MECHANIC (MARINE DIESEL)

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – AUTOMOBILE

सत्यमेव जयते

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

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

MECHANIC (MARINE DIESEL)

(Revised in 2018)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL - 5

Developed By

Ministry of Skill Development and Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
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Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

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1. BACKGROUND

1.1 Apprenticeship Training Scheme under Apprentice Act 1961

The Apprentices Act, 1961 was enacted with the objective of regulating the programme of training of apprentices in the industry by utilizing the facilities available therein for imparting on-the-job training. The Act makes it obligatory for employers in specified industries to engage apprentices in designated trades to impart Apprenticeship Training on the job in industry to school leavers and person having National Trade Certificate (ITI pass-outs) issued by National Council for Vocational Training (NCVT) to develop skilled manpower for the industry**.** There are four categories of apprentices namely**; trade apprentice, graduate, technician and technician (vocational) apprentices.**

Qualifications and period of apprenticeship training of **trade apprentices** vary from trade to trade. The apprenticeship training for trade apprentices consists of basic training followed by practical training. At the end of the training, the apprentices are required to appear in a trade test conducted by NCVT and those successful in the trade tests are awarded the National Apprenticeship Certificate.

The period of apprenticeship training for graduate (engineers), technician (diploma holders and technician (vocational) apprentices is one year. Certificates are awarded on completion of training by the Department of Education, Ministry of Human Resource Development.

1.2 Changes in Industrial Scenario

Recently we have seen huge changes in the Indian industry. The Indian Industry registered an impressive growth during the last decade and half. The number of industries in India have increased manifold in the last fifteen years especially in services and manufacturing sectors. It has been realized that India would become a prosperous and a modern state by raising skill levels, including by engaging a larger proportion of apprentices, will be critical to success; as will stronger collaboration between industry and the trainees to ensure the supply of skilled workforce and drive development through employment. Various initiatives to build up an adequate infrastructure for rapid industrialization and improve the industrial scenario in India have been taken.

1.3 Reformation

The Apprentices Act, 1961 has been amended and brought into effect from 22nd December, 2014 to make it more responsive to industry and youth. Key amendments are as given below:

- Prescription of number of apprentices to be engaged at establishment level instead of trade-wise.
- Establishment can also engage apprentices in optional trades which are not designated, with the discretion of entry level qualification and syllabus.
- Scope has been extended also to non-engineering occupations.
- Establishments have been permitted to outsource basic training in an institute of their choice.
- The burden of compliance on industry has been reduced significantly.

2. TRAINING SYSTEM

2.1 GENERAL

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

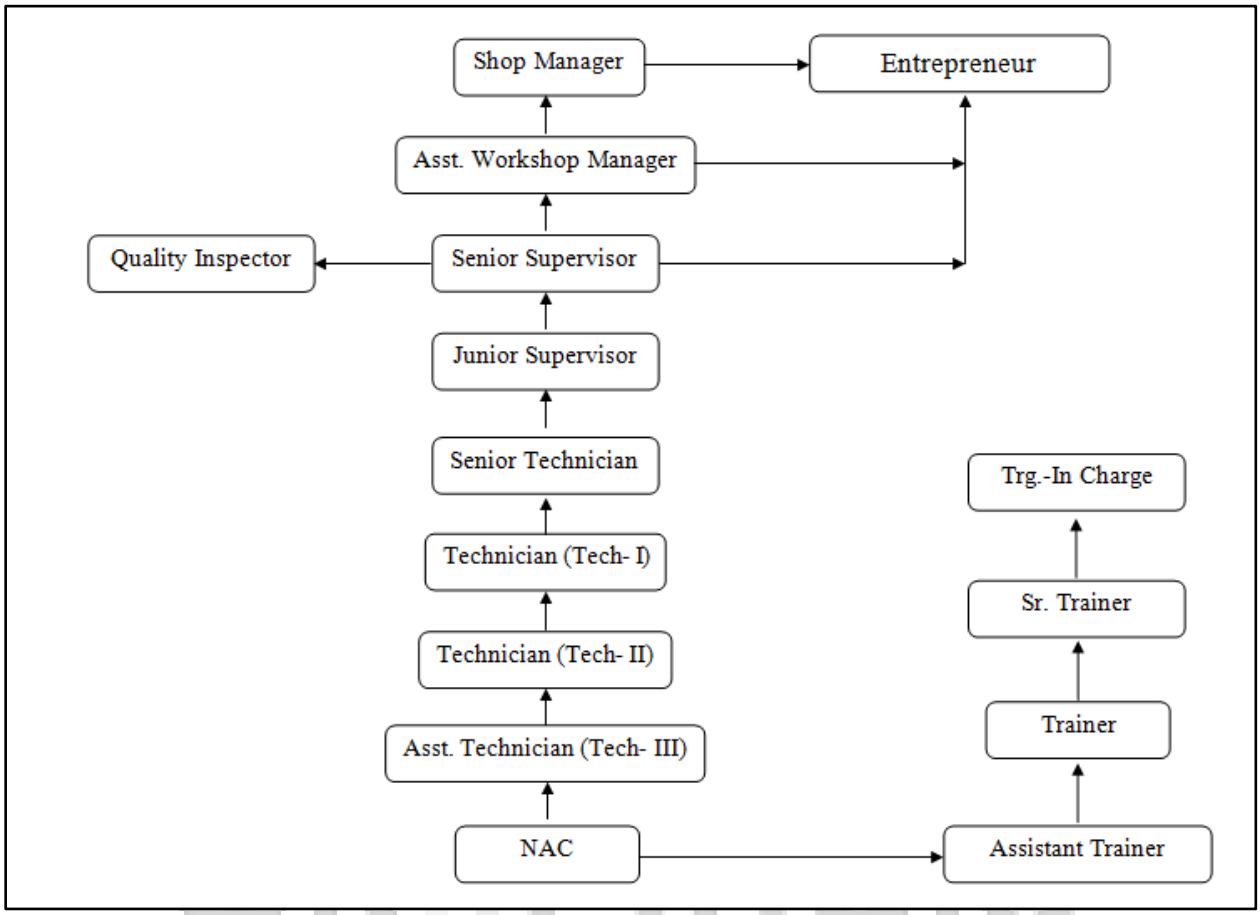
Mechanic (Marine Diesel) trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, while Core area - Workshop Calculation and science, Engineering Drawing and Employability Skills imparts requisite core skills & knowledge and life skills. After passing out the training programme, the trainee is being awarded National Apprenticeship Certificate (NAC) by NCVT having worldwide recognition.

Broadly candidates need to demonstrate that they are able to:

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

2.2 CAREER PROGRESSION PATHWAYS:

- Indicative pathways for vertical mobility.



