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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

FOUNDRYMAN

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4

SECTOR – CAPITAL GOODS AND MANUFACTURING

कौशलं बलम्
Directorate General of Training

FOUNDRYMAN

(Engineering Trade)

(Revised in 2019)

Version: 1.2

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 4

Developed By

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1. COURSE INFORMATION

During the one-year duration of Foundryman trade, a candidate is trained on subjects Professional Skill, Professional Knowledge, Engineering Drawing, Workshop Science & Calculation and Employability Skills related to job role. In addition to this, a candidate is entrusted to make/do project work and Extra Curricular Activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously theory subject is taught in the same fashion to apply cognitive knowledge while executing task.

It broadly covers all aspects of skills required to make casting in foundry industry.

It broadly covers safety aspect in general to safety aspect specific to the trade, identify tools & equipment, raw materials used in casting. Further sand sieving and mixing, sand testing is taught. Other operations like ramming, channel cutting, sand preparation, backing and gate cutting are covered. In addition, core making, preparation of green sand mould, leveling of floor, bedding in mould, preparing mould with different types of core, preparing differing mould as per equipment are also covered. The related wood working different pattern making are also part of the practical task. Different metal working like chipping, filing, grinding, drilling etc. are also covered. Finally, the melting practice on induction furnace is undertaken. Preparation of different moulds viz., loam sand mould, pit mould, CO_2 mould and making casting is covered in the beginning. In addition, preparation of mould with different core setting viz., balancing core, hanging core along with casting different metals are covered. Finding the yield percentage is also part of the practical task. Simultaneously preparation of complete core by joining half core is covered. Further, preparation of mould with different gates viz., pencil, finger, wedge ring, branch, relief sprue, skim bob, horn gate, stepped gate etc. including making casting of different metal is covered. Practical skills like relining different furnace viz., fit, oil fired, muffles are covered along with ladle. The preparations of core by linseed oil and ivpoils, preparing mould without pattern are also part of practical skills. Finally, making cast by die & investment casting are covered.

2. TRAINING SYSTEM

2.1 GENERAL

The Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers a range of vocational training courses catering to the need of different sectors of economy/ Labour market. The vocational training programmes are delivered under the aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

Foundryman trade under CTS is one of the most popular courses delivered nationwide through a network of ITIs. The course is of one-year duration. It mainly consists of Domain area and Core area. In the Domain area, Trade Theory & Practical impart professional skills and knowledge, while Core area (Workshop calculation science, Engineering Drawing and Employability Skills) imparts requisite core skill, knowledge and life skills. After passing out of the training programme, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Candidates broadly need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan work, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job.
- Check the job/assembly as per drawing for functioning, identify and rectify errors in job/assembly.
- Document the technical parameters related to the task undertaken.

2.2 PROGRESSION PATHWAYS:

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise up to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1	Professional Skill (Trade Practical)	1000
2	Professional Knowledge (Trade Theory)	280
3	Workshop Calculation & Science	80
4	Engineering Drawing	80
5	Employability Skills	160
	Total	**1600**

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The **Continuous Assessment** (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in.

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted by **Controller of examinations, DGT** as per the guidelines. The pattern and marking structure is being notified by DGT from time to time. **The learning outcome and assessment criteria will be basis for setting question papers for final assessment. The examiner during final examination will also check** individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%. There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/wastage as per procedure, behavioral attitude, sensitivity to environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.
Assessment will be evidence based, comprising the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examination body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60-75% to be allotted during assessment	
For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices.	• Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. • 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. • A fairly good level of neatness and consistency in the finish. • Occasional support in completing the project/job.
(b) Weightage in the range of 75-90% to be allotted during assessment	

For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices.	• Good skill levels in the use of hand tools, machine tools and workshop equipment. • 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. • A good level of neatness and consistency in the finish. • Little support in completing the project/job.
(c) Weightage in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment. • Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

In Foundryman trade, Mould maker makes mould by hand or machine which is a basic step for making casting metal parts. Mould may be Green sand mould, chemically banded sand (hot box or cold box) mould. Core maker makes core by core box or using machine, for placing inside the mould to have designed holes, undercut or recesses. Metals are melted in different types of furnaces. Different types of treatments are done during meting and pouring of metal inside into the mould. After solidifying, the casting are cleaned and required to improve on machinability, mechanical & metallurgical properties and also reliving internal stresses caused due to process. Executes annealing normalizing and tempering as part of heat treatment.

Foundry charge calculation for cupola, induction and Arc furnaces are necessary to get correct quality of metal considering melting losses.

Plan and organize assigned work, and detect & resolve issues during execution in his own work area within defined limit. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

Reference NCO-2015:

(i) 7211.0100 – Moulder, General
(ii) 8121.4200 – Die Casting Machine Operator
(iii) 8121.4700 – Core Maker, Machine
(iv) 8121.4600 – Annealer, Metal

