SYLLABUS FOR

MECHANIC (DIESEL/MARINE DIESEL)

UNDER

CRAFTSMEN TRAINING SCHEME

&

APPRENTICESHIP TRAINING SCHEME

As approved by
GOVERNMENT OF INDIA

In consultation with
THE NATIONAL COUNCIL FOR
VOCATIONAL TRAINING
&
CENTRAL APPRENTICESHIP COUNCIL

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Ph.: 23280163, 23280164 Telefax : 011-23280165

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M/s Visaa Diesel Sales & Serv.
No. 7, Conran Smith Road,
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M/s Chemoleums Pvt. Ltd.,
37, Ist Main Road,
C.I.T. Nagar, MADARS - 600035

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C.I.M.I. MADRAS - 600032

14. Shri. A. Chendur Pandian : Member
Professor (Mech.)
Dr. M.G.R. Engineering College,
Madhuravoyal, MADRAS.

GENERAL INFORMATION

1.	Name of the Trade	:	**MECHANIC (Diesel/Marine Diesel)**
2.	N.C.O. Code No.	:	845.14
3.	Duration of Craftsman Training	:	One Year
4.	Duration of Apprenticeship Training	:	Three years including one year's Basic Training.
5.	Entry Qualification	:	Passed class 10th Exam. under 10 + 2 system of Education or its equivalent.
6.	Rebate in Training Period	:	1 year to those who passed the Trade of Mechanic (Diesel) conducted by NCVT under C.T.S.
7.	Ratio of Apprentice to Worker	:	1 : 5

FIRST YEAR SYLLABUS

FOR 1ST YEAR FOR (BASIC TRAINING) COMMON ONE YEAR ITI COURSE (NTC) IN MECH. (DIESEL) TRADE/MARINE DIESEL TRADES AND APP. (NAC) SCHEME

Major Areas

		Duration	Weeks From	To
1.	Induction and Safety Training	2 Weeks	01	02
2.	Allied Trade Work - Fitting and Sheet Metal	6 Weeks	03	08
3.	Engine Repair Work	24 Weeks	09	32
4.	Engine Erection Work	1 Week	33	
5.	Fuel Injection System Work	12 Weeks	34	45
6.	Repair of Shop Floor Equipment	2 Weeks	46	47
7.	Electrical Repair Work	4 Weeks	48	51
8.	Revision & Test	1 Week	52	
	Total	52 Weeks		

LIST OF TOOLS AND EQUIPMENTS

For a Batch of 16 Trainees

Sl. No.	Trainees Kit	For Instructors	For Trainees
1.	Hammer Ball pein 0.75 kg	1	16
2.	Chisel Cold flat 19 mm	1	16
3.	Centre punch 10 cm	1	16
4.	Steel Rule 15 cm English and metric	1	16
5.	Screw Driver 30 cm × 9 mm blade	1	16
6.	Screw Driver 20 cm × 9 mm blade	1	16
7.	Spanner D.E. set of 12 metric 8 – 32 mm	1	16
8.	Pliers combination 15 cm	1	16
9.	Hand file 20 cm Second cut	1	16
10.	Feeler Gauge 20 blade	1	16
11.	Ring spanner set of 12 metric 8 – 32 mm	1	16
12.	Steel tool box with locks and keys	1	16

Practical	Theory	Engineering Drawing	Workshop Calculation & Science
2	3	4	5

)n and Safety Training
ments Expected :

/areness of the role of I.T.I. in national building activity.
)pe of trade - Mechanic (Diesel)
'ety rules and Safety Precautions to be observe in the shop floor.
/areness on disciplinary rules and communication channel in the Shop Floor or Working Area.

iliarisation with the Institute. iplinary Rules & Commu- tion channels. Importance of Trade-Types of work done udents in the Institute Shop of the Institute.	General Introduction to the course - Duration of the course and courses content. Study of the Syllabus - General Rules pertaining to the Institute Facilities Available Hostel. Recreation and Medical Facilities - Library - Working Hours. Time Table.	—	—
ription of Safety Equipment	Importance of Safety and General	—	—

2	3	4	5
ir use - Safety Rules to be yed in an Automobile Re- Shop. Accidents & their s - upkeep of fire. Fire Ex- ishers - Familiarisation of ools & Machinery Avail- n the shop - Their use and ep - Importance of Main- ce & Cleanliness of Work- Tools, Jacks, Trays and ;.	Precautions to be observed in the shop - Fire Extinguishers used for different types of fire - Storing and Handling Inflammable Materials - Elementary First Aid.		

ade Work - Fitting and Sheet Metal
:nts Expected :

ity to fire surface and make them flat.
ity to mark and punch.
ity to use hacksaw, drill, reamer, tap and dies.
ity to make simple sheet metal joints and solder.
ity to bend pipes.

2	3	4	5
ıonstration of the use of Fit- Hand Tools - Marking off steel rules callipers, scriber, lers, dot and Centre punch ipping and marked lines in ven piece - Sharpening of els. Centre punch & Dot h to correct Angles.	Systems of Measurement conversion of English into metric measurement and vice-versa - Marking Media - Chalk - Mechani's Blue Red Lead - and Tools used for Marketing Steel rule. Try Square, caliper and Dividers, Scriber Prick and Centre Punch - Hammer and Chisel - uses and Maintenance - Safety Precautions - in Handling Grinding Machines.	Introduction to Engineering Drawing and Blue print reading. Free hand sketching of straight lines. Rectangles, square and circles.	Simple workshop problems involving addition, subtraction, multiplication and division of whole numbers.
sawing filing to given dions - filing true and square ctice different types of filoperations - Marking and ıg clear and blind holes. ening of twist drills safety utions to be observed while a drilling machine.	Types of Hacksaw frames and blades - their selection and uses - types of files and their uses. Care and maintenance of files. Types & sizes of drills - cutting angles and speeds of drills - calculation of tap drill sizes.	Free hand sketching with dimension & proportionate sketching of circles rectangles squares parallelograms. Rhombus, polygons.	Common fractions, addition, subtraction, multiplication and division of common fractions - Vulgar fractions - simple shop problems involving Fractions.

