes, rectangular block etc.
25. 25.	Preparation of moulds sand and mould for copper base alloys such	Copper- copper base alloys foundry techniques copper	---do---	Free hand sketching fettling tools.

	as casting melting of copper alloys such as brass gun metal and bronze in pit type / tilting type crucible furnace.	base alloys. Procedure of melding fluxing and use of covering flux and alloying.		
26. 26.	Preparation of moulds in snap flasks. Preparation of core with various types of core boxes. Pasting method of jointing cores application of core vents on different types of core.	Types of moulding boxes sanp flask and special types of moulding boxes, specification moulding boxes as per IS : 1280-1958 specifications. Different types of core venting step venting pierced venting thread.	Menstruation area rectangles, squares, triangles circles regular polygon etc. Calculation of areas.	---do--
27. 27.	Preparation of moulds with loam sand preparation mould with sweep methods. Loam core making and use of core barrels and core grinds iron.	Loan sand composition materials used process of loam. Mould making preparation of loam cores, use of core barrels and core baking equipment core oven & their types.	Specific gravity examples.	Use of drawing instruments , T square and drawing boards.
28. 28.	Making mould with different mould joints- straight joint stepped joint tapered joint and pattern with irregular joint.	Types of pig iron as per IS cast iron elements of cast iron effect of elements in cast iron. Different types of cast iron other than IS grade white CI moulder CI, chilled CI, mottled CI C.I. etc.	simple problems on straight and ball cranked levers.	Construction of simple figures & solids as mentioned above with dimensions and titles, use of different type of scales in inches and millimeters.

ACHIEVEMENTS :

After completion of the 28 weeks training the trainee should be able to :

1. 1. prepare and operate (60 cm) 24 " dia. Cupols.
2. 2. Fettle all types of castings as per the desired dimensions.
3. 3. Prepare mould and cores with loam sand other special methods.

4. 4. Know the different test available for the quality test for cupola.
5. 5. Prepare larger moulds on floor with draw backs.
6. 6. Prepare copper base alloys and proper selection of alloying elements.
7. 7. Make all types of mould joints.
8. 8. Know all types of gating system and prepare moulds with different gates.

29.	Operation of reverbratory skelnar for furnace melting of cast iron inskelnar furnaces making a batch of particular grade cast iron.	Principle of reverbratory melting advantages melting in reverbratory type furnaces over cupola and other furnaces, rotary furnace, induction furnace, arc furnace.	Calculation on volume and weight of simple solid bodies such as cubes, square and hexagonal prisms shop problems.	Construction of simple figures and solids as mentioned above with dimensions and titles, use of scales in inches and millimeters.
30. 30.	Lining of reverbratory furnace preheating and melting on reverbratory furnace.	Reverbratory furnace. It's application for Grey iron melting. It's advantages in the present day shortage of fuel and making particular grade of casting.	Heat and temp. Thermometric scale Fahrenheit and centigrade scales and their conversion. Name and use of temp. Measuring instruments.	Lettering numbers and alphabets.
31. 31.	Preparation of special moulds by full mould process (us eof expanded polysterene/ thermocole pattern). Making mould with ferrosilicon of Nishiyama process. Use of air setting binder in mould making.	Advantages & disadvantages of fuel mould process. Nishiyam process antioch process. Air setting binders used for moulding.	Shop problems on determination of volume & weight of simple solid bodies.	Free hand sketching of simple objects with dimensions.
32. 32.	Making of mould with special moulding process investment casting process (Lost wax process) etc. And observing new	Advantages & disadvantages of graphite mould, investment casting process – shaw process magnetic moulding- slush casting die	Simple problems on lines angles, triangles and circles.	Free hand sketching of plan and elevation of simple objects like hexagonal bar, square bar, circular

