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

COMPETENCY BASED CURRICULUM

PUMP OPERATOR CUM MECHANIC

(Duration: One Year)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 3.5

SECTOR –AUTOMOTIVE

Directorate General of Training

PUMP OPERATOR CUM MECHANIC

(Engineering Trade)

(Revised in March 2023)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL – 3.5

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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1. COURSE INFORMATION

During one-year duration of “Pump Operator cum Mechanic” trade, a candidate is trained on professional skills& knowledge, and Employability Skill related to job role. In addition to this, a candidate is entrusted to undertake project work, extracurricular activities and on-the-job training to build up confidence. The broad components covered under Professional skill subject are as below: -

The trainee learns toapply safe working practices in a work shop; make choices to carry out marking out the components for basic fitting operations in the work shop; use different types of tools and work shop equipment in workshop; perform precision measurements on the components and compare parameters with specifications used in work shop practices. He/ she is able to use different type of fastening and locking devices in a in Diesel Engine; cutting tools in the work shop following safety precautions while grinding; perform basic fitting operations used in the work shop practices and inspection of dimensions; produce sheet metal components using various sheet metal operations; perform basic electrical testing in a in Diesel Engine; perform battery testing and charging operations; construct basic electronic circuits and testing; manufacture components with different types of welding processes in the given job and inspect component using Nondestructive testing methods.

During the later phase the trainee is familiarized with the identification of hydraulic and pneumatic components in a Diesel Engine Pump. He/she is able to identify and check functionality of stationary Diesel Engine – components, & engine performance on load and engine speed; diagnose and troubleshoot Diesel Engines for mechanical &electrical causes; servicing of plain/journal bearings, anti-friction bearings; identify and check functionality of major components and assemblies of reciprocating pumps, rotary pumps. They are trained to ascertain and select measuring instrument and measure dimension of components and evaluate for accuracy; use different types of conventional and special tools, hardware, fasteners and work shop equipment in the workshop; trouble shooting of pumps; identify and check functionality of major components and assemblies of centrifugal pumps; identify and check functionality of major components and assemblies of submersible pumps; carryout repairs in the fuel feed system; apply safe working practices and environment regulation in an workshop; construct electrical circuits and test its parameters by using electrical measuring instruments etc.

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.

Pump Operator cum Mechanic trade under CTS is one of the popular courses delivered nationwide through a network of it is. The course is of one-year duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area(Employability Skills)imparts requisite core skill, knowledge and life skills. After passing out of the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainees broadly need to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan and organize work processes, identify necessary materials and tools;
- Perform work with due consideration to safety rules, Govt. Bye laws and environmental protection stipulations;
- Apply professional skill, knowledge & employability skills while performing jobs.
- Check the components as per drawing for functioning, identify and rectify errors in components.
- Document the technical parameters related to the work undertaken.

2.2 PROGRESSION PATHWAYS

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise to the level of Manager.
- Can become Entrepreneur in the related field.
- Can join Apprenticeship program 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 it is.
- 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)	840
2	Professional Knowledge (Trade Theory)	240
3	Employability Skills	120
	Total	**1200**

150 hours of mandatory OJT (On the Job Training) of industry opportunity not available the group project is mandatory.

4	On the Job Training (OJT)/ Group Project	150
5	Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification, or, add on short term courses.

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 has 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 are 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.

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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%.

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 some of 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
- Computer based multiple choice question examination
- Practical Examination

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 for formative assessment:

Performance Level	Evidence
(a) Marks 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) Marks 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) Marks 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

Pump-Station Operator, Waterworks; Operates pumping equipment to transfer raw water to treatment plant, or distribute processed water to residential, commercial, and industrial establishments: Turns valves, pulls levers, and flips switches to operate and control turbine- or motor-driven pumps that transfer water from reservoir to treatment plant, or to transfer processed water to consumer establishments. Reads flow meters and gauges to regulate equipment according to water consumption and demand. Inspects equipment to detect malfunctions, such as pump leaks or worn bearings. Repairs and lubricates equipment, using hand tools. Records data, such as utilization of equipment, power consumption, and water output in log. May operate equipment to treat and process raw water. May test water for chlorine content, alkalinity, acidity, or turbidity.

Pump Man (Petroleum Refining); Controls pumps and manifold systems to circulate crude semi compressed and finished petroleum products, water and chemical solutions through processing and storage departments of refinery according to schedules or instructions and plans movement of product through lines of processing and storage unit, utilizing knowledge of interconnections and capacities of pipelines, valve manifolds, pumps and tanks. Synchronizes activities with other pump houses to assure continuous flow of products and minimum contamination between products. Starts battery of pumps, observes pressure and flow meter and turns valve to regulate pumping speeds according to schedules. Turns hand wheels to open line valves to direct flow of product. Signals by telephone to operate pumps in designed units to open and closed pipeline and tank valves and to gauge, sample and determine temperature of tank contents. Records operating data, such as products and quantities pumped, stocks used, gauging results and operating time. May blend oil and gasoline. May repair pumps, lines and auxiliary equipment.

Reference NCO-2015:

a) 3132.0600 – Pump-Station Operator, Waterworks
b) 3134.0300 – Pump Man (Petroleum Refining)

Reference NOS:

a) PSC/N0136
b) SGJ/N1702
c) PSC/N0133
d) PSC/N0131
e) PSC/N0132
f) PSC/N0134
g) PSC/N0135
h) PSC/N9901
i) PSC/N0139
j) PSC/N0140
k) PSC/N0130
l) ASC/N9416
m) ELE/N9412
n) PSS/N6002
o) PSS/N9406
p) CSC/N0204
q) PSC/N9406
r) CSC/N9404
s) ASC/N9404
t) ASC/N9438
u) CSC/N0901
v) PSC/N0151
w) PSC/N0152
x) PSC/N0153
y) PSC/N0154
z) ASC/N9405
aa) PSS/N1709
bb) PSC/N9415
cc) CSC/N9401
dd) CSC/N9402

4. GENERAL INFORMATION

Name of the Trade	**PUMP OPERATOR CUM MECHANIC**
Trade Code	DGT/1044
NCO – 2015	3132.0600; 3134.0300
NOS Covered	PSC/N0136, SGJ/N1702, PSC/N0133, PSC/N0131, PSC/N0132, PSC/N0134, PSC/N0135, PSC/N9901, PSC/N0140, PSC/N0130, ASC/N9416, ELE/N9412, PSC/N0139, PSS/N6002, PSS/N9406, CSC/N0204, PSC/N9406, CSC/N9404, ASC/N9404, ASC/N9438, CSC/N0901, PSC/N0151, PSC/N0152, PSC/N0153, PSC/N0154, ASC/N9405, PSS/N1709, PSC/N9415, CSC/N9401, CSC/N9402
NSQF Level	Level-3.5
Duration of Craftsmen Training	One Years (1200 hours + 150 hours OJT/Group Project)
Entry Qualification	Passed 10th class examination with Science and Mathematics or with vocational subject in same sector or its equivalent.
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)	20 (There is no separate provision of supernumerary seats)
Space Norms	84 Sq. m
Power Norms	11 KW
Instructors Qualification for	
1. Pump Operator cum Mechanic Trade	B.Voc/Degree in Automobile/ Mechanical Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field. **OR** 03 years Diploma in Automobile/ Mechanical 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 "Pump Operator cum Mechanic" with three-year post qualification experience in the relevant field. **<u>Essential Qualification</u>:** Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) 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.***
2. Workshop	B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering

Calculation & Science	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.
3. 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/ Draughtsman group of trades with three years' experience. **Essential Qualification:** Regular / RPL variants of National Craft Instructor Certificate (NCIC) in relevant trade OR Regular/RPL variants NCIC in RoDA or any of its variants under DGT
4. Employability Skill	MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills. (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.
5. Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