2	3	4	5
ing a clear and blind hole ion of tap drill size - use of ation - cutting threads on t/stud - adjustment of two Die - reaming a hole/bush t the given pin/shaft - scrap- given machined surface.	Tapes & dies - description use of different types taps & dies - use of 'V' threads - Precautions while using taps & dies - description and use of different types of scrapers, Reamers and emery papers.	Reading of simple Blue Prints Sketching of simple solids such as cubes. Rectangular Blocks. Cylinders.	Applied Workshop Problems involving Fractions & Vulgar Fractions.
uring Diameter of pistons Journals. Crankpins, Kingig end and main bearings ler Bores with Micrometers rnier Callipers - measuring ı and Thickness of mad flat and round bars - Meag of valve Angles with proor head - Locating centre of nd bar with centre Head.	Construction & Method of Reading Micrometers (internal and external) and Vernier Caliper - Correct handling of Micrometers & Vernier Calipers. Reading of Vernier Scale - Description and use of combination set Care and Maintenance of Micrometers. Vernier calipers, Combination set.	– do –	Properties of Ferrous Metals - Their uses - Cast Iron. Wrought iron plain and High Carbon Steel High Speed steel & Alloy steel.
ng of Metal Parts by Soft ering - Simple marking out	Sheet Metal Workers Hand Tools - Their Description and uses -	Freehand sketching of Nuts	– do –

2	3	4	5
heet Metal and Cutting - ing and folding.	Description of simple soldering and brazing, Fluxes used for common joints - types of sheet metal joints - their uses.	- Bolts - Studs - with dimension from samples.	
ice in Silver soldering pipe ing. Annealing of pipes - g Nipples and Unions - ring and Brazing of pipes.	Sheet and wire gauges - the blow lamp and its uses - pipe fitting Explanation of various common Metal sheets used in Sheet Metal shop.	Sketching of views of solid bodies - such as square and Rectangular Blocks - Hollow cylinders rings - cones.	Properties of Non-Ferrous Metals & Tehri uses Copper, Zinc, Lead, Tin, Brass, Alunium, Bronzes, Solder, Bearing Metals.

epair Work

ients Expected :

ity to remove jammed bolts, nuts and prepare maintenance schedule.
ity to start and stop diesel engine and observe its performance.
ity to test compression and Vaccum and analyse the results.
ity to use Torque wrenches, remove the cylinder head, decarbonise and refit.
ity fo measure bore, piston, ring clearance, valve clearance, bearing clearance, crank shaft Main journal, crank pin journal fillet radius, warpage of cylinder head and block.

2	3	4	5
ity to overhaul oil filters, oil coolers, oil pump, water pump & radiator. Test Thermostat valves.			
ity to fit new Shell bearings in main and connecting rod and set bearing.			
ity to Reassemble the engine parts, start and adjust idle speed of the engine.			
ity to set timing of fuel injection pump.			
ity to Diagnose engine noises of different nature and rectify.			
ity to diagnose faults in lubrication and cooling system and rectify.			
cises involving use of ches, pliers, screw drivers ullers - cleaning and lubri- of engine parts. Location ntification of engine com- nts.	General Description & Construction of diesel & Petrol Engine - Characteristics & Classification working principles of 4 stroke diesel & Petrol engine - comparison between petrol and diesel engine with specific reference to their various characteristics.	Freehand sketching of rivets washers with dimensions from samples.	Brief description of manufacturing process of non-ferrous metals i.e., copper, aluminium, zinc, and tin.
ce on unserviceable diesel e, removing jammed nuts roken studs reconditioning	Two stroke cycle diesel engine types of scavanging uniflow and loop flow scavange opposed pis-	Free hand Sketching of Bolts & Nuts with dimensions from samples.	– do –

2	3	4	5
amaged stud hole fitting ized studs.	ton engine differences between two stroke and 4 strokes cycle diesel engines.		
ion of materials for gas- nd packings - use of lock- evices lock nuts, cotters, ins and circlips lock rings tion where they are used tion and checking leak- f air, fuel oil & exhaust in gine.	Engine details - cylinder materials - cylinder arrangements cylinder liners and their advantages, cylinder heads, description function, cares and maintenance - Location combustion chamber in cylinder heads and also heater plugs and port & valve arrangements.	Explanation of simple orthographic projection hand sketching of 4 stroke -two stroke cycles.	F.P.S. & C.G.S. system. Metric weights and measurements, conversion factors, S.I. Units.
ce on starting and stop- of diesel engines - use of counter in determining the e speed - running of en- on load - checking tem- ire fuel and oil compres- esting of cylinders.	Combustion chambers - pumps open and closed types, advantages, compression, ratio & compression pressures - compression testing of cylinders and analysis of results & its importance.	Explanation of simple orthographic projection in 3rd angle.	Shop problems on metric system of weights and measurements.

2	3	4	5
nance checks - daily, , monthly for different f engines - writing up of ion schedules - Mainte- of log sheets - details of nance.	Need for maintenance check up in diesel engine -preparation of maintenance schedule from charts of popular makes of engines.	Views of simple hollow & solid bodies with dimensions.	Meaning of tenacity elasticity, malleability brittleness, hardness, compressibility and ductility with example.
e, rocker are assembly olds & cylinder head ng valves & its parts - ig & decarbonizing - ig valve seats & valve reconditioning valve seats icing valves - lapping on its seats testing leaks ve seats for leakage - ion of cylinder heads & ld - surfaces for marging cs - use of hydraulic valve	Valves & valve operation - Mechanise - parts & function of each valve timing diagram - camshaft & timing gears - types of drives used in engines chain tension & its importance cylinder head and manifold construction & function water jackets passages. Description of hydraulic valve lifter.	Freehand sketching of valve, valve springs, valve assembly with dimension.	Effect of alloying elements on properties of cast iron and steel.

2	3	4	5
tle rocker arm assembly & check shaft - bushes, nd rocker arm for wear acks and reassemble. valve springs, tappets, ods, tappet screws and stem cap, Reassemble parts in sequence, refit r head and manifold & arm assembly adjustable learances starting engine carbonising.	Necessity of valve clearance prescribed by makes of engine - effects of incorrect clearances - common troubles & remedy - reason for marging of cylinder head.	Simple isometric view of objects such as square, rectangles and cubes.	Square root of perfect square and hole number square root of decimals.
ing piston & connecting n engine - examine - pis- lands for wear - examton skirts for cracks & ons, clean oil holes - connecting rod for bend	Piston and piston rings function - types and material is used - recommended clearances for the rings its necessity precautions while fitting rings - connecting rods - types function and material used - meth-	Freehand sketching of piston gudgeon pins rings and connecting rod with dimensions from samples.	Shop problems involving square roots.