	process in companies by work visits.	(gravity and pressure) casting vacuum and continues casting V process.		bar, tapered hollow bars etc.
33. 33.	Preparation of moulds with co2 process. Prepaartion of core with co2 process.	Co2 process for moulds and core making sodium silicate prepaartion types of sand and grain size requirement of co2 types of probes used for gasing reclamation of co2 sand.	Simple problems on lines, angles, triangles and circles.	---do----
34. 34.	Grading, inspection, and gauging checking accuracy of a casting by gauges & measuring tools carrying out visual inspection of casting detecting the defect and identifying defects in casting.	Inspection of casting destruction and non destructing test radio graphy test Gamma Ray and X ray ultra sonic testing etc.	Calculation of volume of sand required for moulds.	Views of simple solid and hollow bodies cut by section plane.
35. 35.	Preparation of mould in a hand moulding nachine. Use of pneumatic rammer and air compressor . preparation of core by core shootens.	High pressure moulding machine types moulding machines types hand operated and power operated sand slinger power hydraulically operated machine. Core blowers and core shootens.	Calculatiuon of weight of sand and mould boxes.	---do---
36. 36.	Preparation of mould for applicaiton of chills and denseners.	Solidification of metal directional solidifiacation use of chills and denseners.	Calculation of areas of triangles polygons.	Reading of simple Blue Print.
37. 37.	Preparing moulds with step gating and bottom gating.	Step gating bottom gating feeding risering nasic concept of design of gates and risers.	Calculation of areas of triangles polygons	Exercises on blue print reading.
38. 38.	Preparation of	Chaplets types	Calculation of	Exercises on

	moulds for setting cores with chaplets setting of cores in a mould with balancing core.	calculation of chaplet requirement. Calculation of core print area required.	areas of triangles polygons.	blue print reading.
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ACHIEVEMENTS :

After completion of 38 weeks training the trainee should be able to do :

1. 1. operate and melt metal in a reverbratory furnace.
2. 2. Prepare special types of mould by lost wax process shaw process and ferrosilicon process and co2 process.
3. 3. Do basic visual inspection on casting and gaging.
4. 4. Know the directional solidifiacton and gating risering principles.

39.39.	Preparation of black washing mixtures (plumbago)- bott clay and ladle lining mixtures)	Types of facing materials coating of facing materials bott clay composition and shape and size for effectiveness ladle lining procedure mixtures monolithic and brick lining.	Logarithms.	Exercises on blue print reading.
40.40.	Making a casting in a gravity die or permanent mould casting preparation setting of cores for permanent mould. Casting of permanent mould.	Permanent mould cores in permanent mould gating of permanent mould coating of permanent moulding and casting alloys. Operating temp. Of die cast alloys advantages and dis advantages of permanent mould casting alloys. Advantages and disadvantages of permanent mould casting.	Logarithm- use of tables , multiplication and division.	Exercises on blue print reding.
41.41.	Preparation of plaster moulds and ceramic moulds.	Materials used in plaster moulds and ceramic moulds. Limitations of alloys used and	--do---	Free hand sketching of simple objects related to the trade and

		the products made.		preparation of simple working drawings from the sketches.
42.42.	Preparation of moulds for steel casting coating of non carbonaceous materials on moulds placing exothermic compounds or sleeves on moulds.	Types of steel casting annealing casting foundry techniques gating and risering for steel casting steel melting furnaces and their types. Application of steel casting in Engg. Field.	Further practice in the use of logarithmic tables.	--do--
43.43.	Preparation of moulds for malleable iron S.G. iron etc.	Malleable cast iron types black heart white heart. Annealing process of MCISG iron advantages melting addition of magnesium in iron vacuum furnaces,.	Electricity and its uses. Electric current +ve and -ve terminals. Use of switches and fuses conductors & insulators.	---do---
44.44.	Repairing a casting grooving gouging welding plugging depositing metal by thin layers by metallising filling up of unwanted cavities by cold setting metal compounds.	Solvaging of casting, preparation of casting for solvaging welding metalising cold setting metal resin compounds thermit welding burning on process etc.	Reading of simple graphs.	---do---
45.45.	Making of different types of core by using different types of cores with different core binders and baking then in oven and other methods.	Core binders-baking oven baking method die electric core oven. Materials used to increase collapsibility of cores.	Simple explanation of different forms of energy heat mechanical and electrical examples conversion from one form to another.	----do---
46.46.	Making a mould with multiple gating system, making a mould with side riser and blind riser.	Advantages of multiple gating system. Use of blind risers williams core and side risers gate	Plotting and reading of simple graphs.	Free hand sketching of simple objects related to the trade and preparation of