2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years (*Basic Training and On-Job Training*) : -

Total training duration details: -

Time (in months)	1-3	4-12	13-15	16-24
Basic Training	**Block– I**	**-----**	**Block – II**	**------**
Practical Training (On - job training)	**----**	**Block – I**	**------**	**Block – II**

A. Basic Training

For 02 yrs. Course (Engg) :-(**Total 06 months:** 03 months in 1st yr. + 03 months in 2nd yr.)

For 01 yr. course (Engg) :-(**Total 03 months:** 03 months in 1st yr.)

S No.	Course Element	Total Notional Training Hours	
		For 02 Yrs. course	**For 01 Yr. course**
1.	Professional Skill (Trade Practical)	550	275
2.	Professional Knowledge (Trade Theory)	240	120
3.	Workshop Calculation & Science	40	20
4.	Engineering Drawing	60	30
5.	Employability Skills	110	55
	Total (Including internal assessment)	**1000**	**500**

B. On-Job Training:-

For 02 yrs. Course (Engg) :-(**Total 18 months:** 09 months in 1st yr. + 09 months in 2nd yr.)

Notional Training Hours for On-Job Training: 3120 Hrs.

For 01 yr. course (Engg) :-(**Total 12 months**)

Notional Training Hours for On-Job Training: 2080 Hrs.

C. Total training hours:-

Duration	Basic Training	On-Job Training	Total
For 02 yrs. course (Engg)	1000 hrs.	3120 hrs.	4120 hrs.
For 01 yr. course (Engg)	500 hrs.	2080 hrs.	2580 hrs.

2.4 ASSESSMENT & CERTIFICATION:

The trainee will be tested for his skill, knowledge and attitude during the period of course and at the end of the training programme as notified by Govt of India from time to time. The Employability skills will be tested in first two semesters only.

a) The **Internal assessment** during the period of training will be done by **Formative assessment method** by testing for assessment criteria listed against learning outcomes. The training institute have to maintain individual *trainee portfolio* as detailed in assessment guideline. The marks of internal assessment will be as per the template (Annexure – II).

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

2.4.1 PASS REGULATION

The minimum pass percent for Practical is 60% & minimum pass percent for Theory subjects 40%. The candidate pass in each subject conducted under all India trade test.

2.4.2 ASSESSMENT GUIDELINE

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

Assessment will be evidence based comprising the following:

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

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

Performance Level	Evidence
(a) Weightage in the range of 60 -75% to be allotted during assessment	
For performance in this grade, the candidate with occasional guidance and showing due regard for safety procedures and practices,	• Demonstration of good skill in the use of hand tools, machine tools and workshop

has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	equipment • Below 70% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A fairly good level of neatness and consistency in the finish • Occasional support in completing the project/job.
(b) Weightage in the range of above75% - 90% to be allotted during assessment	
For this grade, the candidate, with little guidance and showing due regard for safety procedures and practices, has produced work which demonstrates attainment of a reasonable standard of craftsmanship.	• Good skill levels in the use of hand tools, machine tools and workshop equipment • 70-80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A good level of neatness and consistency in the finish • Little support in completing the project/job
(c) Weightage in the range of above 90% to be allotted during assessment	
For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.	• High skill levels in the use of hand tools, machine tools and workshop equipment • Above 80% tolerance dimension/accuracy achieved while undertaking different work with those demanded by the component/job/set standards. • A high level of neatness and consistency in the finish. • Minimal or no support in completing the project.

3. JOB ROLE

Brief description of Job roles:

Mechanic, Petrol Engine; Petrol Engine Fitter, locates defects, repairs, and overhauls stationary petrol engines for correct performance to drive pumps, generators, propulsion shafts, etc., checks engine to locate defects. Dismantles or partly dismantles it according to nature of defects and measures essential parts such as cylinder bore, crank pins, pistons etc., using cylinder gauge, micrometre and other appropriate tools. Gets cylinders rebored, valve seats refaced and liners filled if necessary. Fits and taps pistons in cylinders, decarbonises cylinder head and grinds valves using appropriate abrasives. Replaces or repairs worn out or damaged parts and assembles them, doing supplementary tolling as necessary to ensure accuracy of fit. Installs assembled or repaired engine in position, sets timings, fits accessories, adjusts tappets, carburettor, fan belt etc. and connects it to propulsion drive. Starts engine, tunes it precisely and runs it at prescribed or set standard making necessary adjustments. Observes different readings such as temperature, fuel level, oil pressure etc for optimum performance. Checks, adjusts and lubricates equipment periodically and performs other operations to keep engine in good working order. May rebore engine, reface valve seats, anneal pipes, braze or solder parts etc.

Assembler, Stationary Diesel Engine assembles stationary diesel engine from finished components, makes adjustments, sets alignments, clearances etc. and ensures stipulated performance. Places diesel engine block on jig or other fixture using hoisting equipment. Fits or assembles various parts to engine block such as crank shaft, cam shaft, main bearing, connecting rods, timing gears pistons, fuel pump, atomiser, automatic timing mechanism, exhaust manifold suspension, etc. using spanners, wrenches, screw drivers and other special tools and devices. Collects various parts like nuts, bolts, washers etc. from nearby bins and fits or screws them to cylinder head. Checks assembled units or parts at every stage for prescribed accuracy, alignment, tolerance etc. using special tools. Records part number fitted or assembled to engine block and notes factual details or position regarding clearances, adjustments etc. made. Assembles other sub-assemblies like starter, alternator timing chain, heater assembly switch, radiator etc. Places assembled engine at central places for engine test. May conduct engine test on dynamo meter and note actual tuning conditions and make necessary adjustments. May overhaul and repair engines or other components.

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

Reference NCO-2015:

a) 7233.0300 - Mechanic, Petrol Engine
b) 8211.0600 - Assembler, Stationary Diesel Engine

4. NSQF LEVEL COMPLIANCE

NSQF level for Mechanic (Marine Diesel) trade under ATS: **Level 5**

As per notification issued by Govt. of India dated- 27.12.2013 on National Skill Qualification Framework total 10 (Ten) Levels are defined.

Each level of the NSQF is associated with a set of descriptors made up of five outcome statements, which describe in general terms, the minimum knowledge, skills and attributes that a learner needs to acquire in order to be certified for that level.

Each level of the NSQF is described by a statement of learning outcomes in five domains, known as level descriptors. These five domains are:

a. Process
b. professional knowledge,
c. professional skill,
d. core skill and
e. Responsibility.

The Broad Learning outcome of Mechanic (Marine Diesel) trade under ATS mostly matches with the Level descriptor at Level- 5.

The NSQF level-5 descriptor is given below:

Level	Process Required	Professional Knowledge	Professional Skill	Core Skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context.	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problem by selecting and applying basic methods, tools, materials and information.	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and Learning and some responsibility for other's works and learning.