2	3	4	5
ist and parent bore for id ovality and gudgeon ies for wear - check elonof cap fixing bolts.	ods of fixing gudgeon pin on small end method of lubriation provided for small end bushes.		
ng crankshaft and camom engine - checking aft for bend & twist - g oil retainer and thrust s for wear - measure haft journal for wear - g flywheel and mountiges. Spigot, bearing - ibration damper for deheck cam shaft for bend	Crankshaft - Construction & functions - materials used - arrangements of crank pins and Main journals - balancing methods - Flywheel construction & its function and material used Rim marks and balancing. Elementary knowledge of function of clutch & coupling units attached to flywheel.	Freehand sketching of crankshaft and flywheels with dimensions from samples.	Ratio and proportions shop problems.
ig cylinder blocks sureasure cylinder bore for	...ription & function of cylinder block - material used - cylin-	Freehand sketching of cylinder block and cylinder	Mass. Unit of mass, force - absolute unit of force -

2	3	4	5
t ovality - check main parent bore for taper & clean oil gallery passage pipe line - check main cap bolt holes check cam earings and tappet bore - water passages and ex-welsch plugs check cyl-ead for warping.	der liners & details - crank case and oil pan and their construction water jacket passage & wall thickness - bolt hole dimensions for cylinderhead fixing provision for mounting accessories like oil pump, water pump filters - oil flow passages and cleaning plugs.	head.	weight of a body, shop problems.
bearing inserts in cylinck & capchecking and clearance & oil holes & ; lugs fix crank shaft on torque bolts - check end nove shaft - check seatat similarly for connectand Check seating and	Engine bearinggs - classification and location - materials used & composition of bearing materials - shell bearing and their advantages - special bearing material for diesel engine application bearing failure & its causes - care & maintenance. Meaning of term ovality and traper in cylinderical parts.	Freehand sketching of bearing with dimensions from sample.	Mass. unit of mass, force - absolute unit of force - weight of a body shop problems.

2	3	4	5
auling oil pump, oil filters oolers aircleaners and ers, check and adjust oil ire relief valves - chang- l in the sump, repairs to oil ipe lines and unions.	Friction - its meaning and importance, methods to reduce friction in engine oil use of lubricants - oil grease high detergent oil for diesel engine lubrication - properties of lubricants.	Freehand sketching of oil filters oil pumps, coolers with dimensions from samples.	Examples of useful and wasteful friction.
emble all parts of engine rect sequence and torque lts and nuts as per makers mendations for engines.	Need for lubrication system for diesel engines - types used and layout of the system by pass & full flow arrangement - types of oil pumps, oil filters, oil coolers, common troubles - care and maintenance.	Freehand sketching of oil filters, oil pumps, oil coolers with dimensions from samples.	Examples of use and wasteful friction in engine, applied problems.
emble all parts of engine rect sequence and torque lts & nuts as per markers, mendations for the engine	Engine assembly procedure need for cleanliness and special tools and gauges used for engine assembling. Practice - periods of	Freehand sketching of bolts and nuts with dimensions from sample, Freehand sketching of torque	Work. Unit of work, Energy power, Unit of power.

2	3	4	5
sories & start and run ıe on stands.	decarbonising and overhauling engine - interms of hours of run or mileage - running in procedure of overhauled engines.	wrenches.	
ıg cylinder liner from linder block, practice in ng and refitting new lin- ır makers recommenda- ecautions while fitting ers.	Cylinder liners - construction & purpose - material used and finish provided types of liners in use - methods used to fit the same in cylinder bore, advantages of wet and dry linears wear pattern.	Freehand sketching of cylinder liners with dimensions from sample.	Work, Unit of work energy power - Unit of power - shop problems.
ng radiator and water om engine, cleaning & g flushing radiator test- mostat and refitting on - overhauling - water fitting adjusting fan belt and connecting water	Need for cooling an engine general description and types of air and liquids - cooling used in engine layout of cooling system and parts in the layout - function of parts like radiator thermostat and water pumps - purpose of thermo-	Free hand sketching of water pump thermostatic valve & water jackets in the cylinder block.	Ratio & proportion.

2	3	4	5
ith radiator with hoses ıg cooling system of the	stat & need to maintain engine working temperature deaireation cooling system no loss tank.		
ling air compressor and r - cleaning all parts ıg wear in the cylinder s reassembling all parts g them in the engine.	Description & operation of air compressor and exhauster attached to transport vehicle engines - common troubles & maintenance of both their specific application for the brakes of the vehicle.	– do –	Ratio and proportion problems.
ing a petrol engine in a ic procedure clean & all parts for wear & heck oil clearance re- and connecting rods - check cylinder wear ıe piston and rings con- ods - and crank shaft - ning if necessary - re-	Description of internal & external engines different types of I.C. Engines parts of all IC Engine - 4 stroke O T T O cycle engine - Two stroke petrol engine differences between the two - importance of valve timings - and parts if valve operting system description and operation. Description of	Free hand sketching of 4 stroke cycle 2 stroke cycle valve lining diagram.	Different forms of energy - mechanical, electrical, heat, solar, chemical atomic etc.

2	3	4	5
: all parts in sequence akers, recommendation ng value tappets - start : slow speed of the en-	petrol injection in petrol engines.		
on engine tune up op- s involving testing and compression of en- justing valve clearance, and adjusting ignition adjusting carburetor for eeds Overhauling AC : Testing for its working ; spark plugs & testing ing as per maker's rec- dation starting engine. ng slow speed.	Brief Description of engine components - their location and functions cooling and lubrication system - parts and layout of the system - fuel supply system - layout of parts in the system & function of each part Ignition system in a petrol engine system layout & parts of ignition system and functions of each part - working of the system importance of Firing order ind. Adv. retard mechanism.	Freehand sketching of parts of an engine. Freehand sketching of layout of fuel supply system Ignition system lubrication and cooling systems.	Conversion of energy from one to another with examples.
Local Industrial	Plants and Factories.		

2	3	4	5
ole shooting in cooling and tion system/engine check- p and rectifying oil and leaks changing defective ng and gaskets - testing or leaks & testing func- g of thermostat.	Step by step method of diagnosis of troubles in the lubrication and cooling system reasons for engine over heating & remedies for the same. Crank case dilution & crank case ventilation flow test rate recommended for radiator.	View of solid & hollow bodies cut sections plane.	Measuring of Horse Power. IHP. FHP and applied shop problem.
iosis of engine faults like bearing - noises, piston pin flywheel knock & valve - and crank noises and die- ock.	Reasons for development of noises in the engine components - rectification methods of assembling practice to be followed during engine overhauling as per makers shop manual.	Views of hollow & solid bodies cut section plane.	Meaning of horse power IHP, BHP, FHP applied shop problems Description of dynamometers.
iosis of engine faults like y, exhaust, overheating, vibration, missing cylin- exhaust noise, hunting	Reasons for excessive exhaust smoke overheating vibration, missing & hunting noises in an engine methods of eliminating	Practice on blue print readings.	Effects of force on materials like bending, twisting and shearing problems.

