

Syllabus  
for the Trade of

# **PATTERN MAKER**

**Under**  
**Apprenticeship Training Scheme (ATS)**



Government of India

**GOVERNMENT OF INDIA**  
**MINISTRY OF LABOUR & EMPLOYMENT**  
**DIRECTORATE GENERAL OF EMPLOYMENT & TRAINING**

GENERAL INFORMATION

1. Name of the Trade : Pattern-Maker
2. N.C.O. Code No. : 819.20
3. Entry Qualification : Passed in VIII class Examination under 10+2 system of education or its equivalent.
4. Duration of Apprenticeship Training. : 3 Years including 1 year Basic Training.
5. Rebate to Ex-I.T.I. Trainees. : Full
6. Ratio of Apprentices to Workers. : 1 : 7

SYLLABUS FOR THE TRADE OF PATTERN MAKER  
UNDER  
APPRENTICESHIP TRAINING SCHEME

(Period of Training - 3 Yrs)

NOTE :

1. All freshers should undergo one year Basic Training followed by two years training in the Shop Floor. The apprentices should have more practice on the Shop Floor on those operations skills which may have already learnt during Basic Training.
2. The content of first year of two year training in Industrial Training Institutes in this trade is exactly same as mentioned in (1) above. The trainees of Industrial Training Institutes who may be engaged for two years for Shop Floor Training after one year training in Industrial Training Institutes should follow the same course for apprenticeship as in (1) above.
3. The operations/skills marked (\*) would also be taught to the trainees in Industrial Training Institutes in this trade in second year. The Industrial Training Institute trainees i.e. those who after completion of two years training in Industrial Training Institutes could be engaged for undergoing Apprenticeship Training for the remaining period of one year in this trade, should learn the remaining operations skills, if any, on the Shop Floor during Apprenticeship and develop his method of work, speed accuracy and finish in jobs, which would normally consist of operations skills already learnt by him.

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S1. List of operations/skills to be learnt during apprentice  
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Basic Training : 1 Year

1. Instruction in safety precautions as applicable to the trade.
2. Reading and marking out from drawings in mm & in inch.

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3. Wood Work :
  - (a) Setting out
  - (b) Hand sawing
  - (c) Planing
  - (d) Chiselling
  - (e) Gouging
  - (f) Sharpening of tools.
4. Simple various joints of wood.
5. Instruction in safety precautions related to the moulding trade.
6. Use of moulding hand tools.
7. Sand preparation for moulds and cores.
8. Simple pit moulding.
9. Open and green sand moulding.
10. Closed green sand moulding of circular and rectangular blocks.
11. Making moulds from simple or solid pattern split pattern and cored pattern.
12. Preparation of moulds from a pattern having loose pieces.
13. Preparation of mould of a pulley having vertical core.
14. Making mould of a bush bearing having horizontal core.
15. Making vertical horizontal and balancing cores.
16. Reinforcement driving and dressing of core.
17. Making moulds and cores from pattern having tail drop core and cover core.
18. Making mould and core of a step pulley with the help of sweep.
19. Making mould and cores of a flanged pipe and bend pipe with the help of skeleton pattern.
20. Preparation of mould from a plate or match plate pattern for mass production.

21. Preparation of mould for irregular parting pattern or thin pan pattern with the help of follow board.
22. Making mould of a pattern having stop off.
23. Use of master pattern and part pattern.
24. Use of draw back system.
25. Preparing layouts for simple patterns showing various allowances.
26. Making simple 'flat back' patterns of various shaped blocks having draft and contradictions allowances as per lay out.
27. Preparing "self core" pattern with draft on internal and external vertical faces as per lay out.
28. Preparing patterns with 'selfcore' portions such as packing gland bearing bracket, surface plate and simple machine base.
29. Turning various simple forms (between centres, and on face plate) on wood turning lathe.
30. Grinding and sharpening of wood turning tools.
31. Preparing patterns of simple forms with core prints.
32. Preparing core boxes of simple forms.
33. Turning patterns for bushing (plane and collered) in solid and split design with core prints.
34. Preparing split patterns for flanged pipes and their core boxes.
35. Preparing patterns with balancing core prints.
36. Preparing patterns for various shaped brackets, comprising the construction of web and rib, bosses and lose pieces.
37. Preparing patterns with tail core prints and ram up core.
38. Preparing core boxes for ram up cores.

39. Making patterns with straight and irregular parting lines, comprising the formation of arms at angles, ribs and bosses fillets from solid stock such as simple levers rocker arm lever, off set lever and bell crank lever.
40. Brazing sharpening and setting of band saw blades.
41. Preparing patterns for hand wheels of simple form by turning and forming the arms by hand operations.
42. Making follow board of simple forms.
43. Preparing patterns for various types of pipes, involving turning shaping and fitting of branches such as T elbows lateral Y and U shaped pipes patterns and their core boxes.
44. Designing and preparing templates of various forms as required.

Shop Training : 2 Years :

45. Instructions on safety precautions on the shop floor.
46. Metal work : Simple filing operations such as chipping, sawing filing simple fitting of the parts-drilling and tapping.
47. Preparing patterns of circular form involving turning formation or construction of arms (odd and even numbers) building up rims in segmental construction such as hand wheels flanged rings pulleys rope pulleys.
48. Preparing section or segment core boxes for wheels pulleys for preparing moulds by core assembly.
49. Making patterns with cover core print such as patterns for piston, elbow with side outlet and their core boxes.
50. Preparing split patterns with non-identical cope and drag parts involving working out curved forms from solid stock such as patterns for lathe tail stock, shackle, pipe vice, bench vice and their core boxes.

