SYLLABUS OF SEMESTER SYSTEM
FOR THE TRADE OF

Pump Operator cum Mechanic

Under

Craftsmen Training Scheme (CTS)
(One year/Two Semesters)

Redesigned in
2014

By
Government of India
Ministry of Labour & Employment (DGE&T)

SYLLABUS FOR THE TRADE

GENERAL INFORMATION

1.	Name of the Trade	:	Pump operator cum Mechanic
2.	N.C.O. Code No.	:	**7233.40**
3.	Duration of Craftsmen Training	:	1Year (Two Semester having duration of six months each)
4.	Power Norms	:	11 KW
5.	Space Norms	:	84 Sq. mtr.
6.	Entry Qualification	:	Passed 10th class examination under 10+2 system of education with Science and Mathematics or its equivalent.
7.	Unit strength	:	16 + 30% super Numeric
8.	Instructors Qualification	:	a) Degree in Automobile/ Mechanical Engg./Electrical Eng from recognised college/University with one year experience in the relevant field. OR Diploma in **Automobile/ Mechanical** Engg /Electrical Engg From recognized board of technical education with two years experience in the relevant field OR 10th Passed + NTC/NAC in the Trade of **"(Pump Operator Cum Mechanic)**" with 3 years post qualification experience in the relevant field **and** b) With "**National Crafts Instructor Certificate".**

* **Note**:

1) At least one Instructor must have Degree in Automobile/ Mechanical Engg /Electrical Engg. When applied for 02 units.
2) Instructor Qualification for WCS & E.D, as per the Training Manual

9. For Employability Skills One Contract/Part Time/Guest Faculty for Generic Module .

i) MBA/ BBA with two years experience **OR** Graduate in Sociology / Social Welfare / Economics with Two years experience **OR** Graduate / Diploma with Two years experience and trained in Employability Skills from DGET institutes

AND

Must have studied English / Communication Skills and Basic Computer at 12^{th} / Diploma level and above

OR

Existing Social Study Instructors duly trained in Employability Skills from DGET institutes

Distribution of training on Hourly basis:

Total hours /week	Trade practical	Trade theory	Work shop Cal. &Sc.	Engg. Drawing	Employability skills	Extra curricular activity
42 Hours	27 Hours	5 Hours	3 Hours	3 Hours	2 Hours	2 Hours

COURSE INFORMATION (PUMP OPERATOR CUM MECHANIC)

1.**Introduction :**

- An intensive industrial survey was made to ascertain the requirements of skill-gap in the automobile sector, a scientifically designed survey covering labour-market survey web-survey was conducted. Based on the data obtained the skills are identified and accordingly the syllabus has been drafted. Subsequently the Trade expert committed reviewed.

2. Terminal Competencies/Deliverables :

After successful completion of the above course, the trainee shall be able to perform the following skills with proper sequence.

- **R**epairs all types of pumps such as centrifugal, plunger types etc., according to specifications for pumping water, oil, air etc.,
- Dismantles pump using hand tools and examines mechanism to locate faults or damage, Repairs defective parts or obtains replacements, sets them in position and assembles pump.
- Tests reassembled or repaired unit for pressure, leakage etc., makes necessary adjustment and observes performance for appropriate yield of air, oil or water.
- May erect and install pumps at site and connect to motor power.
- May locate faults to electric system motor repaired such as rewinding of field coils or armatures by Electrician or Armature Winder. May specialise in repairing centrifugal or reciprocating pumps.
- Oil Engine Fitter repairs services and overhauls diesel or oil engines for efficient performance as prime mover to drive machinery and equipment. Examines engine to locate defects, using various tools and instruments.
- Dismantles or partly dismantles it to remove damaged or worn out parts and replaces or repairs them.
- Instals assembled or repaired engine in position and connects pulley or wheel to propulsion system. Starts engine, tunes it up and observes performance noting different meter readings. such as temperature, fuel level, oil pressure, etc. and sets it to specified standard for optimum performance.
- Checks, adjusts and lubricates engine periodically and performs such other functions to keep engine in good working order.

- May solder or braze parts and service diesel fuel pumps and injectors.

- Measures essential parts like cylinder, bores piston, sizes crank pins etc. using gauges, micrometer and other precision tools and gets cylinders re-bored, liners fitted, valve seats refaced, etc. as necessary.

3. Employment opportunities:

On successful completion of the course the candidates can either get employed, or become a self-employed Entrepreneur in any one of the following fields.

a) Wage Employment

1. Pump operator
2. Pump Service Mechanic
3. Pump Fitter in Pump Manufacturing Concern in Assembly Shop or Test Shop
4. Dealers service mechanic
5. Spare Parts Sales Assistant / Manufacturers' Representative
6. Laboratory Assistant

b) Self Employment

1. Pump Service Mechanic
2. Pump Operator
3. Spare Parts Salesman
4. Spare Parts Dealer

4. Further learning pathways:

- On successful completion of the course trainee can get themselves enrolled in Apprenticeship training in reputed Industrial organisation.
- The qualified candidates have scope for lateral entry into the Diploma courses offered by some of the State Governments
- The qualified candidates can also get themselves upgraded by taking up the Second Semester at his own convenience in the CTS scheme, since the first semester is common to the following trades.