		with shrink box.		simple working drawings from the sketches.
47. 47.	Identifying casting defects from CI casting aluminium casting and suggesting remedy for them.	Casting defects causes, remedies. Factors related to casting defects. Method of avoiding casting defects. Control over materials-designs and other factors.	Meaning of horse power and brake horse power. Simple problems on work energy and power.	Further practice in Blue Print reading and exercises related to the trade.
48. 48.	Preparation of special moulds for calculating metallostatic pressure acting on mould upward thrust downward side way thrust.	Force acting on moulds and cores metallostatic pressure on moulds. Calculation of metallostatic pressure on mould walls.	Calculation of volume and weight of simple solid bodies using.	---do---
49. 49.	Making a mould with wedge gate for light metals and cast irons melting and pouring the moulds fettling the thin casting.	Foundry mechanisation and lay out	Further problems on mensuration as above.	Further practice in blue print reading and exercises related to the trade.
50. 50.	Revision of major skills of the trade.	Revision of major knowledge portion of the trade.	Revision	Revision
51. 51.	Revision	Revision	Revision	Revision
52. 52.	----- ----T	----- ----E	----- --S	----- ----T

ACHIEVEMENT :

After completion of 52 weeks of training the trainee should be able to :

1. 1. prepare sand mixture for cores green sand and dry sand moulds.
2. 2. Prepare cupola.
3. 3. Tap out metal from the cupola.
4. 4. Clean types of cupola while it is working.
5. 5. Pour metals into the moulds.
6. 6. Know the constituents of charges for cast iron, aluminium bronze.
7. 7. Recognise sands, binders, fluxes, metals etc.
8. 8. Prepare moulds and cores as per patterns and core boxes and cast within dimensional. Accuracy of +- 1/16" or +- 1.5 mm

9. 9. Fettle the castings with the help of chisels, brushes, hammers and grinders.

10.10. Know the theory of co2 process and shell moulding process.

LIST OF TOOLS AND EQUIPMENT MOULDER

SR. NO.	ITEMS	FOR INSTRUCTOR	FOR TRAINEE
	TRAINEES KIT :		
1.	Tool tray steel 145 x 45 x 5 cm	1	16
2.	Taper trowel 18 cm round	1	16
3.	Heart and square 3 x 1.2 x 1.2 cm	1	16
4.	Spool tools 32 x 16 mm- 25 x 6 mm	1	16
5.	Cleaners 9 x 300 mm	1	16
6.	Cleaners 6 x 300 mm	1	16
7.	Rule steel 300 mm and 12"	1	16
8.	Vent wire 3 mm	1	16
9.	Rapping spike forged & hardened	1	16
10.	Safety goggles	1	16
	TOOLS MEASURING INSTRUMENTS & SHOP OUT FIT :		
SR. NO.	ITEMS	FOR TRAINEE	
11.	Hammers ball pein 0.45 kg.	8	
12.	Chisel cold flat 2 cm x 22 cm	8	
13.	File flat 30 cm bastard	8	
14.	File flat 30 cm second cut	8	
15.	File half round 30 cm bastard	8	
16.	File half round 30 cm second cut	8	
17.	Hammer peg and pin	16	
18.	Hammer flat	8	
19.	Protective apron jute or asbestos	16	
20.	Legging leather	2	
21.	Folding rule, wooden 60 cm	4	
22.	Goggles furnace, antiglau armond heat proof	16	
23.	Face shields clear	8	
24.	Gauntletsleather fettling	16	
25.	Gauntlets asbestos furnace	16	
26.	Footwear asbestos over shoes	16	
27.	Head wear anticoncussion firnace	8	
28.	Fire extinguisher foam chemical (according to factor regulations)	2	
29.	Fiast aid box, based on burn treatment	2	
30.	Dividers firm joint 20 cm	4	
31.	Sledge hammer 8 kg.	4	
32.	Hammer ball pein	8	
33.	Hammer brick layers 20 cm	4	
34.	Hammer lamp wandering lead	4	