4. GENERAL INFORMATION

Name of the Trade	**FOUNDRYMAN**
Trade Code	DGT/1031
NCO - 2015	7211.0100, 8121.4200, 8121.4700, 8121.4600
NSQF Level	Level-4
Duration of Craftsmen Training	One Year (1600 Hours)
Entry Qualification	Passed 10th class examination
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, LC, DW, AA, LV, DEAF
Unit Strength (No. Of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	128 Sq. m
Power Norms	11 KW
Instructors Qualification for	
(i) Foundryman Trade	B.Voc/Degree in Mechanical/Metallurgy Engineering/Advanced Diploma in Foundry Technology from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Mechanical/Metallurgy Engineering from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/NAC passed in the trade of "Foundryman" with three-year experience in the relevant field. **Essential Qualification:** Relevant National Craft Instructor Certificate (NCIC) in any of the variants under DGT. ***Note:- Out of two Instructors required for the unit of 2(1+1), one must have Degree/Diploma and other must have NTC/NAC qualifications. However, both of them must possess NCIC in any of its variants.***
(ii) Workshop Calculation & Science	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE/ recognized board of

	technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade **OR** NCIC in RoDA or any of its variants under DGT
(iii) Engineering Drawing	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Engineering from AICTE/ recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field. **OR** NTC/ NAC in any one of the engineering trades with three years' experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade **OR** NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT.
(iv) Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills from DGT institutes. (Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above) **OR** Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills from DGT institutes.
(v) Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

Distribution of training on hourly basis: (Indicative only)

Total Hrs /week	Trade Practical	Trade Theory	Workshop Cal. & Sc.	Engg. Drawing	Employability Skills
40 Hours	25 Hours	7 Hours	2 Hours	2 Hours	4 Hours

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES (TRADE SPECIFIC)

1. Categorize different types of tools, equipment & raw material used in foundry following safety precautions.
2. Prepare sand mix for moulding.
3. Perform different types of sand testing & find out result.
4. Produce green sand moulds by using appropriate hand tools.
5. Produce different casting components by different metal with different moulding process and finish the casting as per requirement.
6. Produce wooden joint, make pattern and repair defective pattern and boxes.
7. Prepare mould with loose piece pattern and loose piece core box.
8. Perform metal working such as marking, sawing, filling, grinding, drilling etc.
9. Make casting of aluminium/ magnesium by melting on Induction furnace & identify defects.
10. Prepare mould by different moulding process, make cast iron castings identify defects.
11. Make a casting, fettle the casting & calculation yield percentage.
12. Prepare complete core by joining half cores.
13. Make mould by various types of gate to produce different type of metal casting. Find out defects & visit industry to show different operation for casting making.
14. Make an extra thick casting & finish it.
15. Reline & prepare different types of furnaces for melting cast metals.
16. Make core by using linseed oil & IVP oils.
17. Prepare mould without pattern & with sweep pattern.
18. Make casting by die casting process & yield percentage of casting.
19. Make casting by investment casting process & binder less process.

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
1. Categorize different types of tools, equipment & raw material used in foundry.	Select appropriate tools & equipment.
	Identify raw materials used in foundry.
	Ensure function of every raw material.
	Ensure proper use of every tools and equipment.
	Identify wrong & defective tools &equipment.
2. Prepare sand mix for moulding.	Plan & identify tools, equipment required for the job.
	Select raw materials required for preparing sand mix.
	Prepare the proper mixing of the sand.
	Check the correct proportion of the mixing sand.
	Check the moisture content of the mixing sand.
3. Perform different types of sand testing & find out result.	Identify testing specific equipment for particular test.
	Check accuracy of the equipments.
	Perform sand test correctly.
	Evaluate testing result.
4. Produce green sand moulds by using appropriate hand tools.	Plan &identify tools &equipments required for producing green sand mould.
	Select the raw materials, pattern required for making mould & channels.
	Make necessary mould with the given pattern and cut channel cutting & gate cutting observing standard procedure.
	Make coating of pattern observing standard procedure.
	Repair the mould, if necessary.
5. Making different types of core. Produce different casting components by different metal with different moulding process and finish the casting as	Plan & identify proper tools and equipments for making different casting components.
	Select all raw materials required for the mould, different metal melting.
	Select pattern for the mould.
	Make the floor and level it and level checked with sprit level & straight edge.
	Make the core with the help of core box and assemble the mould with

per requirement.	core.
	Select all charging materials for casting.
	Prepare the furnace for melting the metal as per type of metal.
	Pour melting metal into the mould cavity with special care. (maintain all safety measure)
	Fettle the casting carefully.
6. Produce wooden joint, make pattern and repair defective pattern and boxes.	Plan & identify proper tools for making wooden joint, making pattern and for repair patterns & core boxes.
	Study the design for the wooden joints.
	Perform all operations and make the joints.
	Observe safety procedure during above operations.
	Check dimensional accuracy as per standard procedure.
	Avoid waste.
7. Prepare mould with loose piece pattern and loose piece core box.	Plan & identify proper tools and equipments required.
	Select loose piece pattern.
	Select loose piece core box.
	Select raw material for sand mixer.
	Mix the sand with write quantity.
	Make the mould with loose piece pattern.
	Make core with loose piece core box.
	Make the mould and assemble it.
	Observe all step of operation during working.
	Check correctness of the job.
8. Perform metal working such as marking, sawing, filling, grinding, drilling etc.	Identify tools &equipments for making sawing, chipping, filling, grinding & drilling.
	Select appropriate material & the above operation.
	Perform above operation carefully.
	Observe safety & precaution during operation.
	Check the accuracy of the job.
9. Make casting of aluminium/ magnesium by melting on induction furnace & identify	Observe the safe working of furnace for melting metal.
	Select raw materials for charging of furnace.
	Select raw materials for making mould.
	Select pattern for making mould.
	Make mould & pour molten metal to the mould.