Craftsman Training Scheme

1. Mechanic Motor Vehicle - 2 Years (4 Sem)
2. Mechanic Diesel – 1 Year (2 Sem)
3. Mechanic Motor Cycle - 1 Year (2 Sem)
4. Mechanic Auto Electrical and Electronics - 1 Year (2 Sem)
5. Mechanic Agricultural Machinery - 2 Years (4 Sem)
6. Mechanic Tractor - 1 Year (2 Sem)
7. Pump Operator cum Mechanic - 1 Year (2 Sem)

Syllabus for the trade of Pump operator Cum Mechanic
First Semester (Semester code No.)
Duration: Six Months.

Syllabus for Trade practical and Trade Theory

Week No.	Trade Practical (27 Hrs/week)	Trade Theory (5 Hrs/week)
1	Familiarisation with institute, Job opportunities in the automobile sector, Machinery used in Trade. 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 time table
2	Practical related to Safety and Health, Importance of maintenance and cleanliness of Workshop. Interaction with health centre and fire service station to provide demo on First aid and Fire safety, Use of fire extinguishers. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of Used engine oil. 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 vehicles. **Energy conservation**-Definition, Energy Conservation Opportunities (ECOs)-Minor ECos and Medium ECOs, Major ECOs), Safety disposal of Used engine oil, Electrical safety tips.
3-5	Practice using all marking aids, like steel rule with spring calipers, dividers, scriber, punches, Chisel etc., Layout a work piece- for line, circle, arcs and circles. Practice to measure a wheel base of a vehicle with measuring tape. Practice to measure valve spring tension using spring tension tester Practice to remove wheel lug nuts with use of an air impact wrench Practice on General workshop tools & power tools.	**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 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. Hammer- ball pein, lump, mallet. Screw drivers-blade screwdriver, **Phillips** screw driver, Ratchet screwdriver. Allen key, bench vice & C-clamps, Spanners- ring spanner, open end spanner & the combination spanner, universal adjustable open end 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.
6&7	Measuring practice on Cam height,	**Systems of measurement**, Description, care &

	Camshaft Journal dia, crankshaft journal dia, Valve stem dia, piston diameter, and piston pin dia with outside Micrometers. Measuring practice on the height of the rotor of an oil pump from the surface of the housing or any other auto component measurement with depth micrometer. Measuring practice on valve spring free length. Measuring practice on cylinder bore, Connecting rod bore, inside diameter (ID) of a camshaft bearing with Telescope gauges. Measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. Measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator. Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. Measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. Practice to check engine manifold vacuum with vacuum gauge. Practice to check the air pressure inside the vehicle tires is maintained at the recommended setting.	use of - Micrometers- Outside and depth mirometer, Micrometer adjustments, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, straightedge, feeler gauge, thread pitch gauge, vacuum gauge, tire pressure gauge.
8 & 9	Practice on General cleaning, checking and use of nut, bolts, & studs etc., Removal of stud/bolt from blind hole. Practice on cutting tools like Hacksaw, file, chisel, Sharpening of Chisels, center punch, safety precautions while grinding. Practice on Hacksawing and filing to	**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.** **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,

	given dimensions.	bench and pedestal grinders, safety precautions while grinding. **Limits, Fits & Tolerances**:-Definition of limits, fits & tolerances with examples used in auto components
10 & 11	Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills Safety precautions to be observed while using a drilling machine. Practice on Tapping a Clear and Blind Hole, Selection of tape drill Size, use of Lubrication, Use of stud extractor. Cutting Threads on a Bolt/ Stud. 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.
12	Practice on making Rectangular Tray. Pipe bending, Fitting nipples unions in pipes. Soldering and Brazing of Pipes.	**Sheet metal** - State the various common metal Sheets used in Sheet Metal shop Sheet metal operations - Shearing, bending, Drawing, Squeezing Sheet metal joints - Hem & Seam Joints Fastening Methods - Riveting, soldering, Brazing. fluxes used on common joints. Sheet and wire-gauges. The blow lamp- its uses and pipe fittings.
13	Practice in joining wires using soldering Iron, Construction of simple electrical circuits, Measuring of current, voltage and resistance using digital multimeter, 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 Mulitmeter, Conductors & insulators, Wires, Shielding, Length vs. resistance, Resistor ratings
14	Diagnose series, parallel, series-parallel circuits using Ohm's law, Check electrical circuit with a test lamp, perform voltage drop test in circuits using multimeter, measure current flow using multimeter /ammeter, use of service manual wiring diagram for troubleshooting.	Fuses & circuit breakers, Ballast resistor, Stripping wire insulation, cable colour codes and sizes, Resistors in Series circuits , Parallel circuits and Series-parallel circuits, Electrostatic effects, Capacitors and its applications, Capacitors in series and parallel.
15	Cleaning and topping up of a lead acid battery, Testing battery with hydrometer,	Description of Chemical effects, Batteries & cells, Lead acid batteries & Stay Maintenance Free (SMF) batteries, Magnetic effects, Heating effects, Thermo-electric energy, Thermisters,

