

<b>SYLLABUS FOR PUMP OPERATOR CUM MECHANIC TRADE</b>			
<b>DURATION: ONE YEAR</b>			
<b>Duration</b>	<b>Reference Learning Outcome</b>	<b>Professional Skills (Trade Practical) With Indicative Hours</b>	<b>Professional Knowledge (Trade Theory)</b>
Professional Skill 50Hrs.;  Professional Knowledge 14 Hrs.	Comply with environment regulations and housekeeping in the workshop following safety precautions.	1. Familiarization with institute, Job opportunities, Machinery used in Trade. (10hrs.)	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. (07 hrs.)
		2. Types of work done by the students in the shop floor.(15hrs.)	
Professional Skill 50Hrs.;  Professional Knowledge 14 Hrs.	Make choices to carry out marking out the components for basic fitting operations in the	3. Practical related to Safety and Health, Importance of maintenance and cleanliness of Workshop.(5hrs.)	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. (07 hrs.)
		4. Interaction with health center and fire service station to provide demo on First aid and Fire safety, Use of fire extinguishers. (5hrs.)	
Professional Skill 50Hrs.;  Professional Knowledge 14 Hrs.	Make choices to carry out marking out the components for basic fitting operations in the	5. Demonstration on safe handling and Periodic testing of lifting equipment, and Safety disposal of used engine oil. (10hrs.)	Hand & Power Tools:- Marking scheme, Marking material-chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper, Description, care and use of Surface plates,
		6. Energy saving Tips of ITI electricity usage. (5hrs.)	
Professional Skill 50Hrs.;  Professional Knowledge 14 Hrs.	Make choices to carry out marking out the components for basic fitting operations in the	7. Practice using all marking aids, like steel rule with spring calipers, dividers, scribe, punches, Chisel etc. (15hrs.)	Hand & Power Tools:- Marking scheme, Marking material-chalk, Prussian blue. Cleaning tools- Scraper, wire brush, Emery paper, Description, care and use of Surface plates,
		8. Layout a work piece- for	

	workshop.	line, circle, arcs and circles. (15hrs.) 9. Practice to measure a wheel base of a in Diesel Engine with measuring tape. (20hrs.)	steel rule, measuring tape, try square. Calipers-inside and outside. Dividers, surface gauges, scribe, punches-prick punch, center punch, pin punch, hollow punch, number and letter punch. Chisel-flat, cross-cut.(14 hrs.)
Professional Skill 25Hrs.;  Professional Knowledge 07 Hrs.	Use different types of tools and workshop equipment in the workshop.	10. Practice to measure valve spring tension using spring tension tester. (6hrs.) 11. Practice to remove wheel lug nuts with use of an air impact wrench. (6hrs.) 12. Practice on General workshop tools & power tools. (13hrs.)	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. (07 hrs.)
Professional Skill 50Hrs.;  Professional Knowledge 14 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. (07 hrs.) 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. (07 hrs.) 15. Measuring practice on valve spring free length. (3hrs.)	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, (14 hrs.)

		<p>16. Measuring practice on cylinder bore, Connecting rod bore, inside diameter (ID) of a camshaft bearing with Telescope gauges. (7hrs.)</p> <p>17. Measuring practice on cylinder bore for taper and out-of-round with Dial bore gauges. (6hrs.)</p> <p>18. Measuring practice to measure wear on crankshaft end play, crankshaft run out, and valve guide with dial indicator. (6hrs.)</p> <p>19. Measuring practice to check the flatness of the cylinder head is warped or twisted with straightedge is used with a feeler gauge. (5hrs.)</p> <p>20. Measuring practice to check the end gap of a piston ring, piston-to-cylinder wall clearance with feeler gauge. (5hrs)</p> <p>21. Practice to check engine manifold vacuum with vacuum gauge. (4hrs.)</p>	
<p>Professional Skill 25Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p>	<p>Use of different type of fastening and locking devices</p>	<p>22. Practice on General cleaning, checking and use of nut, bolts, &amp; studs etc. (15hrs.)</p> <p>23. Removal of stud/bolt from blind hole. (10hrs.)</p>	<p>Fasteners- Study of different types of screws, nuts, studs &amp; bolts, locking devices, Such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers and locating where they are used. Washers &amp; chemical compounds can be used to help secure these fasteners. Function of Gaskets, Selection of materials for gaskets and packing, oil seals. (07 hrs.)</p>
<p>Professional Skill 25Hrs.;</p>	<p>Use cutting tools in the workshop, following safety</p>	<p>24. Practice on cutting tools like Hacksaw, file, chisel, sharpening of Chisels,</p>	<p>Cutting tools :- Study of different type of cutting tools like Hacksaw, File- Definition, parts of</p>