35.	Cutting pliers	4
36.	Vice bench 12 cm jaw	4
37.	Degasing bales, 10 cm perforated hood	4
38.	c-clamps 20 cm perforated hood	8
39.	c-clamps 30 cm light duty steel	8
40.	Saw hand	2
41.	Hacksaw 30 cm adjustable	8
42.	* moulding boxes 30 x 40 x 15 cm RSDL	32 pairs
43.	* moulding boxes 75x75x25 cm RSDL	16 pairs
44.	* snap flask 40x35x12 cm RSDL	1
45.	* snap flask 30x30x10 cm RSDL	1
46.	* work bench 15x10x6 cm	1
47.	Spring balance dial type 10 kg. By grams with removabl;e scoop	1
48.	Shovel hand	16
49.	Blow lamp(kerosene)	8
50.	Wheel barrows	4
51.	Bench working 245x125x75 cm	1
52.	Plane grooving 6 mm cutter	2
53.	Hammer claw 0.75 kg.	2
54.	Screw driver 25 cm with 15 mm blade	4
55.	Screw driver 15 cm	4
56.	Tape measuring 20 cm steel	1
57.	Saw hand 45 to 66 cm	4
58.	Trammel	2
59.	Fire buckets with stand	4
60.	Black board with easel	1
61.	Lockers steel with 8 drawers each	4
62.	Engineers try square 15 cm	4
63.	Scriber	4
64.	Caliper odd leg	4
65.	Caliper inside 15 cm	4
66.	Center punch 15 cm	4
67.	Chisel 9 x 15 mm	8
68.	Steel rule 600 mm	2
69.	Bellows (hand) leather 25 cm	16 nos.
70.	Screw drivers 18 cm	1
71.	Pliers 20 cm	4
72.	Try square (for wood work))	16 nos.

	LIST OF EQUIPMENTS IN GENERAL INSTALLATION	
1.	Air compressor with maximum working pressure of 250 PSI	1
2.	Pneumatic rammer with rubber rammer head	1
3.	Pneumatic chisel 1 no. With suitable chisel	1
4.	Reverbratory furnace similar to skelenar 250 kg. Capacity with motor blower and complete lining shield drop burner and air pipes and oil tank and pipe line.	1
5.	Moulding sand mixer muller 35 kg. Capacity with motor and reduction gear unit. 3 HP motor impeller R.M. 30	1
6.	Speedy moister tester working with calcium carbide equipment (ditert type) with balance pressure gauge and brushes spoonn etc.	1
7.	Green hardness tester dial type risdale diets etc.	1
8.	Co2 cylinder with co2 probe and rubber hoses with nozzle ½" wheel valve	1
9.	LPG cylinder 2 nos. With heating torch (instead of hose pipe) etc.	1
10.	Cylinder trolley suitable to co2 cylinder and indane gas cylinder	1
11.	Heating (furnace oil) and pumping unit to suit to 250 kg. Skelnar type furnace/ with heating pressure gauge etc. Wesman model SPM simplex model motorised rotary gear oil pump pre heater	1
12.	Sand testing equipments permeability meter, universal strength tester, sieve sheker standard sand rammer, shatter index tester	1
13.	Moulding machine hand squeeze with a stripping device pin lift type	1
14.	Weighing machine 300 kg. By 100 gms.	1
15.	Pedestral grinder DE 35 cm power operated.	1
16.	Core oven 6' x 3' x 3' electric hot air circulated with maximum temperature 350 degree adjustable	1
17.	Cupola capacity 1 and ½ tons/ hour motorised blower, volume gauge, pressure gauge, blower pump pipe line, charging platform, blast control valve, spark arrester	1
18.	Sand sampler	1
19.	Auto sand riddle with 3 tons/ hour riddling capacity	1
20.	Oil fired furnace tilting tyre crucible furnace to fit 100 no. Crucible.	1