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

1. Comply with environment regulations and housekeeping in the workshop following safety precautions. (NOS: PSC/N0136, SGJ/N1702)
2. Make choices to carry out marking out the components for basic fitting operations in the workshop. (NOS: PSC/N0131, PSC/N0133, PSC/N0132, PSC/N0134, PSC/N0135, PSC/N0139, PSC/N9901)
3. Use different types of tools and workshop equipment in the workshop. (NOS: PSC/N0140)
4. Perform precision measurements on the components and compare parameters with specifications used in workshop practices. (NOS: PSC/N0130)
5. Use of different type of fastening and locking devices. (NOS: ASC/N9416)
6. Use cutting tools in the workshop, following safety precautions while grinding. (NOS: PSC/N0136)
7. Perform basic fitting operations used in the workshop practices and inspection of dimensions. (NOS: PSC/N0131, PSC/N0133, PSC/N0132, PSC/N0134, PSC/N0135, PSC/N0139, PSC/N9901)
8. Perform basic pipe bending & fitting etc. (NOS: PSC/N0133, PSC/N0131)
9. Perform basic electrical testing in Diesel Engine. (NOS: ELE/N9412)
10. Perform battery testing and charging operations. (NOS: PSS/N6002)
11. Construct basic electronic circuits and testing. (NOS: PSS/N9406)
12. Manufacture components with different types of welding processes in the given job. (NOS: CSC/N0204)
13. Inspect the component using Non-destructive testing methods. (NOS: PSC/N9406)
14. Identify the hydraulic and pneumatic components (NOS: CSC/N9404)
15. Identify and check functionality of stationary Diesel Engine - components, & engine performance on load and engine speed. (NOS: ASC/N9404)
16. Diagnose and Troubleshoot Diesel Engines for Mechanical & Electrical causes. (NOS: ASC/N9438)
17. Servicing of plain/journal bearings, anti-friction bearings. (NOS: CSC/N0901)
18. Identify and check functionality of major components and assemblies of reciprocating pumps. (NOS: PSC/N0151, PSC/N0152)
19. Identify and check functionality of major components and assemblies of rotary pumps. (NOS: PSC/N0151, PSC/N0152)
20. Ascertain and select measuring instrument and measure dimension of components and evaluate for accuracy. (NOS: PSC/N0154)
21. Use different types of conventional and special tools, hardware, fasteners and workshop equipment in the workshop. (NOS: PSC/N0153)

22. Trouble shooting of pumps. (NOS: PSC/N0154)
23. Identify and check functionality of major components and assemblies of centrifugal pumps. (NOS: PSC/N0151, PSC/N0152)
24. Identify and check functionality of major components and assemblies of submersible pumps. (NOS: PSC/N0151, PSC/N0152)
25. Carryout repairs in the fuel feed system. (NOS: ASC/N9405)
26. Construct electrical circuits and test its parameters by using electrical measuring instruments. (NOS: ELE/N9412)
27. Identify and check functionality of major components and assemblies of A.C motors. (NOS: PSS/N1709)
28. Identify different type of keyways, preparing keys to fit into keyways. (NOS: PSC/N9415)
29. Identify, select, and use different types of knots. (NOS: PSC/N0136)
30. Identify, select, use of different types of lifting tackles. (NOS: PSC/N0136)
31. Identify and check functionality of major components and assemblies of bushes, bearing sand couplings. (NOS: CSC/N0901)
32. Read and apply engineering drawing for different application in the field of work. (NOS: CSC/N9401)
33. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
1. Comply with environment regulations and housekeeping in the workshop following safety precautions. (NOS: PSC/N0136, SGJ/N1702)	Identify environmental pollution and contribute to the avoidance of instances of environmental pollution.
	Carryout maintenance and cleaning of workshop and lifting equipment.
	Take opportunities to use energy and materials in an environmentally friendly manner.
	Avoid waste and dispose waste as per procedure.
	Recognize different components of 5S and apply the same in the working environment.
	Demonstrate on safe handling and Periodic testing of lifting equipment and Safety disposal of used engine oil.
2. Make choices to carry out marking out the components for basic fitting operations in the workshop. (NOS: PSC/N0131, PSC/N0133, PSC/N0132, PSC/N0134, PSC/N0135, PSC/N0139, PSC/N9901)	Mark according to drawings by using marking tools on the work pieces.
	Chip the job in accordance with standard specifications and tolerances.
	Measure all dimensions in accordance with standard specifications and tolerances.
3. Use different types of tools and workshop equipment in the workshop. (NOS: PSC/N0140)	Identify the different types of hand and power tools used in the workshop.
	Operate various tools and workshop equipment.
4. Perform precision measurements on the components and compare parameters with specifications used in workshop practices (NOS: PSC/N0130)	Measure all dimensions in accordance with standard specifications and tolerances by using precision measuring instruments.
	Measure the parameters related with the inDiesel Engine components for its effective operation by matching with manufacturer's specification using different gauges.
5. Use of different type of fastening and locking	Identify the different type of fasteners and locking devices used in the in Diesel Engine.

devices in a in Diesel Engine. (NOS: ASC/N9416)	Use different types of locking devices correctly.
	Specify the bolt and nut threads.
	Practice on removing the damaged studs and bolts.
6. Use cutting tools in the workshop, following safety precautions while grinding. (NOS: PSC/N0136)	Identify cutting tool materials and their application.
	Plan and grind cutting and marking tools.
	Measure the tool angles with gauges.
7. Perform basic fitting operations used in the workshop practices and inspection of dimensions (NOS: PSC/N0131, PSC/N0133, PSC/N0132, PSC/N0134, PSC/N0135, PSC/N0139, PSC/N9901)	Mark according to drawing by using marking tools on flat surfaces.
	Hack saw and file the job using different methods and perform in accordance with the standard specifications and tolerance.
	Drilling and reaming on flat surfaces.
	Identify and use hand tools for internal and external threading with taps and dies.
	Measure all dimensions in accordance with standard specification and tolerances.
8. Perform basic pipe bending & fitting etc. (NOS: PSC/N0133, PSC/N0131)	Practice on making Rectangular Tray
	Pipe bending, Fitting nipples unions in pipes
	Produce components as per the drawing.
9. Perform basic electrical testing in a in Diesel Engine. (NOS: ELE/N9412)	Plan and organize the work for electrical component testing.
	Tracing the electrical components in a in Diesel Engine.
	Test continuity and voltage drop in the electrical circuits.
	Operate the electrical components in a in Diesel Engine and test lamps.
10. Perform battery testing and charging operations. (NOS: PSS/N6002)	Ascertain and select tools and materials for the job.
	Comply with safety rules when performing the following operations.
	Plan and select different methods for charging the battery.
	Perform battery testing as per the operating procedure.
11. Construct basic electronic circuits and testing. (NOS: PSS/N9406)	Plan and select different types of basic electronic components and measuring instruments.
	Construct and test the basic electronic gate circuits and its components as per the standard procedure.

12. Manufacture components with different types of welding processes in the given job. (NOS: CSC/N0204)	Plan and select appropriate method to produce components with welding process.
	Comply with safety rules when performing the above operations.
	Mark according to the drawing using marking tools on the job.
	Select appropriate tools and equipment to perform the above operations.
	Set up and produce component as per standard operating procedure.
13. Inspect the component using Nondestructive testing methods. (NOS: PSC/N9406)	Classify different in Diesel Engine components by its manufacturing processes.
	Ascertain and select tools and equipment to do NDT test the given job**.**
	Plan and organize the work for nondestructive testing.
	Perform different types of nondestructive tests using appropriate testing equipment.
	Observe safety/precaution during testing the job.
14. Identify the hydraulic and pneumatic components. (NOS: CSC/N9404)	Comply with safety rules when performing the following operations.
	Locate and identify the hydraulic components in a in Diesel Engine.
	Locate and identify the pneumatic components in a in Diesel Engine.
15. Identify and check functionality of stationary Diesel Engine - components, & engine performance on load and engine speed. (NOS: ASC/N9404)	Identify the components of given stationary Diesel Engine and its function.
	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
	Plan work in compliance with standard safety norms.
	Demonstrate possible solutions and agree tasks within the team.
	Identify different gauges fitted on the board and check for proper functioning.
	Perform daily checks before starting the engine.
	Start the engine and allow it to warm up.
	Identify the problem in functionality of Tachometer, Odometer, temp and Fuel gauge under ideal and on load condition fitted on board and record the reading and compare it with standard reading.
	Repair / Replace the defective gauges as per standard operating practice.
	Check for proper functionality.
	Stop the engine.
16. Diagnose and	Ascertain and select tools and materials for the job and make this