	Connecting battery to a charger for battery charging, Inspecting & testing a battery after charging**,** Measure and Diagnose the cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. Testing of relay and solenoids and its circuit.	Thermo couples, Electrochemical energy, Photo-voltaic energy, Piezo-electric energy, Electromagnetic induction, Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils.
16	Identify and test power and signal connectors for continuity, Identify and test different type of Diodes, NPN & PNP Transistors for its functionality**,** Construct and test simple logic circuits OR, AND & NOT and Logic gates using switches.	**Basic electronics**: Description of Semi conductors, Solid state devices- Diodes, Transistors, Thyristors, Uni Junction Transistors (UJT), Metal Oxide Field Effect Transistors (MOSFETs), Logic gates-OR, AND & NOT and Logic gates using switches.
17& 18	Practice to make straight beads and Butt, Lap & T joints Manual Metal Arc Welding. Setting of Gas welding flames, practice to make a straight beads and joints Oxy – Acetylene welding Film on Heat treatment process	**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 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 auto components with examples.
19 & 20	Practice on Liquid penetrant testing method and Magnetic particle testing method. Identification of Hydraulic and pneumatic components used in vehicle. Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit. Identification of components in Air brake systems**.**	**Non-destructive Testing Methods- Importance of Non-Destructive Testing In Automotive Industry, Definition of NDT,** Liquid penetrant and Magnetic particle testing method – Portable Yoke method **Introduction to Hydraulics & Pneumatics: -** Definition of Pascal law, pressure, Force, viscosity. Description, symbols and application in automobile of Gear pump-Internal & External, single acting, double acting & Double ended cylinder; Directional control valves-2/2, 3/2, 4/2, 4/3 way valve, Pressure relief valve, Non return valve, Flow control valve used in automobile. Pneumatic Symbols, Description and function of

		air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator & Lubricator).
21	Identification of different type of Vehicle. Demonstration of vehicle specification data; Identification of vehicle information Number (VIN). Demonstration of Garage, Service station equipments.- Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands.	Auto Industry - History, leading manufacturers, development in automobile industry, trends, new product. Brief about Ministry of Road transport & Highways, The Automotive Research Association of India (ARAI), National Automotive Testing and R&D Infrastructure Project (NATRIP), & Automobile Association. Definition: - Classification of vehicles on the basis of load as per central motor vehicle rule, wheels, final drive, and fuel used, axles, position of engine and steering transmission, body and load. Brief description and uses of Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands.
22-23	In-plant Training	
24-25	Revision and Test	
26	NCVT Exam	

Automobile Group – 1 year Trade
1st Semster
Workshop Calculation and Science
Syllabus for the trade of Pump operator cum Mechanic

Week No.	Workshop calculation and Science (3 Hrs/week)
1	Units, Derived and fundamental, types of system FPS, CGS, MKS and their conversion. Metric weights and measurements, units conversion factors
2	Fractions- Addition and subtraction, Fractions and whole numbers, Combined addition and subtraction, Multiplication and division of fractions. Operations in problems involving fractions.
3	Order of performing (BODMAS) Mathematical operators , Integers – Rules for dealing with integers, Addition, subtraction, Multiplication and division.
4 & 5	Ratio and proportion. Percentages, Examples of ratios in Automotive technology
6	profit and loss, Discount .
7	simple interest and compound interest
8	depreciation calculation
9-10	Time and work problem , Time and distance, clocks and calendar,
11	Brief description of manufacturing process of steel, and aluminum
12	Meaning of elasticity, malleability, brittleness, hardness, compressibility & ductility and their examples , Properties and uses of cast iron, ferrous metal, gray cast iron, white cast iron, wrought iron, and plain carbon steel, high speed steel and alloy steel.
13	Properties and uses in automobile industries- copper, zinc, lead, tin, aluminum, brass, bronze, solder bearing metals, timber and rubber. Nylon, P.V.C., PP (poly prop line, polymer).
14-15	**Materials – Stress, strain,-** Definition of Stress, Types of stress- Tensile, compressive, shear , Examples of the three basic stresses in automotive components , calculation of stress and strain in automotive application, Stress raisers, Strain-, Tensile, compressive, Shear strain, Tensile strength, Factor of safety, Torsional stress, Strain energy.
16	Definition of cold working and Hot working and its properties on sheet metal. Advantage of Deep drawing material. Importance of Iron- carbon diagram in heat treatment process.
17	Different Type of cutting fluids and their properties. Calculation of cutting speed, feed and drilling time.
18-19	**Forces** – Definition of Force, Types of force -examples,– Direct forces, Attractive forces, Explosive forces, Describing forces, Graphical representation of a force, Addition of forces, Parallelogram of forces ,Triangle of forces, Resolution of forces, Mass, Equilibrium, Pressure, Pressure in hydraulic systems, Hooke's law, Practical applications.
20-21	**Work energy, power–** Definition and calculation of Work, Power and Work done by a torque, Definition and calculation of Energy -Potential energy, Chemical energy, Conservation of energy, Energy equation, Kinetic energy, Energy of a falling body, Kinetic energy of rotation.