1. 1.		IS : 6-1958
2. 2.	Specification for high heat duty fire clay	IS : 8-1958
3. 3.	Specification for moulding boxes	IS : 1280 -1958
4. 4.	Specification for coal dust for use in foundry	IS : 1752-1961
5. 5.	Specification for fire clay used cupolas	IS : 1751-1961
6. 6.	Specification for graphite crucibles	IS : 1748-1961
7. 7.	Specification for gray iron castings	IS : 210-1962
8. 8.	Specification for hard coke for marketing	IS : 489-1965
9. 9.	Specification for white heart malleable iron	IS : 2107-1962
10. 10.	Specification for designation of pig-iron	IS : 2084-1962
11. 11.	Specification for silica flour in foundry use	IS : 3339-1962
12. 12.	Specification for natural moulding sand	IS : 3343-1965
13. 13.	Specification for phosphor copper casting	IS : 2313-1963
14. 14.	Specification for aluminium casting alloy ingot	IS : 202-1966
15. 15.	Specification for foundry pig iron (coke)	IS : 224-1965
16. 16.	Specification for brass ingot	IS : 292-1961
17. 17.	Specification for steel casting for general engineering purpose	IS : 1030—1962
18. 18.	Specification for nentonite for use in foundry	IS : 3021-1965
19. 19.	Specification for glossary of foundry term to foundry technology	IS : 2763-1964
20. 20.	Specification for Grey pig iron	IS : 224-1965
21. 21.	Glossary of terms relating to foundry technology	IS : 2763-1964
22. 22.	Pattern plates for machine moulding boxes	IS : 4604-1968
23. 23.	Wooden pattern equipment for foundaries	IS : 1513-1959/1971
24. 24.	Cupola furnace for foundry	IS : 5032-1969

25. 25.	General purpose shovels	IS : 274-1966
26. 26.	Glossary of terms relating to refractory materials	IS : 4041-1966
27. 27.	Aprons rubberised acid and alkali resistant	IS : 4501-1967
28. 28.	Fireman's leather boots	IS : 4128-1967
29. 29.	Industrial safety helmets	IS : 2925-1964
30. 30.	Steel castings for general engg. Purpose	IS : 1030-1962
31. 31.	Natural moulding sand for use in foundaries	IS : 3343-1965
32. 32.	Laddles geared, hand operated crane suspended for iron foundariess	IS : 4475-1967
33. 33.	Laddles geared, hand operated crane suspended steel foundries	IS : 4476-1967
34. 34.	Foundry moulding boxes of steel construction	IS : 1280-1967
35. 35.	Coal dust for use in CT foundry	IS : 1752-1967
36. 36.	Closing pins for foundry moulding boxes	IS : 4982-1968
37. 37.	General engg. Drawing code of practices for	IS : 696-1960
38. 38.	Guide pins for foundry pattern plates.	IS : 4881-1968

SYLLABUS FOR THE TRADE OF MOULDER UNDER APPRENTICESHIP TRAINING SCHEME

PERIOD OF TRAINING : 3 YEARS

The period of training for this trade in 3 years consisting of basic training for a period of one year and shop training for the remaining period. The syllabus for this trade should be considered as a guide for imparting apprenticeship training according to the facilities available in industry.

LIST OF OPERATIONS/ SKILLS TO BE LEARNT DURING PRACTICAL TRAINING WHICH INCLUDES BASIC TRAINING :

NOTE :

- 1) 1) all fitters should undergo one year Basic Training followed by two years training on the shop floor. The apprentices should have more practice on the shop floor on these operations/ skills which have been already learnt during basic Training and additional operations/ skills during the shop floor training and develop the method of work, speed accuracy and finish in jobs.
- 2) 2) The content of first year of two years training in ; industrial Training Institutes in this trade is exactly ; the same as mentioned in (1) above. The trainees of Industrial Training Institutes should follow the same course for apprentice shop as in (1) above