Troubleshoot Diesel Engines for Mechanical & Electrical causes. (NOS: ASC/N9438)	available for use in a timely manner.
	Plan work in compliance with standard safety norms.
	Carryout the diagnostic procedure by reviewing engine technical workshop manual, following the standard diagnostic procedure for Engine cranks but Not Starting. High Fuel Consumption Engine overheating, Low Power Generation, Excessive oil consumption Low/High Engine Oil Pressure, Engine Noise.
17. Servicing of plain/journal bearings, anti-friction bearings. (NOS: CSC/N0901)	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
	Plan work in compliance with standard safety norms.
	Use the tools and equipment in the way specified by manufacturers to Mounting of bearing on shafts and in housing with proper fit &axis alignment.
	Carryout their Mounting of bearing on shafts and in housing with proper fit & axis alignment by reviewing: Technical data. Removal and replacement procedures. Legal requirements.
	Cleaning up & removing old metal form bearing and replacing with new metal.
	Checking of shafts for alignment with dial indicator.
18. Identify and check functionality of major components and assemblies of reciprocating pumps. (NOS: PSC/N0151, PSC/N0152)	Use of PPE while dismantling and assembling of reciprocating pumps.
	Select tools and materials for the job and make this available for use in a timely manner.
	Use the tools and equipment in the way specified by manufacturers to Dismantle and assembles of reciprocating pumps.
	Carryout their Dismantling and assembling of reciprocating pumps by reviewing: Technical data. Removal and replacement procedures. Legal requirements.
	Check for performance of reciprocating pumps
19. Identify and check functionality of major	Select, care and use of PPE while dismantling and assembling of rotary pumps.

components and assemblies of rotary pumps. (NOS: PSC/N0151, PSC/N0152)	Select tools and materials for the job and make this available for use in a timely manner.
	Use the tools and equipment in the way specified by manufacturers to Dismantle and assembles of rotary pumps.
	Carryout their Dismantling and assembling of rotary pumps by reviewing: Technical data. Removal and replacement procedures. Legal requirements.
	Check for performance of rotary pumps.
20. Ascertain and select measuring instrument and measure dimension of components and evaluate for accuracy. (NOS: PSC/N0154)	Perform servicing of pumps & valves of given general purpose and of corrosive fluids.
	Select gasket, packing gland materials, mark & cut off gasket as per given shape & profile.
	Demonstrate us of gasket cement for fixing & stop leakage.
21. Use different types of conventional and special tools, hardware, fasteners and workshop equipment in the workshop. (NOS: PSC/N0153)	Carryout maintenance of lubrication system.
	Perform fitting of flanges & assembling of given pipe work.
	Demonstrate use of tee, elbow, bend, socket, rectifiers and other pipe fittings for cutting threads & pipes.
22. Trouble shooting of pumps. (NOS: PSC/N0154)	Identity the common fault and take corrective action for reciprocating pumps, rotary pumps, centrifugal pumps and submersible pumps.
	Conduct appropriate and target oriented discussions with higher authority and within the team, where a replacement is uneconomic or unsatisfactory to perform.
	Use testing methods that comply with the manufacturer's requirements.
	Adjust the unit's components correctly where necessary to ensure that they operate to meet the specified operating requirements.
23. Identify and check functionality of major components and assemblies of centrifugal	Select, care and use of PPE while dismantling and assembling of centrifugal pumps.
	Select tools and materials for the job and make this available for use in a timely manner.

pumps. (NOS: PSC/N0151, PSC/N0152)	Use the tools and equipment in the way specified by manufacturers to Dismantle and assembles of centrifugal pumps.
	Carryout their Dismantling and assembling of centrifugal pumps by reviewing: Technical data. Removal and replacement procedures. Legal requirements.
	Check for performance of centrifugal pumps.
24. Identify and check functionality of major components and assemblies of submersible pumps. (NOS: PSC/N0151, PSC/N0152)	Select, care and use of PPE while dismantling and assembling of submersible pumps.
	Select tools and materials for the job and make this available for use in a timely manner.
	Use the tools and equipment in the way specified by manufacturers to Dismantle and assembles of submersible pumps.
	Carryout their Dismantling and assembling of submersible pumps by reviewing: Technical data. Removal and replacement procedures. Legal requirements.
	Check for performance of submersible pumps.
25. Carryout repairs in the fuel feed system. (NOS: ASC/N9405)	Ascertain and select tools and materials for the job and make this available for use in a timely manner.
	Plan work in compliance with standard safety norms.
	Servicing the fuel tank & fuel pipelines.
	Servicing of fuel pipes.
	Replace the air cleaner, fuel filter.
26. Construct electrical circuits and test its parameters by using electrical measuring instruments. (NOS: ELE/N9412)	Plan and organize the work for basic electrical operations.
	Select the tools, instruments and materials required to do the job.
	Comply with safety rules when performing the basic electrical operations.
	Perform electrical wire joints, form electrical circuits of series, parallel and combination of series & parallel circuits and test basic electrical parameters as per the circuit drawings and operating procedures.
27. Identify and check functionality of major components and	Select, care and use of PPE while dismantling and assembling of A.C motors.
	Select tools and materials for the job and make this available for use

assemblies of A.C motors. (NOS: PSS/N1709)	in a timely manner.
	Use the tools and equipment in the way specified by manufacturers to Dismantle and assembles of A.C motors.
	Carryout their Dismantling and assembling of A.C motors by reviewing: Technical data. Removal and replacement procedures. Legal requirements.
	Measure speed of A.C motor using tachometer.
	Starting a single- phase A.C motor with Direct on line (D.O.L).
	Starting a 3-phase motor with star-delta starter.
	Checking for proper running of motor, overheating.
28. Identify different type of keyways, preparing keys to fit into keyways. (NOS: PSC/N9415)	Identify key as per given shaft, hub & keyways.
	Prepare keys to fit into keyways.
29. Identify, select & use of different types of knots. (NOS: PSC/N0136)	Select, care and use of PPE while Practicing different types of knots.
	Select tools and materials such as hemp, manila, nylon, wire etc. for the different types of knots and make this available for use in a timely manner.
	Detection of unsafe/defective conditions of ropes and knots.
30. Identify, select & use of different types of lifting tackles. (NOS: PSC/N0136)	Select, care and use of PPE while Practicing use of different types of lifting tackles.
	Select tools and equipments such as Screw jacks, chain pulley block, crabs and winches, rollers and bars, levers, lashing and packing, Use of inclined plane, hydraulic trolleys for lifting practice.
	Care and maintenance of lifting equipment.
31. Identify and check functionality of major components and assemblies of bushes, bearings and couplings. (NOS: CSC/N0901)	Select, care and use of PPE while dismantling and assembling of bushes, bearings and couplings.
	Select tools and materials for the job and make this available for use in a timely manner.
	Use the tools and equipment in the way specified by manufacturers to Dismantle and assembles bushes, bearings and couplings.
	Carryout their Dismantling and assembling of bushes, bearings and couplings by reviewing: Technical data. Removal and replacement procedures. Legal requirements.
	Check and record results of performance of assembly.

32. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9401)	Solve different mathematical problems
	Explain concept of basic science related to the field of study
33. Read and apply engineering drawing for different application in the field of work. (NOS: CSC/N9402)	Read & interpret the information on drawings and apply in executing practical work.
	Read & analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.

7. TRADE SYLLABUS

SYLLABUS FOR PUMP OPERATOR CUM MECHANIC TRADE			
DURATION: ONE YEAR			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Professional Skill 25 Hrs.; Professional Knowledge10 Hrs.	Comply with environment regulations and housekeeping in the workshop following safety precautions.	1. Familiarization with institute, Job opportunities, Machinery used in Trade. 2. Types of work done by the students in the shop floor.	Admission & introduction to the trade: Introduction to the Course duration, course content, study of the syllabus. General rule pertaining to the Institute, facilities available– Hostel, Recreation, Medical and Library working hours and timetable.
		3. Practical related to Safety and Health, Importance of maintenance and cleanliness of Workshop. 4. Interaction with health center and fire service station to provide demo on First aid and Fire safety, Use of fire extinguishers. 5. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of used engine oil. 6. Energy saving Tips of ITI electricity usage.	Occupational Safety & Health Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs - for Danger, Warning, caution & personal safety message. Safe handling of Fuel Spillage, Fire extinguishers used for different types of fire. Safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment, Authorization of Moving &road testing in Diesel Engines. Energy conservation-Definition, Energy Conservation Opportunities (ECOs)-Minor ECos and Medium ECOs, Major ECOs), Safety disposal of Used engine oil, Electrical safety tips.
Professional Skill 30Hrs.; Professional Knowledge 05 Hrs.	Make choices to carry out marking out the components for basic fitting operations in the workshop.	7. Practice using all marking aids, like steel rule with spring calipers, dividers, scriber, punches, Chisel etc. 8. Layout a work piece- for line, circle, arcs and circles. 9. Practice to measure a wheel	Hand & Power Tools: - Marking scheme, Marking material-chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper, Description, care and use of Surface plates, steel rule, measuring tape, try