defects.	Observe all safety & precaution maintained during metal handling & pouring.
	Fettled the casting & observe defects.
10. Make cast iron castings by different moulding process and identify defects.	Plan & identify proper tools and equipments for making the iron casting.
	Plan & identify proper tools and equipments for making specific mould.
	Select all raw materials and prepare mould.
	Select pattern required for the job.
	Select core box for making cover core.
	Make the mould and insert core carefully.
	Pour the molten metal carefully.
	Safety should be maintained during handling and pouring of molten metal.
	Fettle the job.
	Check the job as per specification.
11. Make a casting, fettle the casting & calculation yield percentage.	Plan and identify the tools and equipments required for making casting.
	Check the core box.
	Select the pattern and check the pattern.
	Identify raw materials.
	Make mould and assemble mould.
	Identify chills & densers.
	Locate position for chills.
	Pour molten metal by observing safety.
	Check the accuracy and quality of the job.
	Calculate percentage of field.
12. Prepare complete core by joining half cores.	Identify and check core box for making jobs.
	Maintain heating temperature of core baking oven.
	Control the mixed sand composition.
	Check accuracy of dimensions and hardness of the core.
13. Make mould by various types of gate to produce different	Plan and identify all hand tools and equipments.
	Identify all raw materials.
	Select the pattern and check it.

type of metal casting and find out defects.	Mix the sand with correct proportion.
	Maintain Core during meeting.
	Maintain correct actions during working.
	Identify defects, if any.
	Repair the mould, if necessary.
14. Make an extra thick casting & finish it.	Plan and identify tools and equipments required.
	Select raw material required for the job.
	Identify pattern and core box.
	Mix the moulding sand with correct proportion and quantity.
	Follow every step for performing mould.
	Repair mould, if needed.
	Follow safety rule during carrying molten metal.
	Find out defect and check quality of the job.
15. Reline & prepare different types of furnaces for melting cast metals.	Identify tools required for relining and repairing of furnace.
	Identify raw materials required for reline and repair.
	Maintain correct proportion of charge materials.
	Maintain relining thickness.
	Maintain preheating temperature and heating time.
	Maintain quality of charge metal for muffle furnace.
	Maintain all safety and precaution during melting practice.
	Check quality of casting.
16. Make core by using linseed oil & IVP oils.	Plan and identify tool requirements.
	Identify raw materials requirements for the job.
	Maintain correct ratio for mixing the sand.
	Check hardness of cores after curing.
	Check quality and finishing of the core.
17. Prepare mould without pattern & with sweep pattern.	Plan and identify the tools and equipments required for the mould.
	Select suitable sweep pattern for sweep moulding.
	Identify raw materials for the mould.
	Mix the sand properly.
	Check dimensions of mould cavity after mould making without pattern.
	Check the dimension of the mould cavity after mould making by sweep pattern.

18. Make casting by die casting process & yield percentage of casting.	Identify the machine required for gravity die casting.
	Ensure the quality of the machine is useable.
	Observe releasing agent in applied in the metallic dies.
	Maintain pouring temperature of molten metal.
	Check the quality of the castings.
	Calculate yield percentage of casting.
19. Make casting by investment casting process & binder less process.	Identify raw materials required for making mould.
	Maintain melting temperature of wax for investment casting.
	Follow steps of making the mould.
	Maintain heating temperature for removal of wax from the mould.
	Extra care for handing the investment mould.
	Check the quality of the casting.

SYLLABUS FOR FOUNDRYMAN TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical) With Indicative Hours**	**Professional Knowledge (Trade Theory)**
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Categorize different types of tools, equipment & raw material used in foundry following safety precautions.	1. Importance of trade training, List of tools & Machinery used in the trade.(01 hr) 2. Safety attitude development of the trainee by educating them to use Personal Protective Equipment (PPE).(05 hrs) 3. First Aid Method and basic training. (02 hrs) 4. Safe disposal of waste materials like cotton waste, metal chips/burrs etc. (02 hrs) 5. Hazard identification and avoidance. (02 hrs) 6. Safety signs for Danger, Warning, caution & personal safety message. (01 hr) 7. Preventive measures for electrical accidents & steps to be taken in such accidents. (02 hrs) 8. Use of Fire extinguishers. (07 hrs) 9. Practice and understand precautions to be followed while working in fitting jobs. (02 hrs) 10. Safe use of tools and	All necessary guidance to be provided to the newcomers to become familiar with the working of Industrial Training Institute system including store's procedures. Soft skills, its importance and job area after completion of training. Importance of safety and general precautions observed in the in the industry/shop floor. Introduction of First aid. Operation of electrical mains and electrical safety. Introduction of PPEs. Response to emergencies e.g. power failure, fire, and system failure. Importance of housekeeping & good shop floor practices. Introduction to 5S concept & its application. Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. Basic understanding on Hot work, confined space work and material handling equipment.