2	3	4	5
eristics of engine and er- irregular idling.	these noises for smooth working of the engine. Exhaust emission testing and control.		
ısis of reasons for start- ficulty in a diesel engine :tifying the faults.	Starting methods, such as compressor starting, capsule starting & diesel engines used for transport, agricultural marine, industrial purposes brief description of each method - methods to eliminate starting difficulty in a diesel engine. Fuel saving - concepts of super charges and turbo charges.	Further practice in blue print reading.	Torque definition example torque wrenches application - problems involving torque values of engine.

ection Work
:nts Expected :

y to erect diesel engine on foundation.

2	3	4	5
ce in erecting overhauled es on stands & foundations ration of templates of foun- ıs holes of the engine base aration of hold - down bolt uts and boxes for founda- its starting engine on foun- ı and observing vibrations.	Necessity of strange foundations for diesel engine details of foundations bolts & nuts composition of a good mix for grounding foundation bolts dimension of pits & boxes to suit engine base - purpose of template - need for aligning the engine on HD Bolts.	Freehand sketching of engine mountings, templates & fixing brackets & stands.	Mensuration of areas volumes & weight calculating solid bodies.

:tion System Work
ıents Expected :

ity to repair leaks of Diesel, oil & air lock in fuel lines and bleed air from the system.
rhaul filters and bleed them.
ity to follow safety precautions while doing the above work.
ity to adjust slow speed and maximum speed in the venturi control unit.
ity to test functioning of pneumatic and mechanical governor.
ity to check and adjust injector on test.

2	3	4	5
ing fuel tanks - checking in the fuel lines soldering airing pipe lines and unrazing nipples to high presine studying the fuel feed n in diesel engines drain- water separator	Fuel feed system in diesels Air injection and airless injection. Systems their general description & layout importance of water separators - constructional details of water separators - constructional details of water separators.	Freehand sketching of water separators and fuel tanks with dimension from sample.	Shop problems on determination of volume & weight of simple bodies.
ing of air from the fuel servicing primary & secy filters removing filters nts - replacing elements in ire filters.	Fuel filters - types & constructional details - reasons for using no. of filters sequence of replacement of filter elements importance of Diesel fuel cleanliness - types of diesel fuel HSD & LSD Description of O.F. valves & their functions.	Freehand sketching of fuel feed system and of filters.	Centre of gravity of bodies - stable & unstable Neutrals & equilibrium Examples & problems on centre of gravity.
antling an unserviceable njection pump feed and	Constructional details of fuel injection pumps, feed pumps and	Freehand sketching of fuel injection pump with dimen-	Simple levers with examples i.e., bell crank lever &

2	3	4	5
ıor studying the parts and mble general maintenace pumps.	governors explanation of function and operation.	sion from samples.	other used in engine - advantage- using them problem on lever.
ving a fuel injection pump ın engine refit the pump to gine - set timing - fill lung oil start and adjust slow of the engine. caliberation l injection pumps.	Importance of timing the pumps with engine - closed slot cross coupling marks vernier scale on coupling advancing and retarding methods effect of over advancing timing device and its details - critical adjustments of jerk - pump phasing and caliberation adjustment for maximum speed - idle speed & smoke limits.	Lettering numbers & alphabets and freehand sketching of feed pump.	Heat and temperature scales of temperature FH and Kelvin, celsius their conversions - Temperature measuring devices used in engine shops.
engine adjust idling speed amping device in pneugovernor and venturi conıit - checking performance	Governors - Pnuematic mechanical & hydraulic. their constructions & operations venturi unit and its purposes and action - precau-	Freehand sketching of a pneumatic governor with dimensions from samples.	Definition of stress and strain and modulus of elasticity ultimate strength types of stresses - factor of

2	3	4	5
ıgine with off load adjust-imings in DPA Systems. PT ps and inline pump.	tions to be observed in attending to the governor - definition of rated speed maximum speed over run of governors - purpose of auxilary venturi in the governor principle of idling damper.		safety examples & problems.
engine - adjusting idle d of the engine fitted with ıanical governor checking - speed operation of the en-	Mechanical governors their constructions. function and operation under different load & speed & maintenance common problems and remedies.	Freehand sketching of mechanical governor with dimensions from sample.	Definition stress strain and modulus of elasticity ultimate strength types of factors of safety stress - example & problems.
king performance for miss-ylinder by isolating defec-njectors & test - dismantle replace defective parts & emble and refit back to the ıe importance of correct	Fuel injection Nozzles description operation of each type spray angles & prifices and their characteristics injector tester - construction & function types of test & their of purpose - Effects of incor-	Freehand sketching of different types of nozzles (cut section) lettering practice.	Mechanical advantage velocity ratio & efficiency example & problems.

2	3	4	5
ing - while assembling the ınd also fitting on to the e.	rect setting of nozzles on engine performance.		

Shop Floor Equipment
ıents Expected :

Repair and maintain equipments and Instruments used for repairing diesel Engines.

ring of grease guns oil cans spray guns & other shop equipment maintenance of ress pedestal grinder valve er and air compressor, en-	Importance of periodical maintenance and upkeep of shop equipments - preventive maintenance to avoid screen & major failure - preparing maintenance charts for machineries & follow up.	Freehand sketching of greases gun hoses - oil gun & service accessories.	Principle and working of simple machines.
iring of injector tester , jacks and stand vacuum mpression gauge mainte- of washing pump and hy-	– do –	Practice on blue print reading of an engine. Freehand sketching of layout of fuel supply system Ignition sys-	Detemination of mechanical advantage velocity ratio efficiency in simple machine. i.e., screw jack/

2	3	4	5
c presses phasing and ating machine.		tem lubrication and cooling system.	winch pulley block wheel & axle & inclined plane.

Repair Work
nts Expected :

y to do simple repairs in the ignition, charging and starting circuits.
y to do repair Dynamo, Self starter, Alternator and other Accessories.

e in joining wires & sol- - forming simple electri- uits - measuring of cur- oltage and resistance g and topping up of a id battery - testing bat- h hydrometer - cell tester ting battery to charger.	Simple electrical circuits series & parallel circuits identification of alternating - current and direct current meters - insulators and conductors - types of resistances - Ohm's law and its application - common electrical terms and symbols primary and secondary cells - lead acid battery, nickel iron and nickel cadmium and alkaline bat-	Freehand sketching of electrical symbols and drawing of simple electrical circuits.	Electricity and its effects static and dynamic electricity AC and DC differences.