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51. Finishing and painting of patterns as per ISI colour scheme.
52. Making pattern in "Shell" form involving turning internal, external shapes on curving out by hand tools such as patterns for cylinder head, electric motor side shell C.I. switch box cover.
53. Preparing "Follow board for Shell" form patterns using plaster of paris.
54. Preparing pattern for air chamber and its core model involving turning.
55. Preparing core box for air chamber pattern by joining series of strips (b) using plaster of paris.
56. Making patterns involving web and rib, construction of thin section such as pattern for J hanger bracket.
57. Preparing patterns and core boxes for various types of valve.
58. Preparing pattern for pipes and their core boxes involving building of stock in stepped form and finishing them such as water jacketed pipe and its core boxes.
59. Preparing patterns for pipes and elbows and their core boxes involving staved construction.
60. Making patterns for gear wheels, sprocket wheels involving turning and formation of teeth.
61. Preparation segment or part core boxes for gear wheel patterns for making moulds by core assembly.
62. Preparing "Master Patterns" for casting metal patterns and core boxes.  
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63. Finishing cast metal patterns and core boxes by hand tools and machine tools.  
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64. Preparing moulds using plaster of paris epoxy resins.  
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65. Preparing patterns and core boxes using epoxy resins.  
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66. Making skeleton patterns and core boxes with strickles.

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67. Preparing sweeps of various forms for loam moulding.
68. Preparing and mounting various types of patterns on match plates (Wooden and metal) including gating systems.
69. Making patterns for chills for producing chilled castings.
70. Preparing patterns for core dryers of various forms.
71. Making of different types of production patterns.
- \* 72. Use of production patterns for machine mould.
- \* 73. Performing various operations on wood working machines used for pattern making.
- \* 74. Inspection of patterns and core boxes.
- \* 75. Inspection of castings.
- \* 76. Repair and maintenance of the patterns and core boxes.
- \* 77. Machine shop observation of various machining operations.

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. Trade Theory,
2. Workshop Calculation and Science.
3. Engineering Drawing.
4. Social Studies.

### FIRST YEAR :

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

### SECOND YEAR :

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

### THIRD YEAR :

#### Trade Theory :

1. Safety at work-accident do not happen, they are caused.
2. Revision of previous 2 years work.
3. Brief description of materials other than wood and metal used in pattern work e.g.plaster of paris,wall araldite, special resins etc. their properties & uses
4. Heat treatment of metals-annealing, hardening, tempering, normalising and case-hardening.
5. Patterns-types of patterns such as one piece pattern, split pattern, loose pieces, sweep pattern,skeleton pattern, mounted pattern etc and introduction to metal pattern-making.

6. Economic construction of large and intricate patterns, numbering, storing and preservation of patterns. Printing of patterns according to ISI standards. Finishing materials used in pattern work e.g. shellac etc.
7. Timbers-different types, their properties and uses, seasoning, storing and preservation of timber.
8. Machine tools description and use of pattern makers' wood lathe, universal saw (bench), band saw, planer and jointer, universal wood working machines. Routine maintenance of those machines.
9. Allowances in construction of patterns. use of construction rule.
10. Brief manufacturing process for pig iron, cast iron, wrought iron, steel and copper, aluminium base alloys, bearing metals etc.
11. Use of tables and manufacturers hand books.
12. Modern development in the trade-new techniques etc.
13. Inspection-reduction of scrap by stage inspection.
14. Introduction of work simplification related to the trade job study, job analysis including planning of sequence of operation, critical approach and method of working, estimation of time and material job handling.
15. Quality and finish of work-importance of quality and finish of jobs at all stages.

(2) Workshop Calculation and Science :

1. Revision of work of previous two years.
2. Problems connected with estimation of time and materials.
3. Further problems as applicable to the trade.
4. Further problems on mensuration work, power and energy.
5. Meaning of tenacity, elasticity, malleability, brittleness, hardness, compressibility and ductility.

6. Meaning of stress, strain, modulus of elasticity, ultimate tensile strength, factor of safety and different types of stresses.
7. Gear and belt drives. Determination of horse power, speed and size of pulleys and gears.
8. Determination of force on the piston ram etc.
9. Velocity, acceleration and retardation.
10. Descriptive explanation of expansion of solids, liquids and gases due to heat, co-efficient of expansion, brief description of transference of heat conduction, convection and radiation.
11. Quantity of heat unit of heat, B.Th., U.C.H.U. calories-specific heat of liquids and solids calorific value of different types of fuels.
12. Heat and temperature thermometric scale-farenheit and centigrade, conversion of farenheit and centigrade.. Conversion of farenheit scale to centigrade and vice-versa. Measurement of temperature. Name and brief description of the temperature measuring instruments used in the workshop including those for high temperature i.e. optical and immersion pyrometers.
13. Calculation of weight from pattern to casting hollow and solid.

(3) Engineering Drawing :

1. Revision of previous two years' work.
2. Explanation of I.S.I. standards for Engineering Drawing (IS : 696-1907).
3. Free hand sketching of objects related to the trades.
4. Advanced Blue Print Reading.
5. Curves of inter-pretations-simple exercises.
6. Drawings of different types of joints used in pattern making.

(4) Social Studies :

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