5. GENERAL INFORMATION

Name of the Trade	MECHANIC (MARINE DIESEL)
NCO - 2015	7233.0300, 8211.0600
NSQF Level	Level – 5
Duration of Apprenticeship Training (Basic Training + On-Job Training)	Two years (02 Blocks each of one year duration).
Duration of Basic Training	a) Block –I : 3 months b) Block – II : 3 months **Total duration of Basic Training: 6 months**
Duration of On-Job Training	a) Block– I: 9 months b) Block–II : 9 months **Total duration of Practical Training: 18 months**
Entry Qualification	Passed class 10th exam under 10+2 system of education or its equivalent.
Selection of Apprenticeship	The apprentices will be selected as per Apprenticeship Act amended time to time.
Instructors Qualification for Basic Training	As per ITI instructors qualifications as amended time to time for the specific trade.
Infrastructure for Basic Training	As per related Trade of ITI
Examination	The internal examination/ assessment will be held on completion of each block. Final examination for all subjects will be held at the end of course and same will be conducted by NCVT.
Rebate to Ex-ITI Trainees	01year
CTS trades eligible for Mechanic (Marine Diesel) Apprenticeship	1. Mechanic Diesel

Note:

- *Industry may impart training as per above time schedule for different block, however this is not fixed. The industry may adjust the duration of training considering the fact that all the components under the syllabus must be covered. However the flexibility should be given keeping in view that no safety aspects is compromised.*
- *For imparting Basic Training the industry to tie-up with ITIs having such specific trade and affiliated to NCVT.*

6. LEARNING OUTCOME

6.1 GENERIC LEARNING OUTCOME

The following are minimum broad Common Occupational Skills/Generic Learning Outcome after completion of the Mechanic (Marine Diesel) course of 02 years duration under ATS.

Block I & II:-

1. Recognize & comply safe working practices, environment regulation and housekeeping.
2. Understand and explain different mathematical calculation & science in the field of study. *[Different mathematical calculation & science – Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.]*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Mechanic (Marine Diesel) / Wireman / Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]*
4. Select and ascertain measuring instrument and measure dimension of components and record data.
5. Explain the concept in productivity, quality tools, and labour welfare legislation and apply such in day to day work to improve productivity & quality.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.
8. Plan and organize the work related to the occupation.

6.2 SPECIFIC LEARNING OUTCOME

Block – I

1. Recognize and comply Safe Working Practice, Proficiency in Survival Technique, Elementary of First Aid, Fire Prevention and Fire Fighting, personal Safety and Social Responsibility, and Security Training.
2. Perform basic workshop operations using suitable tools for drilling, tapping, grinding or twisting drills & silver soldering, Lathe Practice etc, observing suitable care & safety.

3. Check, test and perform measuring & marking by using various measuring & marking tools (Warpage, parent bores, taper, refit cylinder head, follower bores).
4. Test & service different batteries used in electrical appliances & record the data to estimate repair cost.
5. Construct different electrical sub system & measure parameters. (Different Electrical sub system AC/DC motor, Alternator, dynamo etc.)
6. Execute testing, evaluate performance & maintenance of fuel tank, transfer pumps, Overhaul injection pump, governors, fuel filters and water separator. Repair fuel lines & fuel system maintenance.
7. Trace, test & repair all cooling system and lubrication system of engine(assemble fit & test thermostats & reverse flushing of radiator, lubrication system, relief valve adjustment, oil filter, oil cooler, Overhaul Oil pump).
8. Overhaul, service & maintain auxiliary equipments & its parts and check functionality.

Block – II

9. Maintain shop floor tools with due care & following safety norms of tools/instruments & check fuel tank for leaks & repair fuel pipelines.
10. Perform dismantling, overhauling & assembling of multi-cylinder marine engine and check crankshaft bearings for wear, clean & refit piston rings, check alignment of bearings.
11. Dismantling & assembling of clutch pressure plate, stern gear (transmission work), clean inspect & re-assemble gear box.
12. Identify, select, check, maintain, service & overhaul different types of fuel system.
13. Trace, test & reverse flush cooling system & overhaul water pumps.
14. Overhaul, check, & maintain air compressor; dismantle, re-assemble & fit electric starter motors.
15. Identify, select, service, maintain, overhaul exhaust system.
16. Diagnose & rectify the defect in electrical system & auxiliary equipments to ensure functionality of sea water pump, steering system & winch system.

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

7. LEARNING OUTCOME WITH ASSESSMENT CRITERIA

GENERIC LEARNING OUTCOME	
LEARNING OUTCOMES	**ASSESSMENT CRITERIA**
1. Recognize & comply safe working practices, environment regulation and housekeeping.	1.1 Follow and maintain procedures to achieve a safe working environment in line with occupational health and safety regulations and requirements.
	1.2 Recognize and report all unsafe situations according to site policy.
	1.3 Identify and take necessary precautions on fire and safety hazards and report according to site policy and procedures.
	1.4 Identify, handle and store / dispose off dangerous/unsalvageable goods and substances according to site policy and procedures following safety regulations and requirements.
	1.5 Identify and observe site policies and procedures in regard to illness or accident.
	1.6 Identify safety alarms accurately.
	1.7 Report supervisor/ Competent of authority in the event of accident or sickness of any staff and record accident details correctly according to site accident/injury procedures.
	1.8 Identify and observe site evacuation procedures according to site policy.
	1.9 Identify Personal Productive Equipment (PPE) and use the same as per related working environment.
	1.10 Identify basic first aid and use them under different circumstances.
	1.11 Identify different fire extinguisher and use the same as per requirement.
	1.12 Identify environmental pollution & contribute to avoidance of same.
	1.13 Take opportunities to use energy and materials in an environmentally friendly manner
	1.14 Avoid waste and dispose waste as per procedure
	1.15 Recognize different components of 5S and apply the same in the working environment.
2. Understand, explain different mathematical calculation & science in the field of study. Apply in day to day work.	2.1 Explain concept of basic science related to the field such as Material science - Properties of materials, Ferrous & non-ferrous metals, etc.
	2.2 Mass, weight, Density, Specific Gravity etc.