Automobile Group – 1 year Trade

1st Semester Engineering Drawing

Syllabus for the trade of Syllabus for the trade of Pump operator cum Mechanic

Week No.	**Engineering Drawing (3 Hrs/week)** **1st Semester**
1	Importance of engineering drawing as a communication medium, different types of drawing - Machine Drawing, Production Drawing, Part Drawing, Assembly Drawing, Drawing instruments, equipment and materials and their uses
2&3	Scales - Recommended scales, reduced & enlarged Drawing Sheet sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheet, sizes of title block and its contents. Using drawing instruments to draw straight lines, rectangles, squares, circles, polygons.
4&5	Lettering and Dimensioning - Types of Lettering, Guide Lines for lettering, Recommended sizes of letters and numbers, Single stroke letters, Dimensioning - rules and systems of dimensioning – dimensioning a given drawing.
6&7	Identify the alphabet of lines- Read and Interpret the meaning of various line types with examples- Object Lines, Hidden Lines, Center Lines, Phantom Lines, Dimension Lines, Extension Lines, Leaders, Break Lines -Long-break Line, Round, Solid, Hollow Cross Section, Section Lines – Common Manufacturing Materials, Cutting Plane Lines
8-11	Geometric Construction - Bisecting a line - perpendiculars - parallel lines - division of a line; Angles - bisection, trisection, Tangent lines touching circles internally and externally Polygons - Regular polygons - circumscribed and inscribed in circles. Conic sections - Definitions of focus, directrix, eccentricity, Construction of Ellipse by Concentric circles method, Construction of parabola by rectangular method.
12&13	Orthographic Projection - Definition - Planes of Projection - Four quadrants – Reference Line, First angle projection - Third angle projection.
14-17	Isometric Projection - Definition - Isometric axes, lines and planes, Isometric Scale - Isometric view. Drawing of isometric views of plane figures, Drawing of isometric views of prisms and pyramids, Drawing of isometric view of cylinders and cones
18-21	Development of Surfaces - Need for preparing development of surface, Concept of true length - Principal methods of development, Development of simple solids like cubes, prisms, cylinders, pyramids, cones.

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-I

(pl ref to www.dget.nic.in)

Syllabus for the trade of <u>Pump operator Cum Mechanic</u>
Second Semester (Semester code No.)
Duration: Six Months.

Syllabus for Trade practical and Trade Theory

Week NO.	**Trade Practical (28 Hrs/week)**	**Trade Theory (6 Hrs/week)**
1 & 2	Identification of different type of stationary Engine and their applications. Familiarisation with diesel engines, tools and equipment required for maintenance, engine parts and their handling technique. Starting and stopping of engines. Running of engines and checking temperatures, fuel oil pressure and consumption on load and engine speed.	Pump Industry in India - leading manufacturers, development in Pump Industry, trends, new product. Principle of **Compression-ignition engine,** Spark Ignition Engine, differentiate between 4-stroke and 2 stroke, C.I engine and S.I Engine, Otto cycle and Diesel cycle. Different type of starting and stopping method of Diesel Engine. Technical terms used in engine, Engine specification
3.	Cleaning of fuel tank, checking leaks in the fuel lines. Cutting, flaring of tubes to make T & Elbow fitting using unions. Fitting of lubrication pump oil filters, air filters, checking and adjusting of oil pressure. 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.
4.	Practice on troubleshooting in 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.	**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.
5.	Familiarization with plain/journal bearings, anti-friction bearings used on machine assembly. Specification Mounting of bearing on shafts and in housing with proper fit & axis alignment. Use of proper tools. Removal of bearings from shafts & housing by using pullers. Cleaning up & removing old metal form bearing and replacing with new metal. Checking of shafts for alignment with dial indicator.	Types of belt drives, velocity ratio of belt drive. Horse Power 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.
6.	Identification of different pumps, its components, prime movers. Practice on operational safety Dismantling of reciprocating pumps- valves, pistons, cranks, seals etc. for inspection, repair & replacement. 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.

7.	Dismantling of rotary pumps- impeller, shaft, bearing etc, for inspection, Repair & replacement. Cleaning of parts and assembling. Checking for alignment, clearance, etc., Priming technique and its application. 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 equipments required
8.	Servicing of pumps and valves of general purpose and of corrosive fluids. Selection of gasket, packing & gland materials, marking & cutting off gasket as per shape & profile. 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.
9.	Installation of seals leather polythene, asbestos, rope rubber and mechanical seals. Maintenance of lubrication systems. Fitting of flanges and assembling of pipe work, leak testing and rectification. Use of tee, elbow, bend, socket, rectifiers and other pipe fittings. 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
10	Installation of stationary & coupled pumps, checking and correcting of alignment of pump with its prime movers and its serviceability test. 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.
11	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.
12	Dismantling identifying of parts, finding out defects, repairing, and replacement of components, cleaning, assembling, installing and testing of submersible pumps. Finding out & rectifying faults developed during operation.	Submersible pump- construction, operation and selection of appropriate type. Procedure to recondition, install and test of submersible pumps. Causes of failures and remedial measures.
13	Identifying and rectifying defects of pump sets. 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.
14	Familiarization with the safety precautions to be followed for electrical work. Treatment for electrical shock. Use of hand tools connected with electrical	Safety rules to be followed in connection with electrical work. First aid when affected by electrical shock. Purpose, types, description and method to use common electrical hand

	work and maintenance of electrical machines.	tools.
15 & 16	Verification of Ohm's law. Building up of electrical series, parallel and combination of series & parallel circuits. Measurement of current, voltage resistance. Exercise on fixing and connecting switches holders, fuses, plugs sockets, Push buttons, etc. 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.
17	Identifying of A.C motors, their testing, identifying terminals, connecting running & reversing. Measuring speed of A.C motor using tachometer with stop watch. Dismantling, assembling of A.C motors & identification of parts. Starting a single phase A.C motor with Direct on line (D.O.L) starter. Starting a 3 phase motor with star-delta starter. Checking for proper running of motor, overheating etc. maintenance of motors use and connection of single phase preventor trouble shooting in circuit.	AC Motors – related terminology. Purpose, type, construction, operation, testing for correct functioning, maintenance and industrial applications. Trouble shooting & protection of induction motor.
18	Practice on making out key as per shaft, hub, keyways, preparing keys to fit into keyways.	Types of key and key ways, their uses and applications. Preparation of keys, allowable tolerance, clearances. Key fitting procedure-methods. Procedure for removing keys. Types & uses of key pullers.
19	Identifying, selecting, 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 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.
20	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. Use of inclined plane, hydraulic trolleys etc. Care and maintenance of lifting equipment and safety to be observed by	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.