		equipments used in the trade. (01 hr)	(07 hrs.)
		11. Video show of large foundry industries in India. 12. PPT show of various tools & equipment used in foundry. 13. Identify each and every tools &equipments as per desired specification. 14. PPT show of various raw materials used in foundry. 15. Identify each raw materials used in foundry. (25 hrs.)	History of Foundry Industries, development of foundry in India. Importance of foundry Industries. Types of foundries, Advantage of metal casting importance of quality and quality awareness. Different tools &equipments used in foundry. Different raw materials used in foundry Industries. (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Prepare sand mix for moulding.	16. Sieve the used sand with the help of riddle & shovel. (06 hrs) 17. Sieve the used sand with power riddle. (06 hrs) 18. Make Green sand mixture with tempering by shovel. (06 hrs) 19. Make green sand mixture with tempering or moisturing by sand muller. (07 hrs)	Specification tools &equipments. Procedure of use of different tools &equipments. Making of green sand mixture. Special casting process definition materials used composition, the process; use advantages and disadvantage of CO_2 process and shell moulding process. (07 hrs.)
Professional Skill 25Hrs; Professional Knowledge 07Hrs	Perform different types of sand testing & find out result.	20. Test moisture content of green sand with the help of moisture trailer or infrared driver. (05 hrs) 21. Find out clay content of sand.(05 hrs) 22. Find out permeability test of green sand with permeability tester. (05 hrs) 23. Find out strength test with universal testing machine. (05 hrs)	Sand testing different methods of moisture content test permeability test, clay content test, strength test, sand grain fineness test, refractories test of moulding sand. Common types of natural & synthetic moulding sand as per IS 3343-1965 properties of moulding sand. (07 hrs.)

		24. Find out grain fineness no. of moulding sand with sieve shaker tester. (05 hrs)	
Professional Skill 75Hrs; Professional Knowledge 21Hrs	Produce green sand moulds by using appropriate hand tools.	25. Ramming practice by open bedded method to obtain desired hardness such as 60, 70, 80, 90 by green hardness tester. (13 hrs) 26. Ramming practice in moulding boxes with hand rammers to obtain desire green hardness such as 70, 80, 90 by green hardness tester. (12 hrs)	Ramming procedure of rammer and other tools used in marking mould. Importance of hardness test. (07 hrs.)
		27. Cut channel on rammed boxes with cross section such as square, semi-circular. (07 hrs) 28. Cut channel on rammed boxed with cross section such as trapezoid & triangular and finish with cleaner & double ender etc. (08 hrs) 29. Prepare unit sand and prepare mould for block such as square, Rectangular and round.(10 hrs)	Different types of Gate cutting system with different tools used & repairs of gates. Difference between natural and synthetic moulding sand principle ingredients in moulding sand & their effect on physical properties special additives in moulding sand & their effect unit sand. (07 hrs.)
		30. Prepare facing and backing sand and simple moulds with top run gates. (12 hrs) 31. Prepare mould with self-leaving core pattern by using parting line gates. (13 hrs)	Facing sand, baking sand Composition of various moulding sand. Types of mould-advantage and disadvantage of sand mould and metal mould. Self-Core making procedure. Moulding boxes [As per IS 1280-1958] Crucible [As per IS 1748-1961] (07 hrs.)
Professional	Produce different	32. Prepare green sand mould	Definition of green sand

Skill 200 Hrs; Professional Knowledge 56 Hrs	casting components by different metal with different moulding process and finish the casting as per requirement.	by using split pattern for aluminium casting. Use natural moulding sand melt aluminium in different furnace and pour the same into moulds, fettle aluminium casting. (25 hrs)	Advantage and disadvantage of green sand mould, skin dry sand mould, loam sand mould and cement bonded sand mould. Contraction, operation and maintenance of pit furnace. (07 hrs.)
		33. Level the floor with sprit level and straight edge and prepare open sand mould. (25 hrs)	Moulding process – bench moulding different methods advantages, disadvantages and their application. (07 hrs.)
		34. Prepare bedded in mould without core with parting line gate. (12 hrs) 35. Prepare bedded in mould with core and bottom run gate. (13 hrs)	Moulding process floor moulding. Different methods; advantage and disadvantages and their application machine moulding different types of moulding machines and slinger. (07 hrs.)
		36. Prepare mould with vertical core. (10 hrs) 37. Prepare simple cores and assemble in the mould. (10 hrs) 38. Prepare mould with horizontal core and assemble in the mould.(12 hrs) 39. Prepare chair core and assemble in the mould. (18 hrs)	Core: Uses and types, composition of various cores sand mixtures. Types of core boxes core venting and vein forcing or core-core baking – core making machines. (14 hrs.)
		40. Prepare moulds for copper and copper base alloys melts copper alloy in pit furnace & pour & fettle the casting. (13 hrs) 41. Prepare moulds for copper and copper base alloys melts copper alloy in oil fired furnace & pour & fettle the	Construction: Operation & maintenance of oil fire furnace pattern- pattern materials. Difference between wooden pattern and metal pattern. (07 hrs.)