		base of a in Diesel Engine with measuring tape.	square. Calipers-inside and outside. Dividers, surface gauges, scriber, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut.
Professional Skill 25Hrs.; Professional Knowledge 04 Hrs.	Use different types of tools and workshop equipment in the workshop.	10. Practice to measure valve spring tension using spring tension tester. 11. Practice to remove wheel lug nuts with use of an air impact wrench. 12. Practice on General workshop tools & power tools.	Hammer- ball peen, lump, mallet. Screw drivers-blade screwdriver, Phillips screwdriver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open-ended spanner. Sockets & accessories, Pliers - Combination pliers, multi grip, long nose, flat-nose, Nippers or pincer pliers, Side cutters, Tin snips, Circlip pliers, external circlips pliers. Air impact wrench, air ratchet, wrenches- Torque wrenches, pipe wrenches, car jet washers Pipe flaring &cutting tool, pullers-Gear and bearing.
Professional Skill 21Hrs.; Professional Knowledge 03 Hrs.	Perform precision measurements on the components and compare parameters with specifications used in workshop practices.	13. Measuring practice on Cam height, Camshaft Journal dia., crankshaft journal dia., Valve stem dia., piston diameter, and piston pin dia. with outside Micrometers. 14. Measuring practice on the height of the rotor of an oil pump from the surface of the housing or any other component measurement with depth micrometer. 15. Measuring practice on valve spring free length. 16. Measuring practice on cylinder bore, connecting rod bore, inside diameter	Systems of measurement, Description, care & use of - Micrometers- Outside and depth micrometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge,

		(ID) of a camshaft bearing with Telescope gauges. 17. Measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. 18. Measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator. 19. Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. 20. Measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. 21. Practice to check engine manifold vacuum with vacuum gauge.	
Professional Skill 25Hrs.; Professional Knowledge 04 Hrs.	Use of different type of fastening and locking devices	22. Practice on General cleaning, checking and use of nut, bolts, & studs etc. 23. Removal of stud/bolt from blind hole.	Fasteners- Study of different types of screws, nuts, studs & bolts, locking devices, such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers & chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals.
Professional Skill 25Hrs.; Professional Knowledge 04 Hrs.	Use cutting tools in the workshop, following safety precautions while grinding.	24. Practice on cutting tools like Hacksaw, file, chisel, sharpening of Chisels, center punch, safety precautions while grinding. 25. Practice on Hacksawing and filing to given dimensions.	Cutting tools: - Study of different type of cutting tools like Hacksaw, File- Definition, parts of a file, specification, Grade, shape, different type of cut and uses., OFF-hand grinding with sander, bench and pedestal grinders, safety precautions while grinding.

			Limits, Fits &Tolerances: - Definition of limits, fits &tolerances with examples used in components.
Professional Skill 50Hrs.; Professional Knowledge 12 Hrs.	Perform basic fitting operations used in the workshop practices and inspection of dimensions. dimensions.	26. Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills. 27. Safety precautions to be observed while using a drilling machine. 28. Practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. 29. Cutting Threads on a Bolt/ Stud. 30. Adjustment of two-piece Die, reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.	Drilling machine - Description and study of Bench type Drilling machine, Portable electrical Drilling machine, drill holding devices, Work Holding devices, Drill bits. Taps and Dies: Hand Taps and wrenches, Calculation of Tap drill sizes for metric and inch taps. Different type of Die and Die stock. Screw extractors. Hand Reamers – Different Type of hand reamers, Drill size for reaming, Lapping, Lapping abrasives, type of Laps.
Professional Skill 10 Hrs.; Professional Knowledge 02 Hrs.	Perform basic pipe bending & fitting etc.	31. Practice on making Rectangular Tray. 32. Pipe bending, Fitting nipples unions in pipes. 33. Soldering and Brazing of Pipes.	The blow lamp- its uses and pipe fittings.
Professional Skill 50Hrs.; Professional Knowledge 08 Hrs.	Perform basic electrical testing in a in Diesel Engine.	34. Practice in joining wires using soldering Iron. 35. Construction of simple electrical circuits. 36. Measuring of current, voltage and resistance using digital multimeter. 37. Practice continuity test for fuses, jumper wires, fusible links, circuit breakers.	Basic electricity, Electricity principles, Ground connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Multimeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings.
		38. Diagnose series, parallel, series- parallel circuits using	Fuses & circuit breakers, Ballast resistor, Stripping wire insulation,

		Ohm's law. 39. Check electrical circuit with a test lamp, perform voltage drop test in circuits using multimeter. 40. Measure current flow using multimeter/ammeter. 41. Use of service manual wiring diagram for troubleshooting.	cable color codes and sizes, Resistors in Series circuits, Parallel circuits and Series-parallel circuits, Electrostatic effects, Capacitors and its applications, Capacitors in series and parallel.
Professional Skill 44 Hrs.; Professional Knowledge 04 Hrs.	Perform battery testing and charging operations.	42. Cleaning and topping up of a lead acid battery, Testing battery with hydrometer. 43. Connecting battery to a charger for battery charging. 44. Inspecting & testing a battery after charging. 45. Measure and Diagnose the cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. 46. Testing of relay and solenoids and its circuit.	Description of Chemical effects, Batteries & cells, Lead acid batteries & sealed Maintenance Free (SMF) batteries, Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.
Professional Skill 15Hrs.; Professional Knowledge 02 Hrs.	Construct basic electronic circuits and testing.	47. Identify and test power and signal connectors for continuity. 48. Identify and test different type of Diodes for its functionality. 49. Construct and test simple logic circuits OR, AND & NOT and Logic gates using switches.	Basic electronics: Description of Semiconductors, Solid state devices- Diodes.
Professional Skill 25Hrs.; Professional Knowledge 06 Hrs.	Manufacture components with different types of welding processes in the given job.	50. Practice to make straight beads and Butt, Lap & T joints Manual Metal Arc Welding. 51. Setting of Gas welding flames. 52. Practice to make a straight	Introduction to welding and Heat Treatment Welding processes – Principles of Arc welding, brief description, classification and applications. Manual Metal Arc welding -principles, power sources, electrodes, welding

		beads and joints Oxy – Acetylene welding Film on Heat treatment process.	parameters, edge preparation & fit up and welding techniques; Oxy – Acetylene welding - principles, equipment, welding parameters, edge preparation & fit up and welding techniques; Heat Treatment Process– Introduction, Definition of heat treatment, Definition of Annealing, Normalizing, Hardening and tempering. Case hardening, Nitriding, Induction hardening and Flame Hardening process used in components with examples.
Professional Skill 25Hrs.; Professional Knowledge 06 Hrs.	Inspect the component using Non-destructive testing methods.	53. Practice on Liquid penetrant testing method and Magnetic particle testing method.	Non-destructive Testing Methods- Importance of Non-Destructive Testing Definition of NDT, Liquid penetrant and Magnetic particle testing method – Portable Yoke method
Professional Skill 30Hrs.; Professional Knowledge 05 Hrs.	Identify the hydraulic and pneumatic components	54. Tracing of hydraulic circuit on identity hydraulic & pneumatic component & assemblies in the workshop.	Introduction to Hydraulics & Pneumatics: - Definition of Pascal law, pressure, Force, viscosity. Description, symbols and application of Gear Pump-Internal & External, Description and function of air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator & Lubricator).
Professional Skill 50Hrs.; Professional Knowledge 08 Hrs.	Identify and check functionality of stationary Diesel Engine - components, &engine performance on load and engine speed.	55. Identification of different type of stationary Engine and their applications. 56. Familiarization with diesel engines, tools and equipment required for maintenance, engine parts and their handling technique. 57. Starting and stopping of	Pump Industry in India - leading manufacturers, development in Pump Industry, trends, new product. Principle of Compression-ignition engine, differentiate between 4-stroke and 2 strokes, C.I engine and S.I Engine. Different type of starting and stopping method of Diesel

		engines. 58. Running of engines and checking temperatures, fuel oil pressure and consumption on load and engine speed.	Engine. Technical terms used in engine, Engine specification.
		59. Cleaning of fuel tank, checking leaks in the fuel lines. 60. Cutting, flaring of tubes to make T & Elbow fitting using unions. 61. Fitting of lubrication pump oil filters, air filters, checking and adjusting of oil pressure. 62. Preventive maintenance &repairing.	Procedure to clean fuel tank & check leak in the fuel line. Lubrication system – types, description and advantages of each over others. Filters and oil coolers– their description functions and method to overhaul for efficient functioning.
Professional Skill 25Hrs.; Professional Knowledge 05 Hrs.	Diagnose and Troubleshoot Diesel Engines for Mechanical & Electrical causes.	63. Practice on troubleshooting in for Engine Not starting – Mechanical & Electrical causes. 64. High fuel consumption, Engine overheating. 65. Low Power Generation, Excessive oil consumption. (7hrs.) 66. Low/High Engine Oil Pressure, Engine Noise.	Troubleshooting: Causes and remedy for Engine Not starting – Mechanical & Electrical causes, High fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise.
Professional Skill 25Hrs.; Professional Knowledge 04 Hrs.	Servicing of plain/journal bearings, anti-friction bearings.	67. Familiarization with plain/ journal bearings, anti-friction bearings used on machine assembly. 68. Specification & selection for appropriate use. 69. Use of manufacturers catalogues. 70. Mounting of bearing on shafts and in housing with proper fit & axis alignment. 71. Use of proper tools. 72. Removal of bearings from	Types of belt drives, velocity ratio of belt drive. Horsepower transmitted by belt. Ratio & driving tension in a belt. Parallel & cross belt drive, open & cross belt drive, angular belt drive. Methods of fixing and uses. Description, types and application of bushes, bearing and couplings. Procedure to fit bushes, bearings and coupling safely.