<p>Professional Knowledge 07 Hrs.</p>	<p>precautions while grinding.</p>	<p>center punch, safety precautions while grinding.(15hrs.) 25. Practice on Hacksawing and filing to given dimensions.(10hrs.)</p>	<p>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 &amp;Tolerances: - Definition of limits, fits &amp;tolerances with examples used in components. (07 hrs.)</p>
<p>Professional Skill 50Hrs.; Professional Knowledge 14 Hrs.</p>	<p>Perform basic fitting operations used in the workshop practices and inspection of dimensions.</p>	<p>26. Practice on Marking and Drilling clear and Blind Holes, Sharpening of Twist Drills.(8hrs.) 27. Safety precautions to be observed while using a drilling machine. (10hrs.) 28. Practice on Tapping a Clear and Blind Hole, Selection of tap drill Size, use of Lubrication, Use of stud extractor. (12hrs.) 29. Cutting Threads on a Bolt/ Stud.(7hrs.) 30. Adjustment of two-piece Die, Reaming a hole/ Bush to suit the given pin/ shaft, scraping a given machined surface.(13hrs.)</p>	<p>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. (14 hrs.)</p>
<p>Professional Skill 25Hrs.; Professional Knowledge 07 Hrs.</p>	<p>Produce sheet metal components using various sheet metal operations.</p>	<p>31. Practice on making Rectangular Tray. (8hrs.) 32. Pipe bending, Fitting nipples unions in pipes. (10hrs.) 33. Soldering and Brazing of Pipes.(7hrs.)</p>	<p>Sheet metal - State the various common metal Sheets used in Sheet Metal shop Sheet metal operations - Shearing, bending, Drawing, Squeezing Sheet metal joints - Hem &amp; Seam Joints Fastening Methods - Riveting, soldering, Brazing. fluxes used on common joints. Sheet and wire-gauges. The blow lamp- its uses and pipe fittings. (07 hrs.)</p>
<p>Professional</p>	<p>Perform basic electrical testing in</p>	<p>34. Practice in joining wires using soldering Iron. (6hrs)</p>	<p>Basic electricity, Electricity principles, Ground connections,</p>

<p>Skill 50Hrs.;  Professional Knowledge 14 Hrs.</p>	<p>a in Diesel Engine.</p>	<p>35. Construction of simple electrical circuits. (8hrs.) 36. Measuring of current, voltage and resistance using digital multimeter. (4hrs.) 37. Practice continuity test for fuses, jumper wires, fusible links, circuit breakers. (7hrs.)  38. Diagnose series, parallel, series- parallel circuits using Ohm's law.(8hrs.) 39. Check electrical circuit with a test lamp, perform voltage drop test in circuits using multimeter.(6hrs.) 40. Measure current flow using multimeter/ammeter. (6hrs.) 41. Use of service manual wiring diagram for troubleshooting.(5hrs.)</p>	<p>Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter Multimeter, Conductors &amp; insulators, Wires, Shielding, Length vs. resistance, Resistor ratings. (07 hrs.)  Fuses &amp; 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. (07 hrs.)</p>
<p>Professional Skill 50Hrs.;  Professional Knowledge 14Hrs.</p>	<p>Perform battery testing and charging operations.</p>	<p>42. Cleaning and topping up of a lead acid battery, Testing battery with hydrometer. (10hrs.) 43. Connecting battery to a charger for battery charging.(6hrs.) 44. Inspecting &amp; testing a battery after charging.(10hrs.) 45. Measure and Diagnose the cause(s) of excessive Key-off battery drain (parasitic draw) and do corrective action. (14hrs.) 46. Testing of relay and solenoids and its circuit.(10hrs.)</p>	<p>Description of Chemical effects, Batteries &amp; cells, Lead acid batteries &amp; Stay Maintenance Free (SMF) batteries, Magnetic effects, Heating effects, Thermo-electric energy, Thermistors, Thermo couples, Electrochemical energy, Photo-voltaic energy, Piezo-electric energy, Electromagnetic induction, Relays, Solenoids, Primary &amp; Secondary windings, Transformers, stator and rotor coils. (14 hrs.)</p>
<p>Professional</p>	<p>Construct basic electronic circuits</p>	<p>47. Identify and test power and signal connectors for</p>	<p>Basic electronics: Description of Semi conductors, Solid state</p>