		casting. (12 hrs)	
		42. Prepare mould with draw back method & false check method. (10 hrs) 43. Prepare dry sand mould with skeleton pattern. (08 hrs) 44. Prepare black wash & coat on mould. (07 hrs)	Pattern – types of patterns- allowance on pattern colouring of pattern as per IS 1513-1959 care & maintenance of patter. Different types of coating on mould cores. (07 hrs.)
		45. Prepare stack mould. (13 hrs) 46. Prepare snap flask mould. (12 hrs)	Gating system. Various types of top run gate part line gate & bottom gate. (07 hrs.)
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Produce wooden joint, make pattern and repair defective pattern and boxes.	47. Marking on wood for half lap joint. (03 hrs) 48. Sawing on wood for half lap joint – (12 hrs) 49. Planning on wood for half lap joint. (10 hrs)	Brief description: Specification and use of various wood working hand tools. Types of joints & their application in wood working. (07 hrs.)
		50. Making different types of joints on wood. (09 hrs) 51. Prepare simple pattern. (08 hrs) 52. Repair wooden patterns & core boxes. (08 hrs)	Methods of repairing the pattern & core boxes. Induction hardening of S.G. Iron casting. (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Prepare mould with loose piece pattern and loose piece core box.	53. Prepare mould with loose piece pattern & core with loose piece core box. (25 hrs)	Prerequisites of gating system. Riser: Feeders & directional solidification chill: chaplets, denseners & exothermic materials. (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Perform metal working such as marking, sawing, filling, grinding, drilling etc.	54. Metal working – Marking and sawing on straight line – chipping and filling to desired size on different metals. (10 hrs) 55. Grinding the metals to desire size by pedestal grinder and flexible shaft grinder. (10 hrs)	Description, specification and use of common, marking measuring, sawing, chipping and filing instruments used in metal work. Types of grinders – Brief information about other metal cutting equipments. Various types of drill bits and

		56. Drilling on various metals. (05 hrs)	drilling machine. (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Make casting of aluminum/ magnesium by melting on Induction furnace & identify defects.	57. Prepare induction furnace for charging, prepare charges for charging, operate and melt aluminium/ magnesium and pour aluminium/ magnesium into the mould and identify defects. (25 hrs)	Induction furnace types- construction, operation and maintenance. (07 hrs.)
Professional Skill 125 Hrs; Professional Knowledge 35 Hrs	Prepare mould by different moulding process, make cast iron castings identify defects.	58. Prepare dry sand mould with odd sided pattern and make casting.(10 hrs) 59. Fettle the casting (07 hrs) 60. Find out defect. (08 hrs)	Description of dry sand mould. Brief description types, advantages & disadvantages of die casting, centrifugal casting and ceramic moulding process. (07 hrs.)
		61. Prepare a loam sand mould for pan shape casting. (10 hrs) 62. Prepare a loam sand mould for bell shape casting. (15 hrs)	Slush casting process, continuous casting process, permanent mould casting process; Nishiyama process (by using ferrosilicon powder) common casting defects appearance- causes and remedies- salvaging of casting. (07 hrs.)
		63. Prepare a pit mould on foundry floor. (10 hrs) 64. Prepare a mould with pattern having cover core print, assemble cover core in mould and cast by cast iron. (12 hrs) 65. Find out all defects. (03 hrs)	Slush casting process, continuous casting process, permanent mould casting process; Nishiyama process (by using ferrosilicon powder) common casting defects appearance- causes and remedies- salvaging of casting. (07 hrs.)
		66. Prepare simple CO2 mould.(07 hrs) 67. Prepare simple CO2 core. (08 hrs) 68. Assemble in CO2 mould	Fettling of casting knock out and removal and removal of casting from mould removal of gates & risers; Fins & unwanted projection – surface gleaning

		core.(05 hrs) 69. Make a casting by C.I. (02 hrs) 70. Fettle the casting. (02 hrs) 71. List out casting defects. (01 hrs)	trimming and finishing. Inspection of casting – destructive method – non-destructor materials used in foundry and their grades as per I.S. (07 hrs.)
		72. Prepare mould for setting "Balancing core" and set balanced core in mould with the help of chaplets. (20 hrs) 73. Make an aluminium casting using pit furnace. (03 hrs) 74. Fettle the casting. (02 hrs)	Binders - Common binders used in foundry and their application and their grades as per I.S. Common "Facing Materials" used in foundry and their application and their grades as per I.S. Casting design functional design, simplification of foundry practice. Metallurgical design, economic consideration. (07 hrs.)
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Make a casting, fettle the casting & calculation yield percentage.	75. Prepare a mould for setting "Hanging core and set hanging core in mould with the help of chaplets". (15 hrs) 76. Make a casting. (05 hrs) 77. Fettle the casting.(03 hrs) 78. Find out yield percentage. (02 hrs)	Common "Fluxes" used in foundry and their application. Specification (07 hrs.)
		79. Prepare a mould using chills, densers. (20 hrs) 80. Make a casting. (04 hrs) 81. Show a video chart of ferrous & non-ferrous metals. (01 hr)	Function of chills, densers. Different between ferrous &non-ferrous metals. Physical & mechanical properties of metals. (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Prepare complete core by joining half cores.	82. Prepare core halves. (15 hrs) 83. Bake the core halves. (05 hrs) 84. Join the core valves by different methods. (05 hrs)	Classification of iron ores & its treatments. (07 hrs.)
Professional Skill 125 Hrs;	Make mould by various types of gate to produce	85. Prepare mould with pencil gate. (10 hrs) 86. Prepare mould with finger	Different gating system Common cost iron-alloys. Manufacturing process of chilled