		shafts &housing by using pullers. Cleaning up & removing old metal form bearing and replacing with new metal. 73. Checking of shafts for alignment with dial indicator.	
Professional Skill 25Hrs.; Professional Knowledge 05 Hrs.	Identify and check functionality of major components and assemblies of reciprocating pumps.	74. Identification of different pumps, its components, prime movers. 75. Practice on operational safety. 76. Dismantling of reciprocating pumps- valves, pistons, cranks, seals etc. for inspection, repair &replacement. 77. Cleaning of parts & assembling. Installing of reciprocating pumps.	Pumps-its importance for agricultural & industrial applications. Classification of pumps, its prime movers, parts and operation safety. Classification of reciprocating pump, construction and operation. Installation technique of reciprocating pump. Tools and equipment required &procedure.
Professional Skill 25Hrs.; Professional Knowledge 05 Hrs.	Identify and check functionality of major components and assemblies of rotary pumps.	78. Dismantling of rotary pumps- impeller, shaft, bearing etc., for inspection, Repair &replacement. 79. Cleaning of parts and assembling. 80. Checking for alignment, clearance, etc., Priming technique and its application. 81. Installing, operating & testing of rotary pumps.	Classification of rotary pumps- Construction and operation- repairing procedure. Brief description of turbine & stage pumps, positive displacements and their advantages. Meaning of priming and its effect. Installation techniques of rotary pump- procedure, tools and equipment required.
Professional Skill 25Hrs.; Professional Knowledge 05 Hrs.	Ascertain and select measuring instrument and measure dimension of components and evaluate for accuracy.	82. Servicing of pumps and valves of general purpose and of corrosive fluids. 83. Selection of gasket, packing & gland materials, marking & cutting off gasket as per shape &profile. 84. Using gasket cement to stop leakage & for fixing.	Different types of valves-their description, advantages & use. Special pumps & glands used for corrosive fluids. Different gasket cement used to prevent leakage and advantages of each over the other. Principle of direct reading pressure and temperature measuring instruments. Method

			to read and application of pressure and temperature measuring instruments.
Professional Skill 25Hrs.: Professional Knowledge 05 Hrs.	Use different types of conventional and special tools, hardware, fasteners and workshop equipment in the workshop.	85. Installation of seals leather polythene, asbestos, rope rubber and mechanical seals. 86. Maintenance of lubrication systems. 87. Fitting of flanges and assembling of pipe work, leak testing and rectification. 88. Use of tee, elbow, bend, socket, rectifiers and other pipe fittings. 89. Cutting threads for pipes.	Various seals- their use and places of application with advantages. Lubrication-types of lubricant use & methods of lubrication. Various tools and accessories used in pipe fitting with their details. Use of protecting caps on threads. Pipe fitting technique. Procedure to fit flanges & for leak testing.
Professional Skill 25Hrs.; Professional Knowledge 04 Hrs.	Trouble shooting of pumps.	90. Installation of stationary & coupled pumps, checking and correcting of alignment of pump with its prime movers and its serviceability test. 91. Testing of pumps for their delivery flow& pressure.	Method of install align and testing of pumps for their serviceability. Concept of lightening torque for different sizes of bolts.
Professional Skill 25Hrs.; Professional Knowledge 05 Hrs.	Identify and check functionality of major components and assemblies of centrifugal pumps.	92. Reconditioning of centrifugal pumps.	Principle of centrifugal pump. Construction and operation of centrifugal pump in series and parallel. Finding out defects and method to recondition centrifugal pump.
Professional Skill 25Hrs.; Professional Knowledge 05 Hrs.	Identify and check functionality of major components and assemblies of submersible pumps.	93. Dismantling, identifying of parts. 94. Finding out defects, repairing, and replacement of components. 95. Cleaning, assembling, installing and testing of submersible pumps. 96. Finding out & rectifying faults developed during	Submersible pump- construction, operation and selection of appropriate type. Procedure to recondition, install and test of submersible pumps. Causes of failures and remedial measures.

		operation.	
Professional Skill 15Hrs.; Professional Knowledge 05 Hrs.	Carry out repairs in the fuel feed system.	97. Identifying and rectifying defects of pump sets. 98. Practice on preventive & scheduled maintenance of pump sets.	Defects in pump sets- procedure for detection of causes & rectification. Purpose and procedure for balancing of rotor. Procedure to be followed for preventive & scheduled maintenance, planning for spares and other stores.
Professional Skill 50Hrs.; Professional Knowledge 07 Hrs.	Construct electrical circuits and test its parameters by using electrical measuring instruments.	99. Verification of Ohm's law. 100. Building up of electrical series, parallel and combination of series & parallel circuits. 101. Measurement of current, voltage resistance. 102. Exercise on fixing and connecting switches holders, fuses, plugs sockets, Push buttons, etc. 103. Use of test lamp and neon tester. Identification of live, neutral and earthling wires. Measurement of electrical power and energy consumed for a definite period of time.	Description and method to use current, voltage and resistance measuring instruments and precaution to be taken. Insulation Tester- description, method to use and precautions to be taken. Alternating current- Definition explanation and advantages over. Direct current and vice-versa. Concept and application of phase, star and delta connection. Procedure to identify live, neutral, single phase and 3-phase power supply. Method to measure power and energy consumed by electrical appliances using wattmeter and Energy meter.
Professional Skill 20Hrs.; Professional Knowledge 05 Hrs.	Identify and check functionality of major components and assemblies of A.C. motors.	104. Identifying of A.C motors, their testing, identifying terminals, connecting running &reversing. 105. Measuring speed of A.C motor using tachometer with stopwatch. Dismantling, assembling of A.C motors & identification of parts. 106. Starting a single phase, A.C motor with Direct on line (D.O.L) starter. 107. Starting a 3-phase motor with star-delta starter.	AC Motors – related terminology. Purpose, type, construction, operation, testing for correct functioning, maintenance and industrial applications. Trouble shooting & protection of induction motor.

		108. Checking for proper running of motor, overheating etc. maintenance of motors use and connection of single-phase preventer trouble shooting in circuit.	
Professional Skill 20Hrs.; Professional Knowledge 05 Hrs.	Identify the different type of keyways, preparing keys to fit into keyways.	109. Practice on making out key as per shaft, hub, keyways, preparing keys to fit into keyways.	Types of key and keyways, their uses and applications. Preparation of keys, allowable tolerance, clearances. Key fitting procedure-methods. Procedure for removing keys. Types & uses of key pullers.
Professional Skill 20Hrs.; Professional Knowledge 04 Hrs.	Identify, select & use different types of knots.	110. Identifying, selecting, use of different types of ropes such as hemp, manila, nylon, wire etc. 111. Practicing different types of knots and its applications. 112. Method of joining two ropes, together for extension. 113. Detection of unsafe/defective conditions of ropes and knots.	Specification and use of different types of ropes such as hemp, manila, nylon, wire etc. Practicing different types of knots and its applications. Method of joining two ropes together for extension. Detection of unsafe/defective conditions of ropes and knots. Specification and correct use of slings. Safety to be observed in use of ropes and slings.
Professional Skill 20Hrs.; Professional Knowledge 05 Hrs.	Identify, select& use different types of lifting tackles.	114. Use of different types lifting tackles both mechanical and hydraulic such as – Screw jacks, chain pulley block, crabs and winches, rollers and bars, levers, lashing and packing. 115. Use of inclined plane, hydraulic trolleys etc. 116. Care and maintenance of lifting equipment and safety to be observed by handling the equipment.	Description, operation, purpose, application, care and use of Different types of lifting tackles for components of pump set. Precaution to be observed while using lifting tackles.
Professional Skill 20Hrs.;	Identify and check functionality of major components	117. Making different types of keys for fitting pulleys. 118. Assembling and dismantling	Types of pulleys solid, split, “V” groove, step, cone, taper, guided and jockey or rider pulleys, their