2	3	4	5
	teries - their description - construction - common troubles and remedy Maintenance procedure for Batteries.		
g electrical circuit in the ıssembly checking loose, ıd short circuit in igni- uits - cleaning and test- k plugs - overhauling of tor assembly - checking ing ignition timing.	Description of electrical circuits - ignition system and the components - purpose of induction coil, condenser, spark plug - common troubles in ignition circuit and remedy.	Freehand sketching of ignition circuit of a vehicle - sketching the circuit line diagram of magneto ignition.	Magnets - natural and artificial types - poles of magnets - magnetic fields.
ing dynamo or alternator gine dismantling, clean- cking for defects, assem- nd testing for motoring of dynamo and fitting to s.	Description of charging circuit operation of dynamo and regulator unit - ignition warning lamp troubles and remedy in charging system.	Free hand sketching of charging system.	Definition of ampere volts and ohm units of ampere volts. ohm, ohm's law.

2	3	4	5
ing starter motor vehicle	Description of starter motor cir-	Sketching starter motor cir-	Calculation based on
erhauling the starter mo-	cuit - constructional details of	cuit and solenoid switch cir-	Ohm's law.
ing of starter motor.	starter motor solenoid switches	cuit.	
	common troubles and remedy in		
	starter circuit. Description of Al-		
	ternators and Voltage Regulators		
	- Test Benches for Dynamos.		
n Test.			

TOOLS MEASURING INSTRUMENTS AND GENERAL SHOP OUTFIT

1	2	3
1.	Rule Steel 30 cm	1
2.	Dividers spring 15 cm	1
3.	Prick punch 15 cm	1
4.	Chisel crose cut 9 × 3 cm	1
5.	Hammer ball pein 0.5 kg	1
6.	Hammer copper 1 kg with handle	1
7.	Engineers square 15 cm blade	1
8.	Scriber 15 cm	1
9.	Scriber block universal	2
10.	Marking out tables 90 cm × 60 cm × 90 cm (high)	1
11.	Surface plate 60 × 60 cm	1
12.	Hacksaw frame adjustable for 20 - 30 cm blades	2
13.	V block 75 × 38 cm pair with clamps	2
14.	Punch hollow 6, 7, 8, 9, 10.5 and 12 mm set	2 set
15.	Punch figure set 3 mm	1 set
16.	Punch letters set 3 mm	1 set
17.	Hand vise 3 - 7 mm	2
18.	Screw driver, Electrician type 15 cm size	2
19.	File, flat 35 cm Bastard	1
20.	File, flat 25 cm second cut	1
21.	File, flat 20 cm smooth	1
22.	File, flat safe edge 25 cm smooth	1
23.	File, triangular 15 cm second cut	1
24.	File, half round 40 cm second cut	1
25.	File round 30 cm second cut	1
26.	File square 20 cm second cut	1
27.	Drill - twist, metric 3 mm × 12 mm × 1 mm	1 set
28.	Taps and dies complete set in box BSW and metric	1 set
29.	H.S.S. Hand reamer adjustable 10.5 mm to 11.25 mm,	

1	2	3
33.	Scraper bearing	1
34.	Sets of morse socket 0-1 1-2 and 2-3	1 set
35.	Micrometer, outside 0 to 25 mm	1
36.	Micrometer outside 50 mm to 75 mm, 75 mm to 100 mm	1 each
37.	Micrometer with extension rod (Inside) 50 mm to 150 mm	1
38.	Vernier calipers set 25 or 20 cm inside outside depth to read both inches and in mms.	1
39.	Safety goggles (Clear glass)	2 pairs
40.	Hammer, Planishing	1
41.	Setting hammer	1
42.	Mallet (Wooden)	1
43.	Trammel 30 cm	1
44.	Blow lamp 0.5 litre	1
45.	Soldering iron 120 watts	1
46.	Soldering iron, copper 225 cms (Fire headed)	1
47.	Pliers nose (round and straight)	1 each
48.	Snip straight and bent	1
49.	Pot melting	2
50.	Poker	2
51.	Spanners, double ended set of 12 metric size 8 to 32 mm	1 set
52.	Spanner, double off-set double ended set of 7 w/w from 3 mm to 13.5 mm	1 set
53.	Double open ended ignition spanner of BA 0 × 1 to 8 × 9 set of 5	1 set
54.	Spanners, clyburn 15 cm	1
55.	Spanners, adjustable 20 cm	1
56.	Spanner ring of set of 6 S.A.E.	1 set
57.	Spanner for sparking plug 14 mm	1 set
58.	Magneto spanner set with 8 spanners	1 set
59.	Turbo Charger or Super Charger	2 Nos.
60.	Spanner socket set of 8 handled T. Bar ratchet	2
61.	Spanner, T. Flex for screwing up and unscrewing in	

1	2	3
64.	Gun. parafin pressure	1
65.	Gun Grease pressure	1
66.	Chain and block 1000 kg capacity	1
67.	Traycleaning 45 × 30 cm	16
68.	Drilling machine bench to drill upto 12 mm dia.	1
69.	Oil can 0.5 litre	1
70.	Lifter, valve spring	1
71.	Tool valve Grinding, suction type (Consumable tool)	6
72.	Valve seat cutting tools complete with guides & pilot bar (all angles) in a box	1 set
73.	Extractor, stud "Ezy out" Type	1
74.	Compression gauge to read 120 kg/sq. cm and vacuum gauge 0 to 75 cm	1 each
75.	Stone, Carborandum 15 × 5 × 3.75 cm rough and smooth (Consumable)	2
76.	Cylinder gauge, Bore dial gauge with accessories	1
77.	Ring Expander and remover	1
78.	Torque wrench (0 to 75 kg meter)	1
79.	Work bench 250 × 120 × 75 cm with 4 vices of 12.5 cm jaw	4
80.	Lockers with 8 drawers (Standard size)	2
81.	Metal Rack 180 × 150 × 45 cm	2
82.	Fuel feed pump	2
83.	Fuel injection pump	2
84.	Carburetor (Two different types)	2 each
85.	Water pump and oil pump	1 each
86.	Filling jig for adjusting the piston ring gap	1
87.	Steel almirah	1
88.	Black board with casel	2
89.	Desk or table	1
90.	Fire extinguisher	2
91.	Fire buckets with	