Professional Knowledge 35 Hrs	different type of metal casting. Find out defects and visit industry to show different operation for casting making.	gate. (10 hrs) 87. Make casting with aluminium.(05 hrs)	cast iron; S.G. iron and malleable cast iron. (07 hrs.)
		88. Prepare mould with wedge gate. (10 hrs) 89. Prepare mould with ring gate.(10 hrs) 90. Make casting with copper base alloy. (05 hrs)	Effect of alloying elements for ferrous metals. Iron-carbon-equilibrium diagram of plain carbon steel. Inoculation: Purpose of inoculation. (07 hrs.)
		91. Prepare mould with branch gate mould with match plate pattern. (15 hrs) 92. Make casting with cast iron.(06 hrs) 93. Fettle the casting. (04 hrs)	Steel manufacturing process classification common steel alloys and use. (07 hrs.)
		94. Prepare mould with relief sprue gate. (10 hrs) 95. Prepare mould with skim bob gate. (10 hrs) 96. Make a casting with cast iron. (04 hrs) 97. Find out defects. (01 hr)	Advantages of sprue gate & skim bob gates. Wrought iron-manufacturing process- uses. Copper manufacturing process – properties use. (07 hrs.)
		98. Prepare mould with horn gate [Gear wheel type pattern]. (09 hrs) 99. Prepare mould with stepped gate. (09 hrs) 100. Industrial visit to observe the special casting process machine moulding process, operation of different furnaces sand reconditioning process, inspection of casting, fettling process etc. (07 hrs)	Manufacturing process properties and use of aluminium, tin, zinc, lead etc. Properties of grey iron. Microstructure, fracture, mechanical test-tensile test, hardness test etc. (07 hrs.)
Professional Skill 25 Hrs; Professional	Make an extra thick casting & finish it.	101. Prepare mould for extra thick casting with large feeder heads. (18 hrs) 102. Make casting with cast	Manufacturing process of copper base alloys, aluminium base alloys and magnesium base alloys.

Knowledge 07 Hrs		iron.(04 hrs) 103. Fettle the casting. (03 hrs)	Brief information about cupola furnace. (07 hrs.)
Professional Skill 50 Hrs; Professional Knowledge 14 Hrs	Reline & prepare different types of furnaces for melting cast metals.	104. Reline the pit furnace. (10 hrs) 105. Show a video show for operation of blast furnace. (02 hrs) 106. Relining the oil fired furnace. (10 hrs) 107. Charging of oil fired furnace & melt aluminium. (03 hrs)	Brief information about blast furnace, electric furnaces such as arc furnace and induction furnace. Brief information about open hearth furnace, air furnace, paddling furnace and convertors. (07 hrs.)
		108. Reline of ladle. (08 hrs) 109. Pre heat of ladle. (03 hrs) 110. Reline of muffle furnace.(10 hrs) 111. Metal melt by muffle furnace. (04 hrs)	Heat treatment of casting. (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Make core by using linseed oil &IVP oils.	112. Prepare simple oil sand core by using linseed oil. (15 hrs) 113. Prepare oil sand core by IVP oils. (10 hrs)	Calculation of ferrostatic pressure. Calculation of weight required on a mould. (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Prepare mould without pattern & with sweep pattern	114. Prepare simple, regular shape mould without pattern (by cutting practice). (08 hrs) 115. Prepare mould by sweep pattern. (08 hrs) 116. Make mould by ram up core. (09 hrs)	Calculation of molten metal required for different size mould (Aluminium, brass, copper, C.I. etc.) (07 hrs.)
Professional Skill 25 Hrs; Professional Knowledge 07 Hrs	Make casting by die casting process & yield percentage of casting.	117. Prepare simple casting by gravity die casting. (22hrs) 118. Calculation yield percentage.(03hrs)	Cost estimate of simple castings of different metals. Low pressure, high pressure, gravity die casting process. (07 hrs.)
Professional Skill 25 Hrs;	Make casting by investment casting	119. Prepare simple casting by investment casting	Foundry mechanization- layout of a small foundry- list of

Professional Knowledge 07 Hrs	process & binder less process.	process.(13hrs) 120. Prepare simple casting with binder less dry sand process. (12hrs)	material handling equipments and their use. (07 hrs.)
Implant training/ project works: a) Sand control tests b) Wooden joints c) Gear casting by horn gate d) Make a simple pattern e) Oil sand core f) Investment casting g) Die casting h) Ladle casting i) S.G. iron casting			

SYLLABUS FOR CORE SKILLS
1. Workshop Calculation & Science (Common for One year course) (80Hrs.)
2. Engineering Drawing (80 Hrs.)
3. Employability Skills(Common for all CTS trades) (160Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in

LIST OF TOOLS & EQUIPMENT			
FOUNDRYMAN (For batch of 24 candidates)			
S No.	**Name of the Tool & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Tool tray steel	145 x 145 x 5 cm	25 (24+1) nos.
2.	Taper trowel	18 cm round	25 (24+1) nos.
3.	Heart and square trowels	3 x 1.2 x 1.2 cm	25 (24+1) nos.
4.	Trowel heart and scoop		25 (24+1) nos.
5.	Trowel square and scoop		25 (24+1) nos.
6.	Trowel double scoop		25 (24+1) nos.
7.	Trowel double square		25 (24+1) nos.
8.	Tools Spoon	32 x 16 mm - 25 x 6 m	25 (24+1) nos.
9.	Cleaner	6 x 300 m	25 (24+1) nos.
10.	Cleaner	9 x 300 m	25 (24+1) nos.
11.	Vent wire	3 mm	25 (24+1) nos.
12.	Peg rammer		25 (24+1) nos.
13.	Flat rammer	75mm x 25mm height	25 (24+1) nos.
14.	Rapping spike forged and hardened		25 (24+1) nos.
15.	Hand bellows	25 cm	25 (24+1) nos.
16.	Safety goggles (with clear glass)		25 (24+1) nos.
17.	Goggles (antiglare heat proof)		25 (24+1) nos.
18.	Cleaner flange		25 (24+1) nos.
19.	Egg smoother		25 (24+1) nos.
20.	Smoother round corner		25 (24+1) nos.
21.	Smoother square corner		25 (24+1) nos.
22.	Steel rule	300mm	25 (24+1) nos.
23.	Apron leather or asbestos		25 (24+1) nos.
24.	Legging pad		25 (24+1) nos.
25.	Hand gloves (Leather or asbestos)		25 (24+1) nos.
B. INSTRUMENTS AND GENERAL SHOP OUTFIT			
26.	Hammers Ball Peen	0.45 kg	05 nos.
27.	Ball peen hammers	650 to 700 gms.	05 nos.
28.	Sledge hammer	8 kg	02 nos.
29.	Claw hammers	0.75 kg	02 nos.
30.	Chisel cold flat	2x22 cm	13 nos.
31.	Chisel	200x15 mm	13 nos.
32.	File Flat	30 cm Bastard	13 nos.
33.	File Flat	30 cm Second cut	13 nos.