[Different mathematical calculation & science - Conversion of Units, Percentage, & Mensuration-Area & Volume of different surfaces and solids, and Properties of materials, Ferrous & non-ferrous metals, Mass, weight, Density, Specific Gravity etc.]	2.3 Use scale/ tapes to measure as per specification.
	2.4 Calculate area / volume of the materials.
	2.5 Prepare list of appropriate materials by interpreting detail drawings and determine quantities of such materials.
	2.6 Ensure dimensional accuracy of assembly by using different instruments/gauges.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-. Geometrical figures like Triangles, Square, Rectangle, Rhombus, Parallelogram, Circle etc., Lettering & Numbering, Freehand sketching of Hand tools used for Mechanic (Marine Diesel) / Wireman / Electrician/ trade & wire joints, Signs & symbols for Electrical components used in electrical circuits and AC/DC systems, Electrical wiring diagram of different lamps, Schematic diagram of plate and pipe earthing, insulators used in over head line, Layout diagram of a substation, Single line Diagram of Electrical substation feeders.]*	3.1 Read & interpret the information on drawings and apply in executing practical work.
	3.2 Read & analyse the specification to ascertain the material requirement, tools, and machining /assembly /maintenance parameters.
	3.3 Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
	3.4 Read & interpret the signs and symbols for electrical components and AC/DC systems.
	3.5 Encounter drawings with electrical circuit diagrams and layout diagrams.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as Ammeter, voltmeter, meggar, earth tester etc. (as per tool list).
	4.2 Ascertain the functionality & correctness of the instrument.
	4.3 Measure dimension of the components & record data to analyse the with given drawing/measurement.
5. Explain the concept in productivity, quality tools, and	5.1 Explain the concept of productivity and quality tools and apply during execution of job.

labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.2 Understand the basic concept of labour welfare legislation and adhere to responsibilities and remain sensitive towards such laws.
	5.3 Knows benefits guaranteed under various acts.
6. Explain energy conservation, global warming and pollution and contribute in day to day work by optimally using available resources.	6.1 Explain the concept of energy conservation, global warming, pollution and utilize the available recourses optimally & remain sensitive to avoid environment pollution.
	6.2 Dispose waste following standard procedure.
7. Explain personnel finance, entrepreneurship and manage/organize related task in day to day work for personal & societal growth.	7.1 Explain personnel finance and entrepreneurship.
	7.2 Explain role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
	7.3 Prepare Project report to become an entrepreneur for submission to financial institutions.
8. Plan and organize the work related to the occupation.	8.1 Use documents, drawings and recognize hazards in the work site.
	8.2 Plan workplace/ assembly location with due consideration to operational stipulation
	8.3 Communicate effectively with others and plan project tasks
	8.4 Assign roles and responsibilities of the co-trainees for execution of the task effectively and monitor the same.
SPECIFIC OUTCOME	
Block-I & II (Section:10 in the competency based curriculum)	
*Assessment Criteria i.e. the standard of performance, for each specific learning outcome mentioned under **block – I & block – II** (section: 10) must ensure that the trainee achieves well developed skill with clear choice of procedure in familiar context. Assessment criteria should broadly cover the aspect of **Planning** (Identify, ascertain, estimate etc.); **Execution** (perform, illustration, demonstration etc. by applying 1) a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information 2) Knowledge of facts, principles, processes, and general concepts, in a field of work or study 3)Desired Mathematical Skills and some skill of collecting and organizing information, communication) and **Checking / Testing** to ensure functionality during the assessment of each outcome. The assessments parameters must also ascertain that the candidate is responsible for own work and learning and some responsibility for other's work and learning.*	

8. SYLLABUS

BASIC TRAINING (Block – I)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1.	Familiarization with the institute disciplinary rules & communication channels, importance of the trade types of work done by students in the institute shop floor 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.
2-3	**Allied Trade** Instruction on safety precautions on the shop floor Care and used of drills, taps and reamers. Grinding of twist drills Use of central drill Silver soldering Lathe practice (Facing, Taper turning, thread cutting)	**Fastener** Different types of bolts, nuts washer, rivets, studs, studpins, cotter, key etc. and their use Standard screws thread details of common screw threads such as British metric unified and S.L. and their use, thread-chart Drilling Machine, their brief description, 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. Heat treatment of metals and alloys – it's necessary. Definition of terms – hardening, tempering, normalizing and case hardening. Brief description and process employed. Scraping, lapping and honing- operation and application. Lubrication, friction- heat and wear. Lubrication system type of pumps & level indicators Engine cooling- pumps and thermo siphon system. Temperature control,

		thermostatic valve, radiator construction.
4-6	**Power Unit** Strip and reassemble engine Strip and reassemble carburetor and petrol feed pumps Clean and pressure test cylinder block cylinder head (Decarbonizes) 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 valve seat Grind valve Adjust valve timing Adjust valve clearance Charting cylinder bores Check crank shaft, bearing and cylinder block Bore clinder to size Test connecting rod for twist and bend Remove and refit clutch unit and coupling Super charger/ turbocharger – inspection replacement.	Ignition system- magneto and coil. Electric generation current and voltage regulator, cutout, self starter and starting mechanism, Battery charting- maintenance and inspection. 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. Tools- description, use, care and maintenance of al tools used by diesel mechanic- hammers, screw drivers, pliers wrenches, chisels, socket, wrenches, torques wrenches alien keys, puller etc. use of maker special book. Stationary engines – description and classification of stationary engines- 2 stroke and 4 stroke, single and multi-cylinder, double acting and opposed piston, types of rotary engines with names of components
7	**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	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.

8	**Fuel System** 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	Petrol- engine description and function of fuel system components types of system- gravity feed, vacuum, pressure feed. Fuel pumps, air- cleaners and carburetors, Diesel- fuel system components Fuel injection system equipment, Fuel pumps.
9	**Cooling systems** Remove, clean and refit radiator Fit and adjust fan bents Fit fan Fit and test and thermostats Remove, test and refit hoses Overhaul water pump Reverse flushing of radiator	Cooling system- cause and remedies for overheating and descriptive treatment of cooling systems for stationery engines – water pumps, radiators, thermostats, cooling towers anti-freeze and anti-corrosive compounds, DEAIREATION type cooling system Fuel system- type of fuels, derivation and uses, storage and handling of fuels- octane no. and cefane no. detonation fuel knock.
10	**Lubrication System** Introduction to lubrication system Relief valve adjustment Clean and refit oil filters Clean oil coolers Overhaul oil pumps Set pressure relief valve	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. Manufactures specification bearing and bearing surfaces. Oil seats- 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. Need for lubrication- fundamentals of lybrication, the effect of lubrication, lubricating oils, viscosity- SAE numbers, factors, governing, selection of correct grade of oil, Manufactures specification, bearing & bearing surfaces, oil seals, filter and coolers, Importance of cleanliness, oil pumps, engine lubrication system oil pumps joints, pressure regulation of lubricating oil, indication of lubricating