	handling the equipment.	
21	Making different types of keys for fitting pulleys, Assembling and dismantling of bushes, bearings and couplings maintaining safety.	Types of pulleys solid, split, "V" groove, step, cone, taper, guided and jockey or rider pulleys, their functions and uses. Procedure to assemble and dismantle pulleys and impellers from shafts following safety precautions
22-23	In Plant Training	
24-25	**Revision and test**	
26	NCVT Exam	

Automobile Group – 1 year Trade
2nd Semster
Workshop Calculation and Science
Syllabus for the trade of Pump operator cum Mechanic

Week No.	Workshop calculation and Science (3 Hrs/week)
1 & 2	**Factorisation and quadratics**: multiply expressions in brackets by a number, symbol or by another expression in a bracket; by extraction of a common factor eg ax + ay, a(x + 2) + b(x + 2) ; by grouping eg ax − ay + bx − by ; quadratic expressions eg $a^2 + 2ab + b^2$; roots of an equation eg quadratic equations with real roots by factorisation, and by the use of formula
3	**Geometry–** Use of scientific calculator,/logarithmic table Angles -Angular measurement, Angles and rotation, Examples of angles in automotive work, Adding and subtracting angles. Types of angle- Adjacent angles, Opposite angles, Corresponding angles, Alternate angle
4-6	**Trigonometry-** Types of triangle - Acute angled triangle, Obtuse angled triangle, Equilateral triangle, Isosceles triangle, Scalene triangle, Right angled triangle, Labelling sides and angles of a triangle, Sum of the three angles of a triangle. Pythagoras' theorem, Circles, Ratio of diameter and circumference, Length of arc, Timing marks, Wheel revolutions and distance travelled, Valve opening area. Trigonometry- Using sines, cosines and tangents to solve vehicle problems.
7 -10	Formulae for Perimeter and Area of Plane figure - Rectangle, Square, Parallelogram, Triangle, Hexagon, any regular polygon, Trapezium, Circle, sector, Fillet, Ellipse, segment of a circle; Formulae for Volume and surface area of solids- Rectangular solid, Prism, cylinder, pyramids and cones, Frustum of pyramid and cones, sphere, Hollow sphere, segment of sphere, circular ring, spherical sector, Calculation of volume and weight of simple solid bodies such as cubes, square and hexagonal prism-shop problem.
11-13	Statistics – Collecting and sorting raw data, Definition of Discrete variable, continuous variable with Shop examples. Constructing pictographs-pie chart, Bar chart. Frequency and tally Charts. Importance of the shape of a frequency distribution- histogram, frequency polygon, Cumulative frequency plot. Interpreting statistics- sampling, arithmetic mean, median,
14 & 15	**Heat and temperature –**Temperature-Thermodynamic temperature scale (Kelvin), Cooling system temperature; Standard temperature and pressure (STP); Thermal expansion with calculation; Heat- Sensible heat, Latent heat, Specific latent heat, Specific heat capacity, Quantity of heat with calculation; Heat transfer – Conduction, Convection, Radiation ;
16 & 17	**Heating, expansion and compression of gases** - Absolute pressure, Absolute temperature; Laws relating to the compression and expansion of gases -Heating a gas at constant volume, Heating a gas at constant pressure, Charles' law. Expansion or compression at constant temperature – isothermal

18-20	**Internal combustion engines-** Engine power-Brake power, Horsepower, PS – the DIN, Indicated power, Mean effective pressure, Calculation of indicated power, Cylinder pressure vs. crank angle, Mechanical efficiency of an engine, Volumetric efficiency, Torque vs. engine speed, Specific fuel consumption vs. engine speed, Brake power, torque and sfc(Specific fuel consumption) compared, Brake mean effective pressure, Thermal efficiency, Indicated thermal efficiency, Brake thermal efficiency petrol vs. Diesel.
21	**Fuels and combustion-** Calorific value, Combustion-Products of combustion, Relevant combustion equations. Air–fuel ratio-Petrol engine combustion, Detonation, Pre-ignition, Octane rating, Diesel fuel, Flash point , Pour point, Cloud point, Biofuels, Liquefied petroleum gas (LPG) ,Hydrogen, Zero emissions vehicles (ZEVs)

Automobile Group – 1 year Trade

2nd Semester Engineering Drawing

Syllabus for the trade of Syllabus for the trade of Pump operator cum Mechanic

Week Nos.	**Engineering Drawing (3 Hrs/week)** **2nd Semester**
1-4	Read and interpret drawings- Determine information from the title block, Read and interpret industrial prints, Read and interpret detailed and assembly drawings, Identify casting drawings and machining drawings, Read and interpret diagrams, Distinguish between a monodetail and a multidetail drawing.
5-8	Identify different drawing projections - Interpret pictorial and multi-view drawings. Interpret auxiliary and section views, Determine views in a drawing and the significance of the view being shown. Identify missing lines and missing views.
9-12	Free hand sketching of key and screw threads. Read and interpret three Types of screw thread representation: pictorial, schematic and simplified presentation. Terms used in describing a threaded Part, Designation of Thread Specifications, Left-Hand Thread Notations, read and interpret the different type of Finish Symbols, Fillets and Rounds and Machine Slots.
13	Drawing of I .C engine – Diesel and their parts.
14	Free hand sketching of screw jack, Free hand sketching assembly of pulleys.
15	Free hand sketching of different type of bearing.
16	Free hand sketching of reciprocating pump component..
17	Free hand sketching of rotary pump component
18	Free hand sketching of centrifugal pump component
19	Free hand sketching of Submersible pump component
20	Drawing of electrical symbol as per IS:1248, Reading of the circuit diagram of electrical circuits.
21	Electrical circuit diagram connecting A.C. motors.