34.	File half round	30 cm bastard	8 nos.
35.	File half round	30 cm second cut	13 nos.
36.	Folding rule	60 cm	6 nos.
37.	Steel rule	600 mm	6 nos.
38.	Caliper odd leg		4 nos.
39.	Caliper inside	15 cm	6 nos.
40.	Scriber		6 nos.
41.	Centre punch	15 cm	6 nos.
42.	Hacksaw	30 cm adjustable	13 nos.
43.	C Clamps	20 cm	13 nos.
44.	C Clamps	30 cm light duty steel	13 nos.
45.	Screw drivers	25cm with 15mm blade	13 nos.
46.	Screw drivers	15 cm	13 nos.
47.	Screw drivers	18 cm	13 nos.
48.	Pliers	20cm	5 nos.
49.	Plane grooving	6mm cutter	3 nos.
50.	Cutting Pliers		3 nos.
51.	Try Square (for wood work)		13 nos.
52.	Brick layers hammer	20cm	13 nos.
53.	Hand lamp wandering lead		3 nos.
54.	Degassing bale	10cm perforated hood	3 nos.
55.	Bench vice	12cm jaw	6 nos.
56.	Work bench for bench vice	(245x125x75cm)	6 nos.
57.	Blow lamp (Kerosene)		5 nos.
58.	Hand saw		3 nos.
59.	Steel measuring tape	3 meter	2 nos.
60.	Trammel		3 nos.
61.	Shovel hand		13 nos.
62.	Engineers try square	15 cm	5 nos.
63.	Lockers steel	with 8 drawers each	4 nos.
64.	Black board with easel		2 nos.
65.	Fire buckets (2 for water and 3 for sand)		5 nos.
66.	Stand for fire buckets		2 nos.
67.	Fire extinguisher foam chemical type		3 nos.
68.	Fire extinguisher soda ash, etc. type CO_2 gas type		1 each
69.	Face shield clear		13 nos.
70.	Helmet (engineers)		13 nos.
71.	Gauntlets leather fettling		11 pairs
72.	Gauntlets leather fettling		11 pairs

73.	Footwear asbestos over shoes		13 nos.
74.	First Aid Box based on burn treatment		1 nos.
75.	Lividers firm joint	20cm	5 nos.
76.	Moulding boxes	30 x 40 x 15 cm RSDL	25 pairs
77.	Moulding boxes	75 x 75 x 25 cm RSDL	25 pairs
78.	Snap flask	40 x 35 x 12 cm RSDL	1 pair
79.	Snap flask	30 x 30 x 10 cm RSDL	1 pair
80.	Spirit level		5 nos.
81.	Wheel Barrows		2 nos.
82.	Weighing machine	(cap: 0.001 to 150gm)	1 no.
C. GENERAL MACHINERY SHOP OUTFIT			
83.	Air Compressor with maximum working pressure	17.5 kg/cm^2	1 no.
84.	Pneumatic Rammer with Rubber Rammer head		1 no.
85.	Pneumatic Chisel (with suitable chisel)		1 no.
86.	Moulding Sand Muller	35 kg capacity with motor impeller 30 RPM	1 no.
87.	Mould Green Hardness Tester dial type.		1 no.
88.	Core hardness tester		1 no.
89.	CO_2 cylinder with CO_2 probe and Rubber Hoses	with nozzle 12 mm wheel valve	1 no.
90.	LPG Cylinder with heating torch		1 no.
91.	Cylinder trolly suitable to CO_2 cylinder and Gas Cylinder		1 no.
92.	Heating and pumping unit to suit to oil fired tilting type crucible furnace with Heating pressure gauge etc. Motorized Rotary gear oil pump pre-heater.		1 no.
93.	Sand Testing Equipment-permeability meter, Universal Strength tester, Sieve shaker, standard sand rammer, Shatter Index Tester, Clay content Tester, Speedy Moisture teller.		1 each
94.	Moulding Machine hand squeeze with stripping device pin lift type.		1 no.
95.	Weighing machine	300 kg by 100 gms	1 no.
96.	Pedestal grinder DE operated	35 cm power	1 no.