SIC. List of operations/ skills to be learn during the
No. Apprenticeship

Basic Training : 1 year

1. 1. Instruction in safety precautions as applicable to trade.
2. 2. Use of different types of sands.
3. 3. Sand preparation for moulds.
4. 4. Sand preparation of cores.
5. 5. Use of molding tools.
6. 6. Floor and / or box molding using two parts pattern.
7. 7. Pit molding .
8. 8. Simple core making.
9. 9. Extraction of patterns.
10. 10. Use of runners and risers.
11. 11. Closing and pouring.
12. 12. Simple pattern making.
13. 13. Making moulds for variety of castings.
14. 14. Safe handling of molten metals.
15. 15. Use of crucible.
16. 16. Sand preparation and control.
17. 17. Core making.
18. 18. Re- inforcement of moulds and cores.
19. 19. Molding of tin, zinc and lead etc,
20. 20. Split pattern moulding, loose, pattern moulding and plate pattern moulding.
21. 21. Recognition of different refractories and fluxes
22. 22. Aluminum casting, bronze casting and copper casting.

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|----|----|---|
| 23 | 23 | Repairing and coloring of broken patterns and their numbering and storing. |
| 24 | 24 | Fattening of castings.. |
| 25 | 25 | Charging a cupola. |
| 26 | 26 | Firing a cupola. |
| 27 | 27 | Tapping a cupola. |
| 28 | 28 | Repairing, lining and cleaning of cupola, preparation of sand bed for cupola. |
| 29 | 29 | Repairing of crucibles and lining of crucibles and ladles |

Shop Training : 2 year :

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|-----|-----|--|
| 30. | 30. | Instruction in safety precautions on the Shop Floor. |
| 31. | 31. | Use of chills. |
| 32. | 32. | Chill casting. |
| 33. | 33. | Machine moulding. |
| 34. | 34. | Oil sand core making. |
| 35. | 35. | Stack moulding. |
| 36. | 36. | To prepare moulds and cores without the use of patterns and samples. |
| 37. | 37. | Heat-treatment of cast iron and malleable iron. |
| 38. | 38. | Charging a cupola. |
| 39. | 39. | Firing a cupola. |
| 40. | 40. | Tapping a cupola. |
| 41. | 41. | Machine shop observation of machining operations on casting. |
| 42. | 42. | Inspection of casting. |
| 43. | 43. | Co2 Process. |
| 44. | 44. | Die casting. |
| 45. | 45. | Investment casting. |
| 46. | 46. | Plaster mould casting. |
| 47. | 47. | Continuous casting process. |

NOTE : The operations / skills marked (*) are desirable. They must be carried out where facilities are available in the establishment,

SYLLABUS FOR RELATED INSTRUCTION

Related Instruction should be imparted to all the apprentices during the entire period of training including Basic Training. The syllabus given for Related Instruction should be considered as a guide..

The subjects to be taught to the apprentices in Related Instruction :-

1. 1. Trade Theory
2. 2. Workshop Calculation and Science.
3. 3. Social Studies.

First year :

The content of the syllabus for apprentices during first year training should be same as the content of one year course for the I. T. I. trainees in ;this trade.

Second and Third year ;

1. 1. Trade Theory (3 Hrs. Per week or 150 Hrs. Per year approx.)

The number of hours to be spent on different topics in the Trade Theory has been indicated. The hours indicated are fixable and are intended as a guide).