1	2	3
95.	Dynamo and voltage regulator	1 each
96.	Starter motor - Axial type, pre engagement type co-axial type	1 each
97.	Injectors different types	2 each
98.	Battery - 12 volt (Lead Acid and alkaline)	2 each
99.	Chair	1 no.
100.	Distributor Assembly	2 nos.
101.	Pulley set universal for bearing and bushes	1 set
102.	Lifting jack, screw type 3048 kg	2 nos.
103.	Piston ring compressor	2 nos.
104.	Valve key inserter	1
105.	Connecting rod alignment fixture	1
106.	Valve refacer	1
107.	High rate discharge tester	1
108.	A.V.O. Meter	1
109.	Injector testing set (Hand operated)	1
110.	Injector cleaning kit	2 sets
111.	Glow plug	1 set
112.	Nozzle Holder Jigs	1 set
113.	P.T. Injector	1 no.
114.	Bench vice	4 nos.
115.	Alternator	1 no.
116.	Fluid fly wheel torque convertor	1 each
117.	Circlip plier	1 no.
118.	Piston Groove cleaner	1 no.
119.	Thread pitch Gauge	
120.	Fillet Radius Gauge	
121.	Stud Remover	
122.	Cut section models for fuel injector	
123.	Starter test benches.	

1	2	3
	Indian make.	1
4.	Diesel engine cut away model to show working parts for demonstration (one two stroke & one 4 stroke).	2
5.	Diesel engine 4 stroke multicylinder 4/6 vehicular type.	4 nos.
6.	Petrol engine (Running condition, car type) Indian make - Contemporary model.	2 nos.
7.	diesel engine (Running condition) Stationary type.	4 nos.
8.	Petrol engine vertical (2 stroke) Motor cycle/Scooter type 1.5 hp Indian make contemporary model.	1
9.	Growler.	1
10.	Battery charger.	1
11.	Timing lighter.	1
12.	Hydrometer (Consumable tool)	6
13.	Washing pump - reciprocating type electrically operated with 1 kw motor - 1000 litres rank.	1
14.	Portable lifting crane one ton capacity with chain block and tackle arrangement.	1
15.	Trolley type portable air compressor 1 single cylinder with 45 litres capacity Air tank all accessories and with working pressure 6.5 kg/sq. cm^2	2
16.	Cell Tester (High rate discharge tester).	1 no.
17.	Smoke tester.	1 no.
18.	Hydraulic press 5 tonne.	1 no.
19.	Fuel injection pump calibration equipment and its accessories and special tools with attachment for distributor pump and inline pump.	
20.	Engine with P.T. System.	1 no.

TEACHING AIDS

2nd & 3rd year Syllabus for Mechanic Diesel Under App. Scheme

I. **PRACTICAL**

A. **Allied Trade**

Instruction on safety precautions on the shop floor.

Care and use of drills, taps and reamers.

Grinding of twist drills.

Use of Centre drill.

Silver soldering.

Lathe practice (Facing, Taper turning, thread cutting)

B. **Power Unit**

Strip and reassemble engine.

Strip and reassemble carburetor and petrol feed pumps.

Clean and pressure test cylinder block cylinder head (Decarbonise).

Test cylinder block for crack, warpage, parent bores for wear, taper, quality and inline.

Remove and refit cylinder liners.

Test and refit cylinder head.

Test cam follower bores.

Test and refit Rocker arm shaft and new bushes.

Remove and refit valve guides.

Remove and refit valve locks.

Remove and refit seat inserts.

Cut valve seats.

Valve lap.

Reface value seat.

Grind valve.

Adjust valve timing.

Adjust valve clearance.

'Charting' cylinder bores.

Check crank shaft, bearing and cylinder block.

C. **Electricals Systems**

Diagnosis of faults.

Battery maintenance.

Clean and dress commutator.

Overhaul starter motors.

Strip and reassemble dynamo.

Overhaul of electrical systems.

Maintenance of electrical system.

Remove and refit glow plugs.

Overhaul alternator.

D. **Fuel Systems**

Clean and test fuel tanks.

Overhaul transfer pumps.

Overhaul injection pumps.

Overhaul governors.

Calibration and phasing practice.

Test and clean fuel filters and water separator.

Inspect and install fuel lines.

Repair fuel lines.

Fuel system maintenance.

Adjust fuel injection timing.

E. **Cooling Systems**

Remove, clean and refit radiator.

Fit and adjust fan belts.

Fit fan.

Fit and test thermostats.

Remove, test and refit hoses.

Overhaul water pump.

Reverse flushing of radiator.

Clean oil coolers.

Overhaul oil pumps.

Set pressure relief valve.

G. **Starting System**

Use of manufacturer's hand books.

Overhaul auxiliary petrol engine.

Maintenance of auxiliary petrol engine.

Compressor maintenance.

Overhaul compressor and exhauster.

H. **Auxiliary Equipment**

Maintenance and minor repairs.

Diagnosis of faults.

Observation of engine testing - with the help of dynometer.

Regular periodical maintenance.

II. **RELATED INSTRUCTION**

A. **Trade Theory :**

1. Safety at work-accidents do not happen - they are caused.
2. Revision of previous year's work.
3. Fasteners - different types of bolts, nuts, washers, rivets, studs, stud-pins, cotters, keys etc. and their use. Standard screw threads - details of common screw threads such as British metric unified and S.L. and their use, thread - chart.
4. Drilling machine, their brief discription, operation and use. Drilling machine accessories such as adopters, chucks etc. Drill angles and their importance. Marking out for drilling. Drawing back for centres. Cutting speed and coolant Decimal equivalent of drill size. Table of cutting speed feed & coolant. Calculation of drill size for tapping.
5. Heat treatment of metals and alloys - its necessity. Definition of terms - hardening, tempering, normalising and case hardening. Brief description and process employed.