97.	Core oven	180 x 90 x 90 cm electric hot air circulated with maximum temperature 350°C adjustable	1 no.
98.	Muffle Furnace (Electric)	Capacity 20kgs.	1 no.
99.	Sand Sampler		1 no.
100.	Auto Sand riddle	3 tons/hors. ridding capacity	1 no.
101.	Sand Erator		1 no.
102.	Oil Fired tilting type crucible furnace	100 crucible	1 no.
103.	Induction furnace	(Cap:50Kg) suitable for non-ferrous metals	1 no.
104.	Pit Furnace	Cap- 100kg	1 no.
105.	Gravity die casting machine	As per requirement	1 no.
106.	USG testing machine	Digital	1 no.
107.	Magnetic particle testing equipment		1 no.
108.	LCD projector	As per requirement	1 no.
109.	Desktop computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch. Licensed Operating System and Antivirus compatible with trade related software.	1 no.
110.	Printer		1 no.
111.	White Board with stand	As per requirement	1 no.

Note:

1. *Internet facility is desired to be provided in the class room.*

ANNEXURE – II

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

List of Expert members contributed/ participated for finalizing the course curricula of Foundryman trade held on 16.05.17 at Govt. ITI- Aundh, Pune			
S No.	**Name & Designation Shri/Mr/Ms**	**Organization**	**Remarks**
Industry Experts			
1.	Dr. K C Vora, Sr. Dy. Director & Head, Arai Academy	The Automotive Research Association of India, S.No.102, Vetal Hill, Off Paud Road, Kothrud, Pune	Chairman
2.	Jayanta Patra, Sr. Manager	Micromatic Machine Tools (P) Ltd., 240/241,11th Main , 3rd Phase, Peenya Industrial Area, Bangalore	Member
3.	Kashinath M. Patnasetty, Head - Application Support Group	Ace Designers Ltd. Plot No. 7&8, IIPhase Peenya Industrial Area, Bangalore	Member
4.	Sunil Khodke, Training Manager	Bobst India Pvt. Ltd.,Pirangut, Mulashi, Pune	Member
5.	Lokesh Kumar, Manager, Training Academy	Volkswagen India Pvt. Ltd., Pune	Member
6.	Shriram Tatyaba Khaire, Executive Engineering	Sulzer India Pvt. Ltd.,Kondhapuri, Shirur, Pune	Member
7.	Milind P Desai, Sr. Shift Engineer	Atlas Copco (I) Ltd Dapodi, Pune	Member
8.	Shrikant Mujumdar, DGM	John Deere India Pvt Ltd. Pune - Nagar Road, Sanaswadi, Pune	Member
9.	G.D. Rajkumar, Director	GTTI, Coimbatore	Member
10.	Milind Sanghai, Team Manager	Alfa Laval India Ltd. Dapodi, Pune	Member
11.	Rajesh Menon, Unit Manager	Alfa Laval India Ltd., Dapodi, Pune	Member
12.	N K A Madhuubalan, DGM - QC, QA & SMPS	Sandvik Asia Pvt. Ltd., Dapodi, Pune	Member
13.	Irkar Balaji, Sr. Engineer Mfg.	Premium Transmission Ltd., Chinchwad, Pune	Member

14.	Rajendra Shelke, Sr. Engineer Mfg.	Premium Transmission Ltd., Chinchwad, Pune - 19	Member
15.	Bhagirath Kulkarni, Manager Maintenance	Tata Ficosa Auto Sys Ltd., Hinjawadi, Pune	Member
16.	Rohan More, Hr & Admin	Tata Ficosa Auto Sys Ltd., Hinjawadi, Pune	Member
17.	G. Venkateshwaran, TEC Manger- Corporate Responsibility	Cummins India Ltd.	Member
18.	Mahesh Dhokale, Engineer	Tata Toyo Radiator Ltd.	Member
19.	Pankaj Gupta, DGM- HR & IR	Tata Toyo Radiator Ltd.	Member
20.	S K Joshi Head - Business Development	Radheya Machining Ltd., Pune-Nagar Road, Sanaswadi, Pune	Member
21.	A L Kulkarni, DGM Mfg.	PMT Machines Ltd Pimpri, Pune	Member
22.	S V Karkhanis, DGM Planning	PMT Machines Ltd Pimpri, Pune	Member
23.	Kiran Shirsath, Asso. Manager M.E.	Burckhardt Compression Pvt. Ltd., Ranjangaon, Pune	Member
24.	Ajay Dhuri, Manager	Tata Motors Ltd Pimpri, Pune	Member
25.	Arnold Cyril Martin, DGM	Godrej & Boyce Mfg Co Ltd, Mumbai	Member
26.	Ravindra L. More	Mahindra CIE Automotive Ind. Ltd. Ursc- Pune	Member
27.	Kushagra P. Patel	NRB Bearings Ltd., Chiklthana Aurangabad	Member
28.	M. M. Kulkarni, Sr. Manager - Tool room	NRB Bearings Ltd., Chiklthana Aurangabad	Member
DGT & Training Institute			
29.	Nirmalya Nath, Asst. Director of Trg.	CSTARI, Kolkata	Member cum Co-coordinator
30.	Goutam Sutradhar, Prof.	Jadavpore University	Member
31.	Rajib Chaudhuri, Principal	Foundry Cluster Development Association	Member
32.	Damodar Mondal, Trg. Officer	ATI, Howrah	Member
33.	Jugal Kishore Biswas, Instructor	ITI Midnapore	Member

ABBREVIATIONS:

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities


कौशलं बलम्