- (1) Safety at work- accidents do not happen, they are cause.
- (2) Revision of the previous years work.
- (3) Shrinkage of different metals, materials manufacturing processes of pig iron, cast iron, cast malleable cast iron plain carbon steel, steel, alloy steel, cast iron composition – influence of combined end free carbon influence of other elements e. G. Sulfur, silicon phosphorous NI, CR, Mn etc, on ;cast iron manufacturing process of non- ferrous and light alloys used in foundry. Alloy cast iron
- (4) Gating and feeding system. Description of moulding processes- green sand moulding, dry and moulding and loan work. Selection of method. Moulding from irregular patterns.
- (5) Description of molding equipment sands, dressing materials fire clay , clay wash, parting material, core binders etc. Use of exo- thermic compounds..
- (6) Description of blast furnace cupola convector open hearth ;furnace, electric furnace and rocuciblee, method of transportation of molten metal- use of leads etc.
- (7) Description of common molding machines such as straight draw machines, turn over machines, hoppers conveyors, machine for multiple mould core making machines, sand slingers etc. Maintenance of these machines
- (8) Description properties and uses of molding sands and refractors. Properties and uses of foundry fuels and fluxes. Testing of sand for permeability green and dry sand compression and moisture. Testing for clay ;contact, refractoriness and gradation of sand etc.
- (9) Heat treatment of metals annealing, hardening, tempering, normalizing and cast hardening.
- (10) Cleaning of casting- sands, shot and hydroblastings, airless shot blasting and tumbling berels, brushes and dust arras. Fettling of casting. Use of hand and sawing grinders, removal of excess metal and repair of castings by gas and arc cutting and welding.
- (11) Chilled casting use of chills, steel casting influence of alloying elements. Non – ferrous casting- brass, bronze, white metal and aluminum alloy. Bride description of centrifugal casting and die casting.
- (12) Testing of castings and their inspection
- (13) Co2 process in crosses and mould making.
- (14) Shell molding process.
- (15) Coloring and marking of patterns as per IS specification..
- (16) Steel melting and alloy of cast iron.
- (17) Is specification of raw materials and consumable.
- (18) Full mould process or binderless dry sand mould process.
- (19) Properties of cold- setting and non baking binders and their application in the steel industry.
- (20) Salvage of castings.
- (21) Use of tables and manufactures hand books.
- (22) Modern development in ;the trade- new techniques etc.
- (23) Inspection- reduction of scrap by stage inspection
- (24) Introduction to work simplification related to the trade- job study job analysis including planning of sequence of operation. Critic approach and method working. Determining the cost of casting.

- (a) Cost of molten metal,
- (b) Direct labor , .
- (c) Cost of core,
- (d) Over head,
- (e) Fettling.

(25) Quality and finish of work- importance of quality and finish of jobs at all stages- protection of finished surfaces.

(26) Revision and test.

2. 2. Workshop Calculation and Science (1 Hr per week or 50 Hrs per year approx.

(1) Revision of previous years work.

(2) Percentage and its application – problems appropriate to the trade group.

(3) Further problems in menstruation work power and energy.

(4) Friction – simple problem on straight and bed crank levers.

(5) Menstruation and further problem as applicable to the trade.

(6) Elemenator principles of parallelogram and triangle of forces. Force on piston ram etc..

(7) Mechanical advantage- velocity ratio- useful work. Mechanical efficiency of machine.

(8) Gear and belt drives. Determination of horse power speed and size of pulleys and gears.

(9) Velocity acceleration and retardation

(10) Center of gravity..

(11) Specific gravity.

(12) Descriptive explanation of expansion of solids, liquids and gases due to heat- coefficient of expansion, brief description on transference of heat conduction, convection and radiation.

(13) Meaning of tenacity, elasticity malleability, brittleness, hardness, compressibility and ductility.

(14) Meaning of stress, strain, modulus of elasticity, ultimate tensile strength, factor of safety and different types of stresses.

(15) Quality of heat- unit of heat B. TH. U. C. H. U.

(16) Heat and temperature- thermometric scale Fahrenheit scale to centigrade and vice – versa.

(17) Measure of temperature- name and brief description of temperature measuring instruments used in the workshop including those high temperatures e. G. Optical and immersion pyrometers.

Engineering Drawing (2 Hrs per week or 100 Hrs per year approx.)

(1) Revision of previous year's work.

(2) Explanation of IsI standards for Engineering Drawings.
IS : 696- 1960.

(3) Free hand sketching of production of working drawings of simple machines or engine parts.

(4) Advanced Blue Print Reading.

3. 3. Social Studies :

The syllabus has already been approved and is same for all the trades.