SYLLABUS FOR EMPLOYABILITY SKILLS

SEMESTER-II

(Pl ref to www.dget.nic.in)

TRADE: Pump Operator Cum Mechanic

LIST OF TOOLS & EQUIPMNT

A. TRAINEES TOOL KIT per 4 Trainees FOR 20 TRAINEES +1 ISTRUCTOR

Sl.No.	Item with specification	Qty (Nos.)
1.	Allen Key set of 12 pieces (2mm to 14mm)	(5+1)
2.	Caliper inside 15 cm Spring	6
3.	Calipers outside 15 cm spring	6
4.	Center Punch 10 mm. Dia. x 100 mm.	6
5.	Dividers 15 cm Spring	6
6.	Electrician Screw Driver 250mm	6
7.	Hammer ball peen 0.5 kg with handle	6
8.	Hands file 20 cm. Second cut flat	6
9.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	6
10.	Pliers combination 20 cm.	6
11.	Screw driver 20cm.X 9mm. Blade	6
12.	Screw driver 30 cm. X 9 mm. Blade	6
13.	Scriber 15 cm	6
14.	Spanner D.E. set of 12 pieces (6mm to 32mm)	6
15.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	6
16.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	6
17.	Steel rule 30 cm inch and metric	6
18.	Steel tool box with lock and key (folding type) 400x200x150 mm	6
19.	Wire cutter and stripper	6

B. Tools Instruments and General Shop outfits

Sl.No.	Item with specification	Qty. (Nos)
1.	Adjustable spanner (pipe wrench 350 mm)	2
2.	Air blow gun with standard accessories	1
3.	Air impact wrench with standard accessories	4
4.	Air ratchet with standard accessories	4
5.	Allen Key set of 12 pieces (2mm to 14mm)	4
6.	Ammeter 300A/ 60A DC with external shunt	4
7.	Angle plate adjustable 250x150x175	1
8.	Angle plate size 200x100x200mm	2
9.	Anvil 50 Kgs with Stand	1
10.	Auto Electrical test bench	1
11.	Battery –charger	2
12.	Bearing and gear tester	2
13.	Belt Tensioner gauge	1
14.	Blow Lamp 1 litre	2
15.	Bradawl	2
16.	Caliper inside 15 cm Spring	4

17.	Calipers outside 15 cm spring	4
18.	Cam lock type screw driver	1
19.	Car Jet washer with standard accessories	1
20.	Carge winches 3, 5 tonnes	1
21.	Chain pipe wrench 65 m	2
22.	Chain Pulley Block-3 ton capacity with tripod stand	1
23.	Chisel 10 cm flat	4
24.	Chisels cross cut 200 mm X 6mm	4
25.	Circlip pliers Expanding and contracting type 15cm and 20cm each	4
26.	Clamps C 100mm	2
27.	Clamps C 150mm	2
28.	Clamps C 200mm	2
29.	Cleaning tray 45x30 cm.	4
30.	Compression testing gauge suitable for diesel Engine	2
31.	Copper bit soldering iron 0.25 Kg	5
32.	crab	1
33.	Cylinder bore gauge capacity 20 to 160 mm	4
34.	DC Ohmmeter 0 to 300 Ohms, mid scales at 20 Ohms	4
35.	Depth micrometer 0-25mm	4
36.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)	4
37.	Different type of Engine Bearing model	1 set
38.	Digital Tonge Tester 0-20 A AC	2
39.	Dividers 15 cm Spring	4
40.	Drift Punch Copper 15 Cm	4
41.	Drill point angle gauge	1
42.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4
43.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
44.	Electric testing screw driver	2
45.	Energy meter, AC, Single Phase, 5 Amps, 230 Volts	2
46.	Engineers square 700 mm	4
47.	Engineers stethoscope	1
48.	Feeler gauge 20 blades (metric)	4
49.	File flat 20 cm bastard	4
50.	File, half round 20 cm second cut	4
51.	File, Square 20 cm second cut	4
52.	File, Square 30 cm round	4
53.	File, triangular 15 cm second cut	4
54.	Files assorted sizes and types including safe edge file (20 Nos)	2 set
55.	Flat File 25 cm second cut	4
56.	Flat File 35 cm bastard	4
57.	Flow meter 0-400 lt/min	2
58.	Forks clips 02 tonnes (copa)	1
59.	Forks clips 05 tonnes (copa)	1
60.	Foundation bolt	4
61.	Gasket hollow punches 5, 6, 8, 10, 12, 19, 25 mm dia.	1set
62.	Glow plug tester	2
63.	Granite surface plate 1600 x 1000 with stand and cover	1
64.	Grease Gun	2
65.	Growler	2