Professional Knowledge 05 Hrs.	and assemblies of bushes, bearing sand couplings.	of bushes, bearings and couplings maintaining safety.	functions and uses. Procedure to assemble and dismantle pulleys and impellers from shafts following safety precautions.
Engineering Drawing: 40 Hrs.			
Professional Knowledge ED- 40 Hrs.	Read and apply engineering drawing for different application in the field of work.	**ENGINEERING DRAWING: (40 Hrs.)** 1**. Introduction to Engineering Drawing and Drawing Instruments** • Conventions • Sizes and layout of drawing sheets • Title Block, its position and content • Drawing Instrument (2 hrs.) **2. Free hand drawing of –** • Geometrical figures and blocks with dimension • Transferring measurement from the given object to thefree hand sketches. • Free hand drawing of hand tools and measuring tools. (6 hrs.) **3. Drawing of Geometrical figures** • Angle, Triangle, Circle, Rectangle, Square, Rhombus, Parallelogram. • Lettering & Numbering – Single Stroke. (4hrs) **4. Reading of dimension and Dimensioning Practice**. (4 hrs.) **5. Symbolic representation** – • Different symbols used in the Pump operator cum Mechanic trade. (10 hrs.) 6. **Reading of Job drawing and piping Layout** (14 hrs.)	
Workshop Calculation & Science: 38 Hrs.			
Professional Knowledge WCS- 38 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**WORKSHOP CALCULATION & SCIENCE:** **Unit, Fractions** Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, subtraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication & division Solving problems by using calculator(4hrs) **Square root, Ratio and Proportions, Percentage** Square and square root Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction(6hrs) **Material Science** Types metals, types of ferrous and nonferrous metals Physical and mechanical properties of metals(4hrs)	

		Mass, Weight, Volume and Density Mass, volume, density, weight and specific gravity, **numerical related to L, C, O section only** Related problems for mass, volume, density, weight and specific gravity(4hrs) **Speed and Velocity, Work, Power and Energy** Speed and velocity - Rest, motion, speed, velocity, difference between speed and velocity, acceleration and retardation Speed and velocity - Related problems on speed & velocity Work, power, energy, HP, IHP, BHP and efficiency(4hrs) **Heat & Temperature and Pressure** Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Concept of pressure - Units of pressure, atmospheric pressure, absolute pressure, gauge pressure and gauges used for measuring pressure(4hrs) **Basic Electricity** Introduction and uses of electricity, electric current AC, DC their comparison, voltage, resistance and their units Conductor, insulator, types of connections - series and parallel Ohm's law, relation between V.I.R & related problems Electrical power, HP, energy and units of electrical energy(6hrs) **Mensuration** Area and perimeter of square, rectangle and parallelogram Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in liters of hexagonal, conical and cylindrical shaped vessels(6hrs)
Project Work/Industrial Training		

SYLLABUS FOR CORE SKILLS
1. Employability Skills (Common for all CTS trades) (120 Hrs.)

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/ dgt.gov.in

ANNEXURE-I

LIST OF TOOLS AND EQUIPMENT			
PUMP OPERATOR CUM MECHANIC (For batch of 20 Candidates)			
S No.	**Name of the Tools&Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Allen Key	set of 12 pieces (2mm to 14mm)	(5+1) Nos.
2.	Caliper inside	15 cm Spring	(5+1) Nos.
3.	Calipers outside	15 cm spring	(5+1) Nos.
4.	Center Punch	10 mm. Dia. x 100 mm.	(5+1) Nos.
5.	Dividers	15 cm Spring	(5+1) Nos.
6.	Electrician Screwdriver	250mm	(5+1) Nos.
7.	Hammer ball peen	0.5 kg with handle	(5+1) Nos.
8.	Hands file	20 cm. Second cut flat	(5+1) Nos.
9.	Philips Screwdriver	set of 5 pieces (100 mm to 300 mm)	(5+1) Nos.
10.	Pliers combination	20 cm.	(5+1) Nos.
11.	Screwdriver	20cm.X 9mm. Blade	(5+1) Nos.
12.	Screwdriver	30 cm. X 9 mm. Blade	(5+1) Nos.
13.	Scriber	15 cm	(5+1) Nos.
14.	Spanner D.E.	set of 12 pieces (6mm to 32mm)	(5+1) Nos.
15.	Spanner, ring	set of 12 metric sizes 6 to 32 mm.	(5+1) Nos.
16.	Spanners socket with speed handle, T-bar, ratchet	universal upto 32mm set of 28 pieces with box	(5+1) Nos.
17.	Steel rule	30 cm inch and metric	(5+1) Nos.
18.	Steel toolbox with lock and key (folding type)	400x200x150 mm	(5+1) Nos.
19.	Wire cutter and stripper		(5+1) Nos.
B. INSTRUMENT AND GENERAL SHOP OUTFIT			
20.	Adjustable spanner	Pipe wrench 350 mm	2 Nos.
21.	Air blow gun with standard accessories		1 No.
22.	Air impact wrench with standard accessories		4 Nos.
23.	Air ratchet with standard accessories		4 Nos.
24.	Allen Key	set of 12 pieces (2mm to 14mm)	4 Nos.
25.	Ammeter	300A/ 60A DC with external shunt	4 Nos.

26.	Angle plate adjustable	250x150x175	1 No.
27.	Angle plate	size 200x100x200mm	2 Nos.
28.	Anvil	50 Kgs with Stand	1 No.
29.	Battery –charger		2 Nos.
30.	Bearing and gear tester		2Nos.
31.	Belt Tensioner gauge		1 No.
32.	Blow Lamp	1 litre	2 Nos.
33.	Bradawl		2Nos.
34.	Caliper inside	15 cm Spring	4 Nos.
35.	Calipers outside	15 cm spring	4 Nos.
36.	Cam lock type screwdriver		1No.
37.	Car Jet washer with standard accessories		1 No.
38.	Charge winches	3, 5 tons	1 No.
39.	Chain pipe wrench	65 m	2Nos.
40.	Chain Pulley Block	3 ton capacity with tripod stand	1 No.
41.	Chisel	10 cm flat	4 Nos.
42.	Chisels crosscut	200 mm X 6mm	4 Nos.
43.	Circlip pliers Expanding and contracting type	15cm and 20cm each	4 Nos.
44.	Clamps C	100mm	2 Nos.
45.	Clamps C	150mm	2 Nos.
46.	Clamps C	200mm	2 Nos.
47.	Cleaning tray	45x30 cm.	4 Nos.
48.	Compression testing gauge suitable for diesel Engine		2 Nos.
49.	Copper bit soldering iron	0.25 Kg	5 Nos.
50.	Crab		1No.
51.	Cylinder bore gauge capacity	20 to 160 mm	4 Nos.
52.	DC Ohmmeter	0 to 300 Ohms, mid scales at 20 Ohms	4 Nos.
53.	Depth micrometer	0-25mm	4 Nos.
54.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)		4 Nos.
55.	Different type of Engine Bearing model		1 set
56.	Digital Tonge Tester	0-20 A AC	2Nos.
57.	Dividers	15 cm Spring	4 Nos.
58.	Drift Punch Copper	15 cm	4 Nos.
59.	Drill point angle gauge		1 No.
60.	Drill twist	1.5 mm to 15 mm (various sizes)	4 Nos.