<p>Skill 25Hrs.;  Professional Knowledge 07 Hrs.</p>	<p>and testing.</p>	<p>continuity.(10hrs.) 48. Identify and test different type of Diodes, NPN &amp; PNP Transistors for its functionality.(10hrs.) 49. Construct and test simple logic circuits OR, AND &amp; NOT and Logic gates using switches.(5hrs.)</p>	<p>devices- Diodes, Transistors, Thyristors, Uni Junction Transistors ( UJT), Metal Oxide Field Effect Transistors (MOSFETs), Logic gates-OR, AND &amp; NOT and Logic gates using switches. (07 hrs.)</p>
<p>Professional Skill 25Hrs.;  Professional Knowledge 07 Hrs.</p>	<p>Manufacture components with different types of welding processes in the given job.</p>	<p>50. Practice to make straight beads and Butt, Lap &amp; T joints Manual Metal Arc Welding. (08 hrs.) 51. Setting of Gas welding flames.(07hrs) 52. Practice to make a straight beads and joints Oxy – Acetylene welding Film on Heat treatment process.(10 hrs.)</p>	<p>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 &amp; fit up and welding techniques; Oxy – Acetylene welding - principles, equipment, welding parameters, edge preparation &amp; 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. (07 hrs.)</p>
<p>Professional Skill 25Hrs.;  Professional Knowledge 07 Hrs.</p>	<p>Inspect the component using Non-destructive testing methods.</p>	<p>53. Practice on Liquid penetrant testing method and Magnetic particle testing method. (25hrs.)</p>	<p>Non-destructive Testing Methods- Importance of Non-Destructive Testing Definition of NDT, Liquid penetrant and Magnetic particle testing method – Portable Yoke method (07 hrs.)</p>
<p>Professional Skill 50Hrs.;  Professional</p>	<p>Identify the hydraulic and pneumatic components</p>	<p>54. Tracing of hydraulic circuit on hydraulic jack, hydraulic power steering, and Brake circuit.(50 hrs.)</p>	<p>Introduction to Hydraulics &amp; Pneumatics: - Definition of Pascal law, pressure, Force, viscosity. Description, symbols and</p>

<p>Knowledge 14 Hrs.</p>			<p>application of Gear pump- Internal &amp; External, single acting, double acting &amp; 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 Pneumatic Symbols, Description and function of air Reciprocating Compressor. Function of Air service unit (FRL-Filter, Regulator &amp; Lubricator).(14 hrs.)</p>
<p>Professional Skill 50Hrs.; Professional Knowledge 14 Hrs.</p>	<p>Identify and check functionality of stationary Diesel Engine - components, &amp; engine performance on load and engine speed.</p>	<p>55. Identification of different type of stationary Engine and their applications. (05hrs.) 56. Familiarization with diesel engines, tools and equipment required for maintenance, engine parts and their handling technique. (06hrs.) 57. Starting and stopping of engines. (04hrs.) 58. Running of engines and checking temperatures, fuel oil pressure and consumption on load and engine speed.(10hrs.) 59. Cleaning of fuel tank, checking leaks in the fuel lines. (6hrs.) 60. Cutting, flaring of tubes to make T &amp; Elbow fitting using unions. (6hrs.) 61. Fitting of lubrication pump oil filters, air filters, checking and adjusting of oil pressure.(8hrs.) 62. Preventive maintenance &amp; repairing.(5hrs.)</p>	<p>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. (07 hrs.) Procedure to clean fuel tank &amp; 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. (07 hrs.)</p>