		pressure.
11	**Starting System** Use of manufactures hand books Overhauling auxiliary petrol engine Compressor maintenance Overhaul compressor and exhauster	Ignition system- 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. Petrol- Battery ignition system. Description of component parts sparking plugs Use of reference tables and hand books. Modern developments in the trade – new techniques.
12	**Auxiliary Equipment** Maintenance and minor repairs Diagnosis of faults Observation of engine testing- with the help of dynometer Regular periodical maintenance	Ancillary equipment- description and application of ancillary equipment driven by stationary engines with names of part. Generators and switch boards, compressor and air lines, pumps etc. Use of exhaust gases. Preventive maintenance- preparation of maintenance schedules for engines and ancillaries importance of regular servicing, maintenance of long books. Quality and fining work –importance of quality and finish of jobs at all stages- protection of finished surfaces estimation of cost time and material Trouble shooting- faults likely to arise in operation, diagnosis, causes and remedies, Systematic approach, preventive maintenance
13	**Assessment/Examination (03days)**	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	Instruction in safety precaution on shop floor. Care and use of tools instruments Cleaning of commutators Repairing of fuel pipe lines- for leaks Checking fuel tank for leaks.	Heat and temperature units- other forms of energy. Force and resistance power and unit of power mechanical equivalent of heat conversion of energy 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 Part, Functions and materials
2-4	**Power unit** Dismantle engine complete Cleaning and pressure test cylinder block & cylinder head Test cylinder block and head for warping Test cam follower bores. Test and refit rocker arm shaft with new bushes Remove and refit valve guides Cut/ Grind valve seats to correct angles. Reface valve Lap valves on their seats Check crankshaft and camshaft bearings for wear Test connecting rod for twist and bend Check, clean and refit piston rings in the ring grooves Remove, clean check & refit gudgeon pins and bushes Check big end bearings Check alignment of bearing Check oil passages in the crank shaft and engine block and clean Overhaul oil pump and oil filters Measure cylinder bores and chart the readings Measure crankshaft and torques main bearings with torques wrench Measure crank pins and main journals	Shafting, thrust, bearing, stern tube and propellers, principle of propellers, pitch relation between diameter & pitch, variable pitch propellers etc. materials and construction. Application of diesel engine for the propulsion of winch drive, their compressor and electric generators, parts functions and materials. Checks before starting the main engine decompression and hand starting of levers engines by compressed air or by electric starters check while returning, watch keeping observing of system, pressures & temperatures points to be looked into prior to stopping.

	Assemble piston and connecting rod assembly in cylinder block Assembly cylinder head and valve assembly Check and adjust valve timing Adjust valve tapper clearance Replace timing cover oil seal and fit timing cover to block Assemble oil pump, oil filter and sump Fit Glow plugs Start Engine and adjust slow speeds	
5	**Transmission work** Remove gear box assembly and clutch assembly from engine Dismantle clutch pressure plate Reline the clutch plat Dismantle the stern gear, overhaul and refit. Replace clutch shaft pilot bearing in fly wheel Assemble and fit clutch assembly on fly wheel & test for run out Dismantle, clean, inspect and reassemble gear box Remove, clean and refit centre bearings	Reduction gear reverse gear, different types of construction, alignment of engine and tail shafts, method of alignment indication of mis-alignment and ratifications.
6-7	**Fuel System** Clean and test fuel tank for leaks Dismantle, clean, inspect, reassemble and fit transfer pumps Overhaul injection pumps Phase & calibrate F.I. Pump Remove, clean, replace filter element and fit fuel filter Checking and correcting leaks in fuel pipe lines. Check and fill up lubrication oil in fuel injection pumps Bleed air from fuel supply system Lubrication system Drain lubrication oil and fill in fresh oil Remove, clean oil filters, Replace filter element and refit on engine Overhaul oil pumps Check and adjust the oil pressure relief	The storage tank, service tank, fuel feed pumps, filter, high pressure, fuel injection pumps, high pressure fuel connection , fuel injectors testing. Systems which are controlled by remote control types of control. 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 4 stroke and 2 stroke engines, turbo charging different types of engines from 9 H.P. to 310 H.P. makes. High speed, medium speed and low speed engines in line and 'V' type arrangement of cylinders. Valve timing diagram for a 4 stroke cycle

	valve Remove, clean and refit oil coolers	engine setting of valve timing, indicator diagram and relationship to the corresponding valve timing, Fuel injection timing and method of adjusting, advantage of diesel engines over petrol engines.
8-9	**Cooling system** Reverse flush cooling system Fit fan & adjust the fan belt tension Remove, test and fit thermostats Remove, clean, test and refit hose pips Overhaul water pumps **Starting systems** Practice in use of Manufacture's hand books Overhauling auxiliary engine Maintenance of air compressor Overhauling of twin fuel system Overhauling of compressor Check up wear in hand starter equipment Remove dismantle, clean and reassemble and fit electric starter motors	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 Hand air and electric starting arrangements and working principles of centrifugals types of governors.
10	**Exhaust System** Remove clean and refit air filters Overhauling of air intake system Remove clean and refit inlet and exhaust pipes and silencer box Checking leaks in manifold joint and hitting new gaskets	Basic laws of refrigeration, types of refrigeration, components of a simple refrigerating machine, construction operation and working of fish hold refrigeration unit. Centrifugal bricket, gear type pumps sea water bilge pumps, fresh water pumps, diesel oil transfer pumps ad air compressors, layout and use of force, bilges and ballast systems Difference types construction, operations and maintenance of steering gear.
11	**Electric System** Remove, clean, top up and test and refit battery Remove, dismantle, clean assemble and test dynamo Overhaul starter motor assembly Diagnose faults in electrical system Maintenance of Electrical system	Principles and application in fishing vessels Precautions against fire and dangers of oil leakage. Explosion in crank cases and air starting system, care of starting air bottles and mountings.

12	**Auxiliary Equipment** Repair and maintenance of sea water pumps Overhauling of bilge pump- sea cock Overhauling of winch system Overhauling of steering system Diagnosis of faults and correcting them Regular periodical maintenance	Preventive of breakdown by periodical systematic overhauling schedule preventive maintenance, maintenance schedule. Starting difficulties and rectification irregular running, engines not coming to speed or power, over speeding, hunting or oscillating and remedies overheating, lower lub oil pressure, knocking over loading, combustion difficulties, blow by and its manifestation, cause effect on the working power output, rectification, high fuel consumption, low power generation, high oil consumption.
13	**Assessment/Examination (03 days)**	

Note: - *More emphasis to be given on video/real-life pictures during theoretical classes. Some real-life pictures/videos of related industry operations may be shown to the trainees to give a feel of Industry and their future assignment.*

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block – I		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	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.	Development of surfaces of simple objects
2.	Graphs: Plotting of points, plotting of graphs of simple equations -reading of graphs.	Drawing of rivetted joints, different types of threads, bolts and nuts and locking devices, key cotters, different types of couplings, bearings pulleys, gears
3.	Advance problems in Mensuration.	
4.	Meaning of tenacity, elasticity, malleability, brittleness hardness compressibility and ductility.	Consequetion of isometric scales
5.	Meaning of stress, strain, modulus of elasticity, ultimate tensile strength, factor of safety and different types of stresses.	Free hand sketching and production of working drawing of actual machine parts or engines parts such as pistons, connecting rods, crankshafts, diesel injectors, tails stock tools posts engineers vices, drill posts, rather braces.
6.	Difference between pressure and force.	
7.	Determination of force on the piston, ram.	
8.	Torque and its relation to forces on engine mountings and transmission.	
9.	Work and its measurement. Calculation of work done by force on piston, torque on shafts. Power in relation to engine output and road performance.	