		by 0.5 mm	
61.	Electric Soldering Iron	230 V 60 watts 230 V 25 watts	2 each
62.	Electric testing screwdriver		2 Nos.
63.	Energy meter, AC, Single Phase,	5 Amps, 230 Volts	2Nos.
64.	Engineers square	700 mm	4Nos.
65.	Engineers stethoscope		1 No.
66.	Feeler gauge	20 blades (metric)	4 Nos.
67.	File flat	20 cm bastard	4 Nos.
68.	File, half round	20 cm second cut	4 Nos.
69.	File, Square	20 cm second cut	4 Nos.
70.	File, Square	30 cm round	4 Nos.
71.	File, triangular	15 cm second cut	4 Nos.
72.	Files assorted sizes and types including safe edge file (20 Nos)		2 set
73.	Flat File	25 cm second cut	4 Nos.
74.	Flat File	35 cm bastard	4 Nos.
75.	Flow meter	0-400 lt/min	2Nos.
76.	Forks lift	02 tones (capacity)	1 No.
77.	Forks lift	05 tones (capacity)	1 No.
78.	Foundation bolt		4Nos.
79.	Gasket hollow punches	5, 6, 8, 10, 12, 19, 25 mm dia.	1set
80.	Glow plug tester		2 Nos.
81.	Granite surface plate	1600 x 1000 with stand and cover	1 No.
82.	Grease Gun		2 Nos.
83.	Growler		2 Nos.
84.	Hacksaw frame adjustable	20-30 cm	10Nos.
85.	Hammer Ball Peen	0.75 Kg	4 Nos.
86.	Hammer Chipping	0.25 Kg	4 Nos.
87.	Hammer copper	1 Kg with handle	4 Nos.
88.	Hammer Mallet		4 Nos.
89.	Hammer Plastic		4 Nos.
90.	Hand keyway broacher		1 No.
91.	Hand operated chain pulley block		1 No.
92.	Hand operated crimping tool	(i) for crimping up to 4mm and (ii) for crimping up to 10mm	2 Nos.
93.	Hand reamers adjustable	10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75to 14.25 mm and 14.25 to 15.75 mm	2sets
94.	Hand Shear Universal	250mm	2 Nos.
95.	Hand vice	37 mm	2 Nos.
96.	Hollow Punch	set of seven pieces 6mm to 15mm	2 sets each

97.	Hydraulic wheel and bearing puller		2Nos.
98.	Injector – Multi hole type, Pintle type		4 each
99.	Injector cleaning unit		1 No.
100.	Injector testing set (Hand tester)		1 No.
101.	Insulated Screwdriver	20 cm x 9mm blade	4 Nos.
102.	Insulated Screwdriver	30 cm x 9mm blade	4 Nos.
103.	Ladle	150mm Dia	1 No.
104.	Left cut snips	250mm	4 Nos.
105.	Level bottle (sprit)	150 ml.	1 No.
106.	Lifting jack screw type	3 ton capacity	4 Nos.
107.	Magneto spanner	set with 8 spanners	1 set
108.	Magnifying glass	75mm	2 Nos.
109.	Manila ropes	12, 20, 30 mm dia.	2 sets
110.	Marking out table	90X60X90 cm.	1 No.
111.	Masonary bit	(Assorted up to 12 mm)	2set
112.	Master test bars (different size)		1 No.
113.	Megger	500 V	2Nos.
114.	Mobile crank		1 No.
115.	Multimeter digital		5 Nos.
116.	Oil can	0.5/0.25 liter capacity	2 Nos.
117.	Oil Stone	15 cm x 5 cm x 2.5 cm	1 No.
118.	Outside micrometer	0 to 25 mm	4 Nos.
119.	Outside micrometer	25 to 50 mm	4 Nos.
120.	Outside micrometer	50 to 75 mm	1 No.
121.	Outside micrometer	75 to 100 mm	1 No.
122.	Philips Screwdriver	set of 5 pieces (100 mm to 300 mm)	2 sets
123.	Pin spanner set		2Nos.
124.	Pipe cutting tool		2 Nos.
125.	Pipe flaring tool		2 Nos.
126.	Pipe wrench	45 mm	2 Nos.
127.	Pliers combination	20 cm.	2 Nos.
128.	Pliers flat nose	15 cm	2 Nos.
129.	Pliers round nose	15 cm	2 Nos.
130.	Pliers side cutting	15 cm	2 Nos.
131.	Plumb bob		1 No.
132.	Pneumatic scraper with adjustable stroke		2 Nos.
133.	Portable electric drill Machine		1 No.
134.	Portable jack		1 No.

135.	Power Supply	0-12 v, lamp	1 No.
136.	Pressure gauge	0 -5 Kg/cm2	2 Nos.
137.	Prick Punch	15 cm	4 Nos.
138.	Punch Letter	4mm (Number)	2 set
139.	Radius Gauge, Metric		2 Nos.
140.	Ratchet chain pulley		1 No.
141.	Rawl plug tool & kit		2 Nos.
142.	Right cut snips	250mm	4 Nos.
143.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm		4 Nos.
144.	Rollers (steel tubes) from	40 to 65 mm dia.	5 Nos.
145.	Rotary pump working for dismantling and assembling		1 No.
146.	Scientific Calculator		2 Nos.
147.	Scraper flat	25 cm	2 Nos.
148.	Scraper half round	25 cm	2 Nos.
149.	Scraper Triangular	25 cm	2 Nos.
150.	Screw jacks		1 No.
151.	Scriber	15 cm	2 Nos.
152.	Scriber with scribing black universal		2 Nos.
153.	Self alignment roller ball bearing		2 Nos.
154.	Set of stock and dies - Metric		2 sets
155.	Shear legs (tripod)		1 No.
156.	Shear Tin Man's	450 mm x 600mm	4 Nos.
157.	Sheet Metal Gauge		2 Nos.
158.	Single Phase	220 V Capacitor type AC Meter squirrel gage Induction motor	1 No.
159.	Soldering Copper Hatchet type	500gms	4 Nos.
160.	Solid Parallels in pairs (Different size) in Metric		2 Nos.
161.	Spanner Clyburn	15 cm	1 No.
162.	Spanner D.E.	set of 12 pieces (6mm to 32mm)	4 Nos.
163.	Spanner T. flocks for screwing up and up-screwing inaccessible		2 Nos.
164.	Spanner, adjustable	15cm.	2 Nos.
165.	Spanner, ring	set of 12 metric sizes 6 to 32 mm.	2 Nos.
166.	Spanners socket with speed handle, T-bar, ratchet and universal		2 Nos.
167.	Spark lighter		2 Nos.
168.	Spark plug spanner	14mm x 18mm x Size	2 Nos.
169.	Square box wrenches		1 No.

170.	Square T-wrenches		1 No.
171.	SRDG ball bearing, DRDG ball bearing, self aligning ball bearing,		1 No.
172.	Steel measuring tape	10 meter in a case	4 Nos.
173.	Steel rule	15 cm inch and metric	4 Nos.
174.	Steel rule	30 cm inch and metric	4 Nos.
175.	Steel wire Brush	50mmx150mm	5 Nos.
176.	Straight edge gauge	2 ft.	2 Nos.
177.	Straight edge gauge	4 ft.	2 Nos.
178.	Stud extractor	set of 3	2 sets
179.	Stud remover with socket handle		1 No.
180.	Surface gauge with dial test indicator plunger type	i.e. 0.01 mm	2 Nos.
181.	Tachometer (Counting type)		1 No.
182.	Taps and Dies complete sets (5 types)		1 set
183.	Taps and wrenches - UNC, UNF and metric		2 sets
184.	Telescope gauge		4
185.	Temperature gauge	0-100 deg c	2 Nos.
186.	Thermostat		2 Nos.
187.	Thimbles of different sizes		2 Nos.
188.	Thread pitch gauge Metric,		1 No.
189.	Threaded fastener type B		2 Nos.
190.	Threaded fastener type C		2 Nos.
191.	Threaded fastener type F		2 Nos.
192.	Three cell torch		2 Nos.
193.	Three Phase	50 Hz, 5 HP AC squirrel gage induction motor with star delta starter	1 No.
194.	Timing lighter		1 No.
195.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
196.	Trammel	30 cm	2 Nos.
197.	Travelling and gantry cranes		1 No.
198.	Tube expander	up to 62 mm	1 No.
199.	Universal puller for removing pulleys, bearings		1 No.
200.	V‟ Block	75 x 38 mm pair with Clamps	2 Nos.
201.	Vacuum gauge to read	0 to 760 mm of Hg.	2 Nos.
202.	Vernier caliper	0-300 mm with least count 0.02mm	4 Nos.