9. Ignition system - magneto and coil. Electric generation current and voltage regulators, cut out, self starter and starting mechanism. Battery charging - maintenance and inspection.
10. Machinery and equipment compressor valve grinder and refacer, valve seat grinder. Cylinder boring machine crank shaft grinding machine main bearing line boring bar, screw jacks, their description, operation and use, care and maintenance of machinery and equipment.
11. Tools - description, use, care and maintenance of all tools used by diesel mechanic - hammers, screw drivers, pliers wrenches, chisels, socket, wrenches, torque wrenchers allen keys, pullers etc. use of maker's special tools.
12. Stationary engines - description and classification of stationery engines - 2 stroke and 4 stroke, single and multicylinder, double acting and opposed piston, types of rotary engines with names of components.
13. Ancillary equipment - description - and application of ancillary equipment driven by stationery engines with names of part. Generators and switch boards, compressor and air lines, pumps etc. Use of exhaust gases.
14. Preventive maintenance - preparation of maintenance schedules for engines and ancillaries importance of regular servicing, maintenance of long books.
15. Introduction to application of Diesel engines. Internal combustion engine - principal of operation. Otto and diesel cycles, air fuel ratio, indicator diagrams and mean effective pressure, valve timing ignition timing, cooling, valve arrangement and cylinder arrangement correct sequence of operations for dismantling, overhauling and rebuilding crank shaft alignment and balancing. Fly wheels. Governor setting.
16. Cooling system - causes and remedies for over - heating and descrptive treatment of cooling systems for stationery engines - water pumps, radiators, thermostats, cooling towers anti-freeze and anti-corrosive compounds. DEAIREATION type cooling system.
17. Fuel systems - type of fuels, derivation and uses, storage and handling of fuels - octane no. and cefane no. Detonation fuel knock

19. Lubrication - fundamentals of lubrication, oil film and wedge theory, viscosity, fire point, flash point, testing of oils A.E. numbers, factors governing selection of correct grade oil. Manufacturer's specification. Bearing and bearing surfaces. Oil seals - types of lubricant - importance of cleanliness. Oil pumps. Engine - lubrication system in use. Oil pumps and oil filters, additives. Necessity of additives and reasons for replacing oil after specific period or KM.
20. Ignition systems - diesel - compression ignition surface ignition (Semi diesel) firing order, ignition lag. Detonation. Combustion chambers - Air system and filters - super chargers and turbo chargers - effect of altitude on power out put. Petrol - Battery ignition system. Description of component parts sparking plugs.
21. Starting systems - functions - general description Electrical system. Starting and generating circuits, voltage regulators. Batteries. Use care and maintenance. Ancillary petrol engine - compressed air system.
22. Use of reference tables and hand books.
23. Modern developments in the trade - new techniques.
24. Quality and finish of work - importance of quality and finish of jobs at all stages - protection of finished surfaces estimation of cost time and material.
25. Trouble shooting - faults likely to arise in operaion, diagnosis, causes and remedies. Systematic approach, preventive maintenance.
26. Revision and test.

B. **WORKSHOP CALCULATION AND SCIENCE**

1. Revision of previous year's work.
2. Mensuration : Area of circle and ellipse. Volume and weight regular cones and spheres. Calculation of area, volume and weight of simple hollow and solid bodies applied problems.
3. Graphs : Plotting of points, plotting of graphs of simple equations - reading of graphs.
4. Advance problems in mensuration.
5. Meaning of tenacity, elasticity, malleability, brittleness, hardness

8. Determination of force on the piston, ram.
9. Torque and its relation to forces on engine mountings and transmission.
10. Work and its measurement. Calculation of work done by force on piston, torque on shafts. Power in relation to engine output and road performance.
11. Friction coefficient of friction bearings - work lost in bearings and slides. Lubrication, ball and roller bearings.
12. Descriptive explanation of expansion of solids, liquids and gases due to heat - coefficient of expansion. Brief description of transference of heat. Conduction, convection and radiation.
13. Properties of water and lubricants in relating to heat. Specific gravity. Archemedes's principle laws of floatation viscosity - change of viscosity with temperature importance of this relation to selection of lubricants for various purposes.
14. Properties of gases.
15. Magnets - natural and artificial - poles of a magnet. Lines of force magnetic field - earth magnetism.
16. Horse power - mechanical efficiency. Fuel consumption per B.H.P. per hour - Mean effective pressure.
17. Electricity and its various effects. Electric current - positive and negative terminals. Use of switches and fuses, units of current, resistance and voltage Ohm's law. Conductors and insulators, unit of power - watt and kilo - watt - relationship with horse power. Board of trade unit. Electrical circuits cases of open and shorts circuits. Measuring instruments. Ammeter, voltmeter, ohmmeter, megger, watt meter. Types of circuits, batteries, magnets - electromagnets. Working of D.C. and A.C. motors.
18. Hydraulics - elementary principles. Incompressibility of liquids. Properties of liquids. Pascal's Law.

C. **ENGINEERING DRAWINGS**

1. Revision of previous years work

5. Free had sketching and production of working drawing of actual machine parts or engines parts such as pistons, connecting rods, crank shafts, diesel injectors, tail stock tools posts engineer's vices, drill posts, rather braces.
6. Free hand sketching of detailed components from assemblies.
7. Free hand sketching of simple electrical circuits and reading of automotive electrical circuits (IS - 732-1958).
8. Advance blue print reading.
9. Code of practice for genral engineering drawing according to IS 696-1960.

D. **SOCIAL STUDIES**

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

2nd & 3rd year Syllabus for MECHANIC DIESEL Under App. Scheme

I. **PRACTICAL**

A. **General**

1. Instructions in safety precautions on shop floor.
2. Care and use of tools and instruments.
3. Cleaning of commutators.
4. Repairing of fuel pipe lines - for leaks.
5. Checking fuel tank for leaks.

II. **Power Unit**

6. Dismantle engine complete.
7. Clean and pressure test cylinder block & cylinder head.
8. Test cylinder block and head for warping.
9. Test cam follower bores.
10. Test and refit rocker arm shaft with new bushes.
11. Remove and refit valve seat inserts if necessary.
12. Remove and refit valve guides.
13. Cut/grind valve seats to correct angles.

18. Check, clean and refit piston rings in the ring grooves.
19. Remove, clean, check & refit gudgeon pins and bushes.
20. Check big end bearings.
21. Check alignment of bearings.
22. Check oil passages in the crank shaft and engine block and clean.
23. Overhaul oil pump and oil filters.
24. Measure cylinder bores and chart the readings.
25. Measure crankshaft and Torque Main bearings with Torque wrench.
26. Measure crank pins and main journals.
27. Assemble piston and connecting rod assembly in cylinder block.
28. Assembly cylinder head and valve assembly.
29. Check and adjust valve timing.
30. Adjust valve Tapper clearance.
31. Replace timing cover oil seal and fit timing cover to block.
32. Assemble oil pump, oil filter and sump.
33. Fit Glow plugs.
34. Start Engine and adjust slow speeds.