66.	Hacksaw frame adjustable 20-30 cm	10
67.	Hammer Ball Peen 0.75 Kg	4
68.	Hammer Chipping 0.25 Kg	4
69.	Hammer copper 1 Kg with handle	4
70.	Hammer Mallet	4
71.	Hammer Plastic	4
72.	Hand key way broacher	1
73.	Hand operated chain pulley block	1
74.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
75.	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2sets
76.	Hand Shear Universal 250mm	2
77.	Hand vice – 37 mm	2
78.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
79.	Hydraulic wheel and bearing puller	2
80.	Injector – Multi hole type, Pintle type	4 each
81.	Injector cleaning unit	1
82.	Injector testing set (Hand tester)	1
83.	Insulated Screw driver 20 cm x 9mm blade	4
84.	Insulated Screw driver 30 cm x 9mm blade	4
85.	Ladle 150mm Dia	1
86.	Left cut snips 250mm	4
87.	Level bottle (sprit) 150 ml.	1
88.	Lifting jack screw type 3 ton capacity	4
89.	Magneto spanner set with 8 spanners	1 set
90.	Magnifying glass 75mm	2
91.	Manila ropes 12, 20, 30 mm dia.	2 sets
92.	Marking out table 90X60X90 cm.	1
93.	Masonary bit (Assorted up to 12 mm)	2set
94.	Master test bars (different size)	1
95.	Megger 500 V	2
96.	Mobile crank	1
97.	Multimeter digital	5
98.	Oil can 0.5/0.25 liter capacity	2
99.	Oil Stone 15 cm x 5 cm x 2.5 cm	1
100.	Outside micrometer 0 to 25 mm	4
101.	Outside micrometer 25 to 50 mm	4
102.	Outside micrometer 50 to 75 mm	1
103.	Outside micrometer 75 to 100 mm	1
104.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	2 sets
105.	Pin spanner set	2
106.	Pipe cutting tool	2
107.	Pipe flaring tool	2
108.	Pipe wrench 45 mm	2
109.	Pliers combination 20 cm.	2
110.	Pliers flat nose 15 cm	2
111.	Pliers round nose 15 cm	2
112.	Pliers side cutting 15 cm	2

113.	Plumb bob	1
114.	Pneumatic scraper with adjustable stroke	2
115.	Portable electric drill Machine	1
116.	Portable jack	1
117.	Power Supply 0-12 v, lamp	1
118.	Pressure gauge 0 -5 Kg/cm2	2
119.	Prick Punch 15 cm	4
120.	Punch Letter 4mm (Number)	2 set
121.	Radius Gauge, Metric	2
122.	Ratchet chain pulley	1
123.	Rawl plug tool & kit	2
124.	Right cut snips 250mm	4
125.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	4
126.	Rollers (steel tubes) from 40 to 65 mm dia.	5
127.	Rotary pump working for dismantling and assembling	1
128.	Scientific Calculator	2
129.	Scraper flat 25 cm	2
130.	Scraper half round 25 cm	2
131.	Scraper Triangular 25 cm	2
132.	Screw jacks	1
133.	Scriber 15 cm	2
134.	Scriber with scribing black universal	2
135.	Self alignment roller ball bearing	2
136.	Set of stock and dies - Metric	2 sets
137.	Shear legs (tripod)	1
138.	Shear Tin Man's 450 mm x 600mm	4
139.	Sheet Metal Gauge	2
140.	Sher Tinmans 300mm	4
141.	Single Phase 220 V Capacitor type AC Meter squirrel gage Induction motor	1
142.	Soldering Copper Hatchet type 500gms	4
143.	Solid Parallels in pairs (Different size) in Metric	2
144.	Spanner Clyburn 15 cm	1
145.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
146.	Spanner T. flocks for screwing up and up-screwing inaccessible	2
147.	Spanner, adjustable 15cm.	2
148.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2
149	Spanners socket with speed handle, T-bar, ratchet and universal upto	2
150	Spark lighter	2
151	Spark plug spanner 14mm x 18mm x Size	2
152	Square box wrenches	1
153	Square T-wrenches	1
154	SRDG ball bearing, DRDG ball bearing, self aligning ball bearing,	1
155	Steel measuring tape 10 meter in a case	4
156	Steel rule 15 cm inch and metric	4
157	Steel rule 30 cm inch and metric	4
158	Steel wire Brush 50mmx150mm	5
159	Straight edge gauge 2 ft.	2
160	Straight edge gauge 4 ft.	2

161	Stud extractor set of 3	2 sets
162	Stud remover with socket handle	1
163	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	2
164	Tachometer (Counting type)	1
165	Taps and Dies complete sets (5 types)	1 set
166	Taps and wrenches - UNC, UNF and metric	2 sets
167	Telescope gauge	4
168	Temperature gauge 0-100 deg c	2
169	Thermostat	2
170	Thimbles of different sizes	2
171	Thread pitch gauge Metric,	1
172	Threaded fastener type B	2
173	Threaded fastener type C	2
174	Threaded fastener type F	2
175	Three cell torch	2
176	Three Phase 50 Hz, 5 HP AC squirrel gage induction motor with star delta starter	1
177	Timing lighter	1
178	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
179	Trammel 30 cm	2
180	Travelling and gantry cranes	1
181	Tube expander up to 62 mm	1
182	Universal puller for removing pulleys, bearings	1
183	V' Block 75 x 38 mm pair with Clamps	2
184	Vacuum gauge to read 0 to 760 mm of Hg.	2
185	vernier caliper 0-300 mm with least count 0.02mm	4
186	Vibrometer	2
187	Vice grip pliers	2
188	Voltmeter AC to 500 V	2
189	Wall hoists	1
190	Water pump for dismantling and assembling	2
191	Wattmeter AC/DC, 0 to 10 Kw	2
192	Wire Gauge (metric)	5
193	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	1