203.	Vibrometer		2 Nos.
204.	Vice grip pliers		2 Nos.
205.	Voltmeter	AC to 500 V	2 Nos.
206.	Wall hoists		1 No.
207.	Water pump for dismantling and assembling		2 Nos.
208.	Wattmeter	AC/DC, 0 to 10 Kw	2 Nos.
209.	Wire Gauge (metric)		5 Nos.
210.	Work bench	250 x 120 x 60 cm with 4 vices 12cm Jaw	1 No.
C. GENERAL INSTALLATION/ MACHINERIES			
211.	Arbor press hand operated	2 ton capacity	1 No.
212.	Back pull out type centrifugal pump		1 No.
213.	Bench lever shears	250mm Blade x 3mm Capacity	1 No.
214.	Centrifugal pump coupled with mono block set		1 No.
215.	Diesel engine	2 stroke vertical (up to 10 KW/ ISHP)	1 No.
216.	Diesel Engine	4 stroke vertical (up to about 10 KW/ISHP)	1 No.
217.	Diesel Engine Driven portable pump set		1 No.
218.	Diesel Engine	3.5 KW /4.5 HP fitted with pump	1 No.
219.	Drilling machine bench to drill	up to 12mm dia along with accessories	1 No.
220.	Dual Magnetization Yoke	AC / HWDC, 230 VAC, 50Hz	1 set
221.	Gas Welding Table	1220mm x760mm	2 Nos.
222.	Grinding machine (general purpose) D.E. pedestal	with 300 mmdia wheels rough and smooth	1 No.
223.	Horizontal split casing pump		1 No.
224.	Hydraulic jack HI-LIFT type	3 ton capacity,	1 No.
225.	Hydraulic Leak Testing equipment		1 No.
226.	Injector Testing set (Hand Tester)		1 No.
227.	Liquid penetrant Inspection kit		1 set
228.	Multi stage pump		1 No.
229.	Overhead tank, pump, minimum	5000 litres with level indicators and piping layout	1 No.
230.	Pipe Bending Machine (Hydraulic type)	12mm to 30mm	1 No.
231.	Pneumatic rivet gun		2 Nos.
232.	Portable electric drill Machine		1 No.

233.	Reciprocating Pump working for dismantling and assembling		1 No.
234.	Spring tension tester		1 No.
235.	Submersible pump set, eight stage	Upto 10 KW/ 15 HP	1 No.
236.	Tin smiths bench folder	600 x 1.6mm	1 No.
237.	Trolley type portable air compressor single cylinder	with 45 liters capacity Air tank, along with accessories & with working pressure 6.5 kg/sq cm	1 No.
238.	Welding plant Oxy-Acetylene complete (high pressure)		1 No.
239.	Welding Transformer	(150-300 Amps)	1 No.
D. LIST OFCONSUMABLES			
240.	Chalk, Prussian blue.		As required
241.	Chemical compound for fasteners		As required
242.	Diesel		As required
243.	Different type gasket material		As required
244.	Different type of oil seal		As required
245.	Drill Twist (assorted)		As required
246.	Engine coolant		As required
247.	Engine oil		As required
248.	Emery paper	36–60 grit , 80–120	As required
249.	Hacksaw blade (consumable)		As required
250.	Hand rubber gloves tested for	5000 V	5 pair
251.	Lapping abrasives		As required
252.	Leather Apron		As required
253.	Petrol		As required
254.	Safety glasses		As required
255.	Steel wire Brush	50mmx150mm	As required
256.	Gloves for Welding (Leather and Asbestos)		As required
257.	Block of timber (various sizes)		As required
258.	Various type of seal required for pump assembly		As required
E. CLASS ROOM FURNITURE AND MATERIALS			
259.	Book shelf (glass panel)	6½ „ x 3‟ x 1½‟	As required
260.	Computer Chair		1+1 Nos.
261.	Computer Table		1+1 Nos.
262.	Desktop computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or	1+1 Nos.

		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	
263.	Discussion Table	8‟ x 4‟ x 2½ „	2 Nos.
264.	Fire Extinguishers, first- aid box		As required
265.	Instructional Material – NIMI Books/Ref.books		As required
266.	Internet connection with all accessories		As required
267.	Laser printer		1 No.
268.	LCD projector/ LED /LCD TV (42”)		1 No.
269.	UPS		As required
270.	Stools		20 Nos.
271.	Storage Rack	6½ „ x 3‟ x 1½‟	As required
272.	Storage shelf	6½ „ x 3‟ x 1½‟	As required.
273.	Suitable class room furniture		As required
274.	Suitable Work Tables with vices		As required
275.	Tool Cabinet	6½ „ x 3‟ x 1½‟	2 Nos.
276.	Trainees locker	6½ „ x 3‟ x 1½‟	2 Nos. to accommodate 20Lockers

Note: -

1. *All the tools and equipment are to be procured as per BIS specification.*
2. *Internet facility is desired to be provided in the classroom.*

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 participated for finalizing the course curricula of Pump Operator cum Mechanic trade			
SNo.	**Name & Designation Sh./Mr./Ms.**	**Organization**	**Remarks**
1.	Shri T.C. Saravanabava, Deputy Director General (AT),	DGET Headquarters	Chairman
2.	V Krishna Shankar, Gen. Manager,	Ashok Leyland	Member
3.	G Satish Kumar, Manager	Ashok Leyland	Member
4.	GM Cholanrajan, Sr. Manager, Training,	Lansun Toyota, Chennai	Member
5.	M Shanavas Khan,	Hinduja Foundaries	Member
6.	Dr. Abhijit KR Mandal,	National Automotive Testing and R&D Infrastructure Project, Global, Automotive Research center, Chennai	Member
7.	Vadivelan,	National Automotive Testing and R&D Infrastructure Project, Global, Automotive Research center, Chennai	Member
8.	Anatharaman, Proprietor,	Care Care Center, Chennai	Member
9.	MK Gupta,	Maruthi Suzuki	Member
10.	Pandey, Director,	SRFMTTI, Anathapur	Member
11.	P. Thangapalam,	DM- Trg, Dailmer India	Member
12.	S Gopinath,	Sr. Manager, Crompton Greaves	Member
13.	RA. Armstrong,	TAFE	Member
14.	B Muthukumar,	Toyoto Kirloskar, New Delhi	Member
15.	J Dharsan, Asst. Mgr,	Toyoto Kirloskar, Bangalore	Member

16.	C Prakash, Sr. Gen. Manager,	Ashok Leyland	Member
17.	P Palanivelan, Manger,	TVS Sundram Fasteners ltd.	Member
18.	TN Umashankar, Head Manufacturing,	Delphi TVS Ltd.	Member
19.	K Aravind,Regional Trainer,	Bosch Ltd., Chennai	Member
20.	K Mohankumar,	TAFE	Member
21.	M Sivaraman, Consultant,	Delphi TVS	Member
22.	Dr. Ramesh A Professor,	D/o Mechanical Engineering Indian Institute of Technology Madras IIT P.O., Chennai 600 036	Member
23.	Dr. A.R. Mohanty Professor,	D/o Mechanical Engg Indian Institute of Technology Kharagpur Kharagpur India - 721302	Member
24.	Dr. Shankar Ram C S Assistant Profesor	D/o Engineering Design Indian Institute of Technology Madras IIT P.O., Chennai 600 036	Member
25.	Prof. Nilesh J Vasa, Professor,	IIT Chennai	Member
26.	Prof. G. Balaganesh, Professor,	IIT Chennai	Member
27.	J. Rajakumar,Principal,	Brakes India	Member
28.	S HorlyokChelladurai,Retd.	ITI Principal	Member
29.	Mr. K.S. Rao, JDT,	NIMI, Chennai	Member
30.	Mr. Yuvraj, DDT,	ATI Chennai	Member
31.	Mr. G. Venktesh, ADT,	ATI Hyderabad	Member
32.	Mr. S.P. Rewaskar,	ATI Hyderabad	Member
33.	Mr. T.N. Rudra, TO,	ATI, Howrah	Member
34.	Mr. N. Ramesh Kumar, TO,	ATI, Chennai	Member
35.	Mr. Akhilesh Pandey, TO,	ATI, Mumbai	Member
36.	Mr. Vijayaraju, TO,	ATI Hyderabad	Member

37.	Mr. R. Rajesh Kanna, TO,	ATI Chennai	Member
38.	Mr. H.S. Kalara, Principal,	Govt. ITI, Chandigarh	Member
39.	Mr. A. Duraiswamy,	ATO, Govt. ITI, Coimbattore	Member
40.	Mr. W. Nirmal Kumar Isarael, ATO,	Govt. ITI, Trichy	Member
41.	Mr. K. Thaniarasu, ATO,	Govt. ITI, Trichy	Member
42.	Mr. N. Durimurugan, TO,	Govt. ITI, Chengalpattu	Member
43.	Mr. Ravindernath,	Govt. ITI, Ambattur	Member
44.	Palanikumar,	Govt. ITI, Pudukotai, TN	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