<p>Professional Skill 25Hrs.; Professional Knowledge 07 Hrs.</p>	<p>Diagnose and Troubleshoot Diesel Engines for Mechanical &amp; Electrical causes.</p>	<p>63. Practice on troubleshooting in for Engine Not starting – Mechanical &amp; Electrical causes.(8hrs.) 64. High fuel consumption, Engine overheating. (4hrs.) 65. Low Power Generation, Excessive oil consumption.(7hrs.) 66. Low/High Engine Oil Pressure, Engine Noise.(6hrs.)</p>	<p>Troubleshooting :Causes and remedy for Engine Not starting – Mechanical &amp; Electrical causes, High fuel consumption, Engine overheating, Low Power Generation, Excessive oil consumption, Low/High Engine Oil Pressure, Engine Noise. (07 hrs.)</p>
<p>Professional Skill 25Hrs.; Professional Knowledge 07 Hrs.</p>	<p>Servicing of plain/journal bearings, anti-friction bearings.</p>	<p>67. Familiarization with plain/journal bearings, anti-friction bearings used on machine assembly. (3hrs.) 68. Specification &amp; selection for appropriate use. (3hrs.) 69. Use of manufacturers catalogues. (3hrs.) 70. Mounting of bearing on shafts and in housing with proper fit &amp; axis alignment.(4hrs.) 71. Use of proper tools. (3hrs.) 72. Removal of bearings from shafts &amp;housing by using pullers. Cleaning up &amp; removing old metal from bearing and replacing with new metal.(5hrs.) 73. Checking of shafts for alignment with dial indicator.(4hrs.)</p>	<p>Types of belt drives, velocity ratio of belt drive. Horsepower transmitted by belt. Ratio &amp; driving tension in a belt. Parallel &amp; cross belt drive, open &amp; 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. (07 hrs.)</p>
<p>Professional Skill 25Hrs.; Professional Knowledge 07 Hrs.</p>	<p>Identify and check functionality of major components and assemblies of reciprocating pumps.</p>	<p>74. Identification of different pumps, its components, prime movers.(5hrs.) 75. Practice on operational safety.(5hrs.) 76. Dismantling of reciprocating pumps- valves, pistons, cranks, seals etc. for</p>	<p>Pumps-its importance for agricultural &amp; industrial applications. Classification of pumps, its prime movers, parts and operation safety. Classification of reciprocating pump, construction and operation. Installation technique</p>



		inspection, repair & replacement.(8hrs.) 77. Cleaning of parts & assembling. Installing of reciprocating pumps. (7hrs.)	of reciprocating pump. Tools and equipment required & procedure. (07 hrs.)
Professional Skill 25Hrs.; Professional Knowledge 07 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. (7hrs.) 79. Cleaning of parts and assembling. (5hrs.) 80. Checking for alignment, clearance, etc., Priming technique and its application.(6hrs.) 81. Installing, operating & testing of rotary pumps.(7hrs.)	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. (07 hrs.)
Professional Skill 25Hrs.; Professional Knowledge 07 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.(7hrs.) 83. Selection of gasket, packing & gland materials, marking & cutting off gasket as per shape & profile. (8hrs.) 84. Using gasket cement to stop leakage & for fixing. (10hrs.)	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. (07 hrs.)
Professional Skill 25Hrs.: Professional Knowledge 07 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.(6hrs.) 86. Maintenance of lubrication systems. (5hrs.) 87. Fitting of flanges and assembling of pipe work, leak testing and rectification.(5hrs.) 88. Use of tee, elbow, bend,	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. (07 hrs.)