Block – II		
Sl. No.	**Workshop Calculation and Science (Duration: - 20 hrs.)**	**Engineering Drawing (Duration: - 30 hrs.)**
1.	Friction coefficient of friction bearings - work lost in bearings and slides. Lubrication, ball and roller bearings.	Free hand sketching of detailed components from assemblies.
2.	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.	Free hand sketching of simple electrical circuits and reading of automotive electrical circuits (IS- 732-1958)
3.	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.	Advance blue print
4.	Properties of gases.	Code of practice for general engineering drawing according to IS 696-1960.
5.	Magnets - natural and artificial - poles of a magnet. Lines of force magnetic field - earth magnetism.	
6.	Horse power - mechanical efficiency. Fuel consumption per B.H.P. per hour - Mean effective pressure.	
7.	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, wattmeter. Types of circuits, batteries, magnets - electromagnets. Working of DC. and A.C. motors.	
8.	Hydraulics - elementary principles. Incompressibility of liquids. Properties of liquids. Pascal's Law.	

9.2 EMPLOYABILITY SKILLS

(DURATION: - 110 HRS.)

Block – I (Duration – 55 hrs.)	
1. English Literacy Duration : 20 Hrs.	Marks : 09
Pronunciation	Accentuation (mode of pronunciation) on simple words, Diction (use of word and speech)
Functional Grammar	Transformation of sentences, Voice change, Change of tense, Spellings.
Reading	Reading and understanding simple sentences about self, work and environment
Writing	Construction of simple sentences Writing simple English
Speaking / Spoken English	Speaking with preparation on self, on family, on friends/ classmates, on know, picture reading gain confidence through role-playing and discussions on current happening job description, asking about someone's job habitual actions. Cardinal (fundamental) numbers ordinal numbers. Taking messages, passing messages on and filling in message forms Greeting and introductions office hospitality, Resumes or curriculum vita essential parts, letters of application reference to previous communication.
2. I.T. Literacy Duration : 20 Hrs.	Marks : 09
Basics of Computer	Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.
Computer Operating System	Basics of Operating System, WINDOWS, The user interface of Windows OS, Create, Copy, Move and delete Files and Folders, Use of External memory like pen drive, CD, DVD etc, Use of Common applications.
Word processing and Worksheet	Basic operating of Word Processing, Creating, opening and closing Documents, use of shortcuts, Creating and Editing of Text, Formatting the Text, Insertion & creation of Tables. Printing document. Basics of Excel worksheet, understanding basic commands, creating simple worksheets, understanding sample worksheets, use of simple formulas and functions, Printing of simple excel sheets.
Computer Networking and	Basic of computer Networks (using real life examples), Definitions of Local Area Network (LAN), Wide Area Network (WAN), Internet,

Internet	Concept of Internet (Network of Networks), Meaning of World Wide Web (WWW), Web Browser, Web Site, Web page and Search Engines. Accessing the Internet using Web Browser, Downloading and Printing Web Pages, Opening an email account and use of email. Social media sites and its implication. Information Security and antivirus tools, Do's and Don'ts in Information Security, Awareness of IT - ACT, types of cyber crimes.
3. Communication Skills Duration : 15 Hrs. Marks : 07	
Introduction to Communication Skills	Communication and its importance Principles of Effective communication Types of communication - verbal, non verbal, written, email, talking on phone. Non verbal communication -characteristics, components-Para-language Body language Barriers to communication and dealing with barriers. Handling nervousness/ discomfort.
Listening Skills	Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening. Triple- A Listening - Attitude, Attention & Adjustment. Active Listening Skills.
Motivational Training	Characteristics Essential to Achieving Success. The Power of Positive Attitude. Self awareness Importance of Commitment Ethics and Values Ways to Motivate Oneself Personal Goal setting and Employability Planning.
Facing Interviews	Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview.
Behavioral Skills	Problem Solving Confidence Building Attitude
Block – II **Duration – 55 hrs.**	
4. Entrepreneurship Skills Duration : 15 Hrs. Marks : 06	
Concept of	Entrepreneur - Entrepreneurship - Enterprises:-Conceptual issue

Entrepreneurship	Entrepreneurship vs. management, Entrepreneurial motivation. Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.
Project Preparation & Marketing analysis	Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management. Different Between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.
Institutions Support	Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes & procedure & the available scheme.
Investment Procurement	Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure - Loan procurement - Banking Processes.
5. Productivity Duration : 10 Hrs.	Marks : 05
Benefits	Personal / Workman - Incentive, Production linked Bonus, Improvement in living standard.
Affecting Factors	Skills, Working Aids, Automation, Environment, Motivation - How improves or slows down.
Comparison with developed countries	Comparative productivity in developed countries (viz. Germany, Japan and Australia) in selected industries e.g. Manufacturing, Steel, Mining, Construction etc. Living standards of those countries, wages.
Personal Finance Management	Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.
6. Occupational Safety, Health and Environment Education Duration : 15 Hrs.	Marks : 06
Safety & Health	Introduction to Occupational Safety and Health importance of safety and health at workplace.
Occupational Hazards	Basic Hazards, Chemical Hazards, Vibroacoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.
Accident & safety	Basic principles for protective equipment. Accident Prevention techniques - control of accidents and safety

	measures.
First Aid	Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person.
Basic Provisions	Idea of basic provision legislation of India. safety, health, welfare under legislative of India.
Ecosystem	Introduction to Environment. Relationship between Society and Environment, Ecosystem and Factors causing imbalance.
Pollution	Pollution and pollutants including liquid, gaseous, solid and hazardous waste.
Energy Conservation	Conservation of Energy, re-use and recycle.
Global warming	Global warming, climate change and Ozone layer depletion.
Ground Water	Hydrological cycle, ground and surface water, Conservation and Harvesting of water.
Environment	Right attitude towards environment, Maintenance of in -house environment.
7. Labour Welfare Legislation Duration : 05 Hrs.	Marks : 03
Welfare Acts	Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Payment Wages Act, Employees Provident Fund Act, The Workmen's compensation Act.
8. Quality Tools Duration : 10 Hrs.	Marks : 05
Quality Consciousness	Meaning of quality, Quality characteristic.
Quality Circles	Definition, Advantage of small group activity, objectives of quality Circle, Roles and function of Quality Circles in Organization, Operation of Quality circle. Approaches to starting Quality Circles, Steps for continuation Quality Circles.
Quality Management System	Idea of ISO 9000 and BIS systems and its importance in maintaining qualities.
House Keeping	Purpose of House-keeping, Practice of good Housekeeping.
Quality Tools	Basic quality tools with a few examples.