III. **Transmission Work**

35. Remove Gear Box assembly and clutch assembly from engine.
36. Dismantle clutch pressure plate.
37. Reline the clutch plate.
38. Dismantle the stern Gear. Overhaul and Refit.
39. Replace clutch shaft pilot Bearing in fly wheel.
40. Assemble and fit clutch assembly on fly wheel & Test for run out.
41. Dismantle, clean, inspect and reassemble gear box.
42. Remove, clean and refit centre bearings.

IV. **Fuel System**

43. Clean and Test fuel tank for leaks.
44. Dismantle clean and refit primary fuel filters with Replacement elements.
45. Dismantle, clean, inspect, reassemble and fit transfer pumps.

50. Check and fill up Lubrication oil in fuel injection pumps.
51. Bleed air from fuel supply system.

V. **Lubrication System**

52. Drain Lubricating oil and fill in fresh oil.
53. Remove, clean oil filters. Replace filter element and refit on engine.
54. Overhaul oil pumps.
55. Check and adjust the oil pressure relief valve.
56. Remove, clean and refit oil coolers.

VI. **Cooling System**

57. Reverse flush cooling system.
58. Fit fan & adjust the fan belt tension.
59. Remove, test and fit thermostats.
60. Remove, clean, Test and Refit Hose pipes.
61. Overhaul water pumps.

VII. **Starting System**

62. Practice in use of Manufacture's hand books.
63. Overhauling Auxiliary Engine.
64. Maintenance of Auxiliary engine.
65. Maintenance of Air compressor.
66. Overhauling of Twin fuel system.
67. Overhauling of compressors.
68. Check up wear in hand starter equipment.
69. Remove Dismantle. Clean and reassemble and fit electric starter Motors.

VIII. **Exhaust System**

70. Remove clean and refit Air filters.
71. Overhauling of air intake system.
72. Remove, clean and refit inlet and exhaust manifolds.
73. Remove, clean and refit exhaust pipes and silencer box.
74. Checking leaks in manifold joints and Hitting new Gaskets.

IX. **Electrical System**

75. Remove, clean, top up and test and refit b[illegible]

X. **Auxiliary Equipment**

80. Repair and Maintenance of sea water pumps.
81. Overhauling of Bilge pump - sea cock.
82. Overhauling of winch system.
83. Overhauling of steering system.
84. Diagnosis of faults and correcting them.
85. Regular periodical maintenance.

II. RELATED INSTRUCTION :

A. Trade Theory :

1. Fundamentals principle of heat engines.	:	Heat and temperature units - other forms of energy. Force and resistance power and unit of power mechanical equivalent of heat conversion of energy mechanical and thermal efficiencies of an engine - brake horse power (BHP) frictional horse power (FHP) mechanical efficiency of an engine.
2. Types of engines 2 & 4 stroke - cycle details & working principles.	:	Steam, petrol, diesel engines - stroke - volume - compression ratio - the four stroke diesel cycle the two stroke diesel cycle methods of cylinder scavenging - comparison between the four stroke and two stroke engines - Turbo Charging different types of engines from 9 H.P. to 310 H.P. makes.
3. Classification of I.C. Engines	:	High speed, medium speed and low speed engines - in line and 'V' type arrangement of cylinders.
4. Valve timings & settings of valve timings.	:	Valve timing diagram for a 4 stroke cycle engine setting of valve timing - indicator diagram and relationship to the corresponding valve timing. Fuel Injection timing and method of adjusting - advantages of diesel engines over petrol engines

injection pumps, high pressure fuel connection, fuel injectors testing.

7. Lubricating system : Need for lubrication - fundamentals of lubrication - the effect of lubrication - lubricating oils, viscosity - SAE numbers, factors governing selection of correct grade of oil. Manufacturer's specification - bearing & bearing surfaces, oil seals, filter and coolers - importance of cleanliness - oil pumps - engine lubrication systm oil pumps and filters oil additives, pipelines and joints - pressure regulation of lubricating oil - indication of lubricating pressure.

8. Cooling system : Necessity for cooling I.C. engines - air cooling - Sea water cooling and fresh water cooling system study of air cool & water type engines, dismantling of engines - accessories required in various types of cooling heat exchangers, radiation and keel coolers.

9. Starting arrangements : Hand air and electric starting arrangements and precautions for air starting arrangements.

10. Governing & Governing arrangements : Need for governing, the construction and working principles of centrifugal types of governors.

11. Transmission of Power gear box and alignment of shafts : Reduction gear reverse gear, different type of construction Alignment of engine and tail shafts - method of alignment indication of mis-alignment and rectifications.

12. Stern Gear : Shafting, thrust, bearing, stern tube and propellers, principle of propellers, pitch relation between diameter & pitch, variable pitch propellers etc.

14. Engine Operation : Checks before starting the main engine decompression and hand starting of small Engine starting of levers engines by compressed air or by electric starters check while returning, watch keeping observation of system - pressures & temperatures Points to be looked into prior to stopping.

15. Instruments Meters and Gauges. : Working principle and use of thermometer temperature and pressure gauges, pyrometer RPM gauges and tachometers, reading and handling.

16. Remote controls for engine : System which are controlled by remote control types of remote control.

17. Maintenance, repairs and upkeep of engine and maintenance schedule : Prevention of break-down by periodical systematic overhauling schedule preventive maintenance - maintenance schedule.

18. Fault diagnosis & rectification of defects in marine deisel engine : Starting difficulties and rectification irregular running, engines not coming to speed or power - over speeding, hunting or oscillating and remedies - over heating - lower lub oil pressure - knocking over loading. Combustion difficulties, blow by and its manifestation - causes effect on the working power output - rectification, high fuel consumption, low power generation, high oil consumption.

19. Refrigeration : Basic laws of refrigeration, types of refrigeration, components of a simple refrigerating machine, construction operation and working of fish hold refrigeration unit.

20. Pumps & compressors : Centrifugal bricket, gear type pumps sea water bilge pumps, fresh water pumps, diesel oil transfer pumps and air compressors layout and use of

22.	Hydraulic system and their properties	:	Principles and application in fishing vessels.
23.	Explosion in crank case and air starting system	:	Precautions against fire and dangers of oil leakage. Explosion in crank cases and air starting system, care of starting air bottles and mountings.

B. Workshop Calculation and Science :

The syllabus is same as in the trade of Mechanic Diesel of 2nd & 3rd year.

C. Engineering Drawing :

The syllabus is same as in the trade of Mechanic Diesel of 2nd & 3rd year.

D. Social Studies :

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

Those who have done Basic Training in I.T.I. and written WTC the Social Studies is not applicable.