C. General Installation/ Machineries

Sl.No.	Item with specification	Qty (Nos.)
1.	Arbor press hand operated 2 ton capacity	1
2.	Back pull out type centrifugal pump	1
3.	Bench lever shears 250mm Blade x 3mm Capacity	1
4.	Centrifugal pump coupled with mono block set	1
5.	Diesel engine 2 stroke vertical (up to 10 KW/ ISHP)	1
6.	Diesel Engine 4 stroke vertical (up to abouit 10 KW/ISHP)	1
7.	Diesel Engine Driven portable pump set	1
8.	Diesel Engine upto 3.5 KW /4.5 HP fitted with pump	1
9.	Discrete Component Trainer / Basic Electronics Trainer	1

10.	Drilling machine bench to drill up to 12mm dia along with accessories	1
11.	Dual Magnetization Yoke : AC / HWDC, 230 VAC, 50Hz	1 set
12.	Gas Welding Table 1220mm x760mm	2
13.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth	1
14.	Horizontal split casing pump	1
15.	Hydraulic jack HI-LIFT type -3 ton capacity,	1
16.	Hydraulic Leak Testing equipment	1
17.	Injector Testing set (Hand Tester)	1
18.	Liquid penetrant Inspection kit	1 set
19.	Multi stage pump	1
20.	Overhead tank, pump, minimum 5000 litres with level indicators and piping layout	1
21.	Pipe Bending Machine (Hydraulic type) 12mm to 30mm	1
22.	Pneumatic rivet gun	2
23.	Portable electric drill Machine	1
24.	Reciprocating Pump working for dismantling and assembling	1
25.	Spring tension tester	1
26.	Submersible pump set, eight stage upto 10 KW/ 15 HP	1
27.	Tin smiths bench folder 600 x 1.6mm	1
28.	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
29.	Welding plant Oxy-Acetylene complete (high pressure)	1
30.	Welding Transformer (150-300 Amps)	1

D. List of consumable:

Sl. No.	Description	Quantity
1.	Battery- SMF	As required
2.	Brake fluids	As required
3.	Chalk, Prussian blue.	As required
4.	Chemical compound for fasteners	As required
5.	Diesel	As required
6.	Different type gasket material	As required
7.	Different type of oil seal	As required
8.	Drill Twist (assorted)	As required
	Engine coolant	As required
	Engine oil	As required
9.	Emery paper - 36–60 grit , 80–120	As required
10.	Gear oils	As required
11.	Hacksaw blade (consumable)	As required
12.	Hand rubber gloves tested for 5000 V	5 pair
13.	Holders, lamp teakwood boards, plug sockets,	As required
14.	Hydrometer	As required
15.	Lapping abrasives	As required
16.	Leather Apron	As required
17.	Petrol	As required

18.	Power steering oil	As required
19.	Radiator Coolants	As required
20.	Safety glasses	As required
21.	Steel wire Brush 50mmx150mm	As required
22.	Gloves for Welding (Leather and Asbestos)	As required
23.	Block of timber (various sizes)	As required
24.	Various type of seal required for pump assembly	As required

E. Workshop Furniture

Sl. No.	Description	Quantity
1.	Book shelf (glass panel) 6½ ‘ x 3’ x 1½’	As required
2.	Computer Chair	1+1
3.	Computer Table	1+1
4.	Desktop computer and related MS office software	1+1
5.	Discussion Table 8’ x 4’ x 2½ ‘	2
6.	Fire Extinguishers, first- aid box	As required
7.	Instructional Material – NIMI Books/Ref.books	As required
8.	Internet connection with all accessories	As required
9.	Laser printer	1
10.	LCD projector/ LED /LCD TV (42”)	1
11.	Multimedia DVD for Automotive application/subjects	As required
12.	Online UPS 2KVA	1
13.	Stools	21
14.	Storage Rack 6½ ‘ x 3’ x 1½’	As required
15.	Storage shelf 6½ ‘ x 3’ x 1½’	As required.
16.	Suitable class room furniture	As required
17.	Suitable Work Tables with vices	As required
18.	Tool Cabinet - 6½ ‘ x 3’ x 1½’	2
19.	Trainees locker 6½ ‘ x 3’ x 1½’	2 Nos. to accommodate 20 Lockers

List of tools & Equipment for the Trade of Pump operator cum Mechanic - Engineering Drawing (Note : Facilities available in Draughtsman trade can be utilized)

TRAINEE’S TOOLS KIT

Sl. No.	Name of the items	Quantity
1.	Draughtsman drawing instrument box	20+1 set
2.	Set square celluloid 45^0 (250 X 1.5 mm)	20+1 set
3.	Set square celluloid 30^0-60^0 (250 X 1.5 mm)	20+1 set
4.	Mini drafter	20+1 set
5.	Drawing board (700mm x500 mm) IS: 1444	20+1 set

GENERAL MACHINERY SHOP OUTFIT

Sl. No.	Name & Description of Machine	Quantity
1.	Draughtsman table	20 Nos.
2.	Draughtsman stool	20Nos.