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

The **competencies/ specific outcomes** on completion of On-Job Training are detailed below: -

Block – I

1. Recognize and comply Safe Working Practice, Proficiency in Survival Technique, Elementary of First Aid, Fire Prevention and Fire Fighting, personal Safety and Social Responsibility, and Security Training.
2. Perform basic workshop operations using suitable tools for drilling, tapping, grinding or twisting drills & silver soldering, Lathe Practice etc, observing suitable care & safety.
3. Check, test and perform measuring & marking by using various measuring & marking tools (Warpage, parent bores, taper, refit cylinder head, follower bores).
4. Test & service different batteries used in electrical appliances & record the data to estimate repair cost.
5. Construct different electrical sub system & measure parameters. (Different Electrical sub system AC/DC motor, Alternator, dynamo etc.)
6. Execute testing, evaluate performance & maintenance of fuel tank, transfer pumps, Overhaul injection pump, governors, fuel filters and water separator. Repair fuel lines & fuel system maintenance.
7. Trace, test & repair all cooling system and lubrication system of engine(assemble fit & test thermostats & reverse flushing of radiator, lubrication system, relief valve adjustment, oil filter, oil cooler, Overhaul Oil pump).
8. Overhaul, service & maintain auxiliary equipments & its parts and check functionality.

Block – II

9. Maintain shop floor tools with due care & following safety norms of tools/instruments & check fuel tank for leaks & repair fuel pipelines.
10. Perform dismantling, overhauling & assembling of multi-cylinder marine engine and check crankshaft bearings for wear, clean & refit piston rings, check alignment of bearings.
11. Dismantling & assembling of clutch pressure plate, stern gear (transmission work), clean inspect & re-assemble gear box.
12. Identify, select, check, maintain, service & overhaul different types of fuel system.
13. Trace, test & reverse flush cooling system & overhaul water pumps.
14. Overhaul, check, & maintain air compressor; dismantle, re-assemble & fit electric starter motors.
15. Identify, select, service, maintain, overhaul exhaust system.

16. Diagnose & rectify the defect in electrical system & auxiliary equipments to ensure functionality of sea water pump, steering system & winch system.

Note:

1. Industry must ensure that above mentioned competencies are achieved by the trainees during their on job training.
2. In addition to above competencies/ outcomes industry may impart additional training relevant to the specific industrGy.

ANNEXURE – I

INFRASTRUCTURE FOR PROFESSIONAL SKILL & PROFESSIONAL KNOWLEDGE

MECHANIC (MARINE DIESEL)			
LIST OF TOOLS AND EQUIPMENT for Basic Training			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Rule Steel	30 cm	1 No.
2.	Divider spring	15 cm	1 No.
3.	Prick punch	15 cm	1 No.
4.	Chisel cross cut	9 X 3 cm	1 No.
5.	Hammer ball pein	0.5 kg	1 No.
6.	Hammer copper	1 kg with handle	1 No.
7.	Engineers square	15 cm blade	1 No.
8.	Scriber	15cm	1 No.
9.	Scriber block universal		2 Nos.
B : INSTRUMENTS & GENERAL SHOP OUTFIT			
10.	Marking out tables	90cmX 60cmX 90cm (High)	1 No.
11.	Surface plate	60 X 60 cm	1 No.
12.	Hacksaw frame adjustable for	20-30 cm blades	2 Nos.
13.	V block	70 X 38 cm pair with clamps	2 Nos.
14.	Punch hollow	6, 7, 8, 9, 10.5 and 12 mm set	2 Nos.
15.	Punch figure set	3 mm	1 set
16.	Punch letters set	3 mm	1 set
17.	Hand vise	3-7 mm	2 Nos.
18.	Screw driver, Electrician type	15 cm size	2 Nos.
19.	File, flat	35 cm bastard	1 No.
20.	File, flat	25 cm second cut	1 No.
21.	File, flat	20cm smooth	1 No.
22.	File, flat safe edge	25 cm smooth	1 No.
23.	File, triangle	15cm second cut	1 No.
24.	File, half round	30 cm second cut	1 No.
25.	File square	30 cm second cut	1 No.
26.	File square	20 cm second cut	1 No.
27.	Drill- twist, metric	3 mm X 12mm X 1mm	1 set
28.	Taps and dies complete set in box BSW and metric		1 set
29.	H.S.S. Hand reamer adjustable	10.5mm to 11.25mm, 11.25mm to 12.75mm, 12.78mm to 14.25mm, 14.25mm to 15.75mm	1 set

30.	Scraper, flat	25cm handled	1 No.
31.	Scraper, half round	25cm	1 No.
32.	Scraper triangular	25cm	1 No.
33.	Scraper bearing		1 No.
34.	Sets of morse socket	0-1 1-2 and 2-3	1 set
35.	Micrometer,	outside 0 to 25 mm	1 No.
36.	Micrometer, outside	50mm to 75 mm, 75mm to 100mm	1 each
37.	Micrometer, with extension rod (inside)	50mm to 150mm	1 No.
38.	Vernier calipers set 25 or 20 cm inside outside depth to read both inches and in mms		1 No.
39.	Safety goggles (clear glass)		2 pairs
40.	Hammer, plashing		1 No.
41.	Setting hammer		1 No.
42.	Mallet (wooden)		1 No.
43.	Trammel	30cm	1 No.
44.	Blow lamp	0.5 ltr.	1 No.
45.	Soldering iron, copper	225 cms (Fire headed)	1 No.
46.	Pliers nose (round and straight)		1 No.
47.	Snip straight and bent		1 each
48.	Pot melting		1 No.
49.	Poker		2 Nos.
50.	Spanners, double ended	set of 12 metric size 8 to 32 mm	2 Nos.
51.	Spanners, double off-set double ended	set of 7 w/w form 3 mm to 13.5mm	1 set
52.	Double open ended ignition spanner of BA	0 X 1 to 8 X 9 set of 5	1 set
53.	Spanner, clyburn	15cm	1 set
54.	Spanners, adjustable	20cm	1 No.
55.	Spanner ring of set	6 S.A.E	1 No.
56.	Spanner for sparking plug	14mm	1 set
57.	Magneto spanner set	8 spanners	1 set
58.	Turbo charger or super charger		2 Nos.
59.	Spanner socket set of 8 handled T. bar ratchet	`	2 Nos.
60.	Spanner, T, Flex for screwing up and unscrewing in inaccessible position		1 Nos
61.	Double open ended tapper spanner	10.5mm X 12 mm to 16.5mm X 18mm set of four	1 set
62.	Drift, copper	10mm X 150 mm	2 Nos.
63.	Gun paraffin pressure		1 No.