		<p>socket, rectifiers and other pipe fittings. (5hrs.)</p> <p>89. Cutting threads for pipes.(4hrs.)</p>	
<p>Professional Skill 25Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p>	<p>Trouble shooting of pumps.</p>	<p>90. Installation of stationary &amp; coupled pumps, checking and correcting of alignment of pump with its prime movers and its serviceability test.(15hrs.)</p> <p>91. Testing of pumps for their delivery flow &amp; pressure.(10hrs.)</p>	<p>Method of install align and testing of pumps for their serviceability. Concept of lightening torque for different sizes of bolts. (07 hrs.)</p>
<p>Professional Skill 25Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p>	<p>Identify and check functionality of major components and assemblies of centrifugal pumps.</p>	<p>92. Reconditioning of centrifugal pumps.(25hrs.)</p>	<p>Principle of centrifugal pump. Construction and operation of centrifugal pump in series and parallel. Finding out defects and method to recondition centrifugal pump. (07 hrs.)</p>
<p>Professional Skill 25Hrs.;</p> <p>Professional Knowledge 07 Hrs.</p>	<p>Identify and check functionality of major components and assemblies of submersible pumps.</p>	<p>93. Dismantling, identifying of parts. (5hrs.)</p> <p>94. Finding out defects, repairing, and replacement of components. (7hrs.)</p> <p>95. Cleaning, assembling, installing and testing of submersible pumps. (6hrs.)</p> <p>96. Finding out &amp; rectifying faults developed during operation.(7hrs.)</p>	<p>Submersible pump- construction, operation and selection of appropriate type. Procedure to recondition, install and test of submersible pumps. Causes of failures and remedial measures. (07 hrs.)</p>
<p>Professional Skill 25Hrs.;</p> <p>Professional Knowledge 7 Hrs.</p>	<p>Carry out repairs in the fuel feed system.</p>	<p>97. Identifying and rectifying defects of pump sets. (5hrs.)</p> <p>98. Practice on preventive &amp; scheduled maintenance of pump sets. (20hrs.)</p>	<p>Defects in pump sets- procedure for detection of causes &amp; rectification. Purpose and procedure for balancing of rotor. Procedure to be followed for preventive &amp; scheduled maintenance, planning for spares and other stores. (07 hrs.)</p>
<p>Professional Skill 50Hrs.;</p> <p>Professional</p>	<p>Construct electrical circuits and test its</p>	<p>99. Verification of Ohm's law. (8hrs.)</p> <p>100. Building up of electrical</p>	<p>Description and method to use current, voltage and resistance measuring instruments and</p>

<p>Knowledge 14 Hrs.</p>	<p>parameters by using electrical measuring instruments.</p>	<p>series, parallel and combination of series &amp; parallel circuits.(10hrs.) 101. Measurement of current, voltage resistance.(7hrs.) 102.Exercise on fixing and connecting switches holders, fuses, plugs sockets, Push buttons, etc. (12hrs.) 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.(13hrs.)</p>	<p>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. (14 hrs.)</p>
<p>Professional Skill 25Hrs.; Professional Knowledge 07 Hrs.</p>	<p>Identify and check functionality of major components and assemblies of A.C. motors.</p>	<p>104. Identifying of A.C motors, their testing, identifying terminals, connecting running &amp; reversing.(4hrs.) 105.Measuring speed of A.C motor using tachometer with stopwatch. Dismantling, assembling of A.C motors &amp; identification of parts.(6hrs.) 106.Starting a single phase, A.C motor with Direct on line (D.O.L) starter.(4hrs.) 107.Starting a 3-phase motor with star-delta starter. (4hrs.) 108.Checking for proper running of motor, overheating etc. maintenance of motors use and connection of single-phase preventer trouble shooting in circuit.(7hrs.)</p>	<p>AC Motors – related terminology. Purpose, type, construction, operation, testing for correct functioning, maintenance and industrial applications. Trouble shooting &amp; protection of induction motor. (07 hrs.)</p>
<p>Professional Skill 25Hrs.;</p>	<p>Identify the different type of keyways,</p>	<p>109.Practice on making out key as per shaft, hub, keyways, preparing keys to fit into</p>	<p>Types of key and keyways, their uses and applications. Preparation of</p>

Professional Knowledge 07 Hrs.	preparing keys to fit into keyways.	keyways.(25hrs.)	keys, allowable tolerance, clearances. Key fitting procedure-methods. Procedure for removing keys. Types & uses of key pullers. (07 hrs.)
Professional Skill 25Hrs.; Professional Knowledge 07 Hrs.	Identify, select & use different types of knots.	110. Identifying, selecting, use of different types of ropes such as hemp, manila, nylon, wire etc. (5hrs.) 111. Practicing different types of knots and its applications.(6hrs.) 112. Method of joining two ropes, together for extension.(6hrs.) 113. Detection of unsafe/defective conditions of ropes and knots. (8hrs.)	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. (07 hrs.)
Professional Skill 25Hrs.; Professional Knowledge 07 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.(10hrs.) 115. Use of inclined plane, hydraulic trolleys etc. (8hrs.) 116. Care and maintenance of lifting equipment and safety to be observed by handling the equipment. (7hrs.)	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. (07 hrs.)
Professional Skill 25Hrs.; Professional Knowledge 07 Hrs.	Identify and check functionality of major components and assemblies of bushes, bearing sand couplings.	117. Making different types of keys for fitting pulleys.(10hrs.) 118. Assembling and dismantling of bushes, bearings and couplings maintaining safety.(15hrs.)	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. (07 hrs.)

**Project Work/Industrial Training**