64.	Gun grease pressure		1 No.
65.	Chain and block	1000kg capacity	1 No.
66.	Traycleanning	45 X 30 mm	16 No.
67.	Drilling machine bench to drill	upto 12mm dia	1 No.
68.	Oil can	0.5 ltr.	1 No.
69.	Lifter, valve spring		1 No.
70.	Tool valve grinding suction type		6 Nos.
71.	Valve seat cutting tools complete with guides & pilot bar (all angles) in a box		1 set
72.	Extractor, stud		1 No.
73.	Compression gauge to read	120 kg./ sq. cm and vaccum gauge 0 to 75 cm	1 each
74.	Stone, Carborandum	15 X 5 X 3.75 cm rough and smooth	2 Nos.
75.	Cylinder gauge, bore dial gauge with accessories		1 No.
76.	Ring expander and remover		1 No.
77.	Torque wrench	0 to 75 kg meter	1 No.
78.	Work bench	250 X 120 X 75 cm with 4 vices of 12.5 cm jaw	4 Nos.
79.	Lockers with 8 drawers	standard size	2 Nos.
80.	Metal rack	180 X 150 X 45 cm	2 Nos.
81.	Fuel feed pump		2 Nos.
82.	Fuel injection pump		2 Nos.
83.	Carburetor (Two different types)		2 each
84.	Water pump and oil pump		1 each
85.	Filling jig for adjusting the piston ring gap		1 No.
86.	Steel Almirah		1 No.
87.	Black board with casel		2 Nos.
88.	Desk or table		1 No.
89.	Fire extinguisher		2 Nos.
90.	Fire bucket with stand		4 Nos.
91.	Tachometer (Counter type)		1 Nos.
92.	Compressor air piston type (Vchicular) and exhauster unit		1 each
93.	Clutches, different types such as cone type, disc type		1 each
94.	Dynamo and voltage regulator		1 each
95.	Starter motor – Axial type, pre engagement type co-axial type		1 each
96.	Injectors different types		2 each
97.	Battery	12 volt	2 each
98.	Chair		1 No.

99.	Distributor Assembly		2 Nos.
100.	Pulley set universal for bearing and bushes		1 set
101.	Lifting jack, screw type 3048 kg.		2 Nos.
102.	Piston ring compressor		2 Nos.
103.	Valve key inserter		1 No.
104.	Connecting rod alignment fixture		1 No.
105.	Valve refacer		1 No.
106.	High rate discharge tester		1 No.
107.	A.V.O meter		1 No.
108.	Injector testing set (Hand operated)		1 No.
109.	Injector cleaning kit		2 sets
110.	Glow plug		1 set
111.	Nozzle holder jigs		1 set
112.	P.T. injector		1 No.
113.	Bench vice		4 Nos.
114.	Alternator		1 No.
115.	Fluid fly wheel torque converter		1 each
116.	Circlip plier		1 No.
117.	Piston groove cleaner		1 No.
118.	Thread pitch gauge		1 No.
119.	Fillet radius gauge		2 No.
120.	Stud remover		2 No.
121.	Cut section models for fuel injector		1 No.
122.	Starter test benches		1 No.
C : GENERAL MACHINERY INSTALLATIONS			
123.	Grinder with two 18 cm wheels with twist drill grinding attachment		1 No.
124.	Arbor press hand operated	2 ton capacity	1 No.
125.	Light commercial vehicle in running condition (Diesel) Indian Make		1 No.
126.	Diesel engine cut away model to show working parts for demonstration (one two stroke & one 4 stroke)		2 Nos.
127.	Diesel engine 4 stroke multi-cylinder 4/6 vehicular type		4 Nos.
128.	Petrol engine (running condition) stationary type		1 No.
129.	Growler		1 No.
130.	Battery charger		1 No.
131.	Timing lighter		1 No.
132.	Hydrometer (Consumable tool)		6 Nos.
133.	Washing pump- reciprocating type		1 No.

	electrically operated with 1 kw motor-1000 ltr. rank		
134.	Portable lifting crane one ton capacity with chain block and tackle arrangement		1 No.
135.	Trolley type portable air compressor 1 single cylinder with 45 liters capacity air tank all accessories and with working pressure 6.5 kg/ sq. cm^2		2 Nos.
136.	Cell tester (High rate discharge tester)		1 No.
137.	Smoke tester		1 No.
138.	Hydraulic press 5 tonne		1 No.
139.	Fuel injection pump calibration equipment and its accessories and special tools with attachment for distributor pump and inline pump		1 No.
140.	Engine with P.T. System		1 No.

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: MECHANIC (MARINE DIESEL)

LIST OF TOOLS& EQUIPMENTS FOR - 20 APPRENTICES

1) **Space Norms** : 45 Sq. m.(For Engineering Drawing)

2) Infrastructure:

A : TRAINEES TOOL KIT:-			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1.	Draughtsman drawing instrument box		21
2.	Set square celluloid 45^o	(250 X 1.5 mm)	21
3.	Set square celluloid 30^o-60^o	(250 X 1.5 mm)	21
4.	Mini drafter		21
5.	Drawing board IS: 1444	(700mm x500 mm)	21
B : Furniture Required			
Sl. No.	**Name of the items**	**Specification**	**Quantity**
1	Drawing Board		20
2	Models : Solid & cut section		as required
3	Drawing Table for trainees		as required
4	Stool for trainees		as required
5	Cupboard (big)		01
6	White Board	(size: 8ft. x 4ft.)	01
7	Trainer's Table		01
8	Trainer's Chair		01

TOOLS & EQUIPMENTS FOR EMPLOYABILITY SKILLS		
Sl. No.	**Name of the Equipment**	**Quantity**
1.	Computer (PC) with latest configurations and Internet connection with standard operating system and standard word processor and worksheet software	10 Nos.
2.	UPS - 500VA	10 Nos.
3.	Scanner cum Printer	1 No.
4.	Computer Tables	10 Nos.
5.	Computer Chairs	20 Nos.
6.	LCD Projector	1 No.
7.	White Board 1200mm x 900mm	1 No.
Note: - Above Tools & Equipments not required, if Computer LAB is available in the institute.		

ANNEXURE-II

FORMAT FOR INTERNAL ASSESSMENT

Name & Address of the Assessor :			**Year of Enrollment :**
Name & Address of ITI (Govt./Pvt.) :			**Date of Assessment :**
Name & Address of the Industry :			**Assessment location: Industry / ITI**
Trade Name :	**Semester:**		**Duration of the Trade/course:**
Learning Outcome:			

Sl. No	**Candidate Name**	**Father's/Mother's Name**	Safety consciousness (15)	Workplace hygiene (5)	Attendance/ Punctuality (10)	Ability to follow Manuals/ Written instructions (5)	Application of Knowledge (10)	Skills to handle tools & equipment (10)	Economical use of materials (5)	Speed in doing work (10)	Quality in workmanship (15)	VIVA (15)	**Total internal assessment Marks**	**Result (Y/N)**
1														
2														