MARINE ENGINE FITTER

COMPETENCY BASED CURRICULUM

(Duration: 2 Yrs.)

APPRENTICESHIP TRAINING SCHEME (ATS)

NSQF LEVEL- 5

SECTOR – PRODUCTION & MANUFACTURING

सत्यमेव जयते

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

Directorate General of Training

Skill India
कौशल भारत-कुशल भारत

MARINE ENGINE FITTER

(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
EN-81, Sector-V, Salt Lake City,
Kolkata – 700 091

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Co-ordinator for the course: Sh. Nirmalya Nath., ADT, CSTARI- Kolkata

Sl. No.	Name & Designation Sh./Mr./Ms.	Organization	Expert Group Designation
1.	M. Kumaravel, DDT	FTI, Bangalore	Expert

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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.

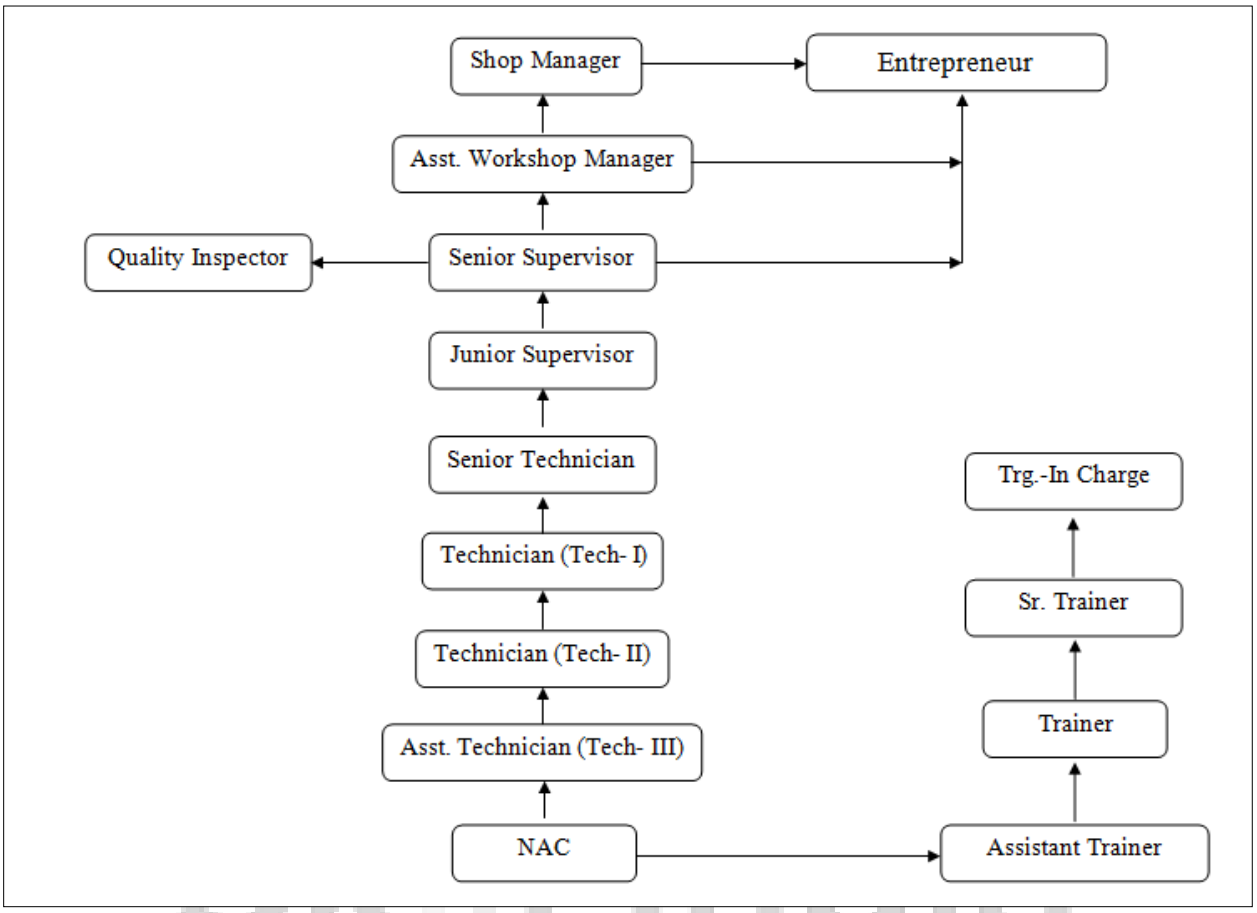
Marine Engine Fitter trade under ATS is one of the most popular courses delivered nationwide through different industries. The course is of two years (02 Blocks) duration. It mainly consists of Domain area and Core area. In the Domain area Trade Theory & Practical impart professional - skills and knowledge, 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 (section-2.4.2). 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 (section-2.4.2) 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, has produced work which demonstrates attainment of an acceptable standard of craftsmanship.	• Demonstration of good skill in the use of hand tools, machine tools and workshop 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:

Marine Engine Fitter, Marine repairs, services and overhauls engines and accessories of ships, boats etc., under guidance of Marine Engineer Fitter. Examines drawings and other specifications. Checks and measures parts for flaws and other accuracy of fit using gauges, micrometers etc., and removes defect by chipping, filing, scraping, grinding and does other supplementary tooling as necessary. Assembles engines and auxiliary machinery in position using hoisting equipment and other tools. Tests completed assembly and makes necessary adjustments, Dismantles partly or completely such machinery in ship as propelling machinery, steam diesel or electric auxiliaries, pumps, cargo-handling machinery anchor-handling gear, ventilating and firefighting equipment, steering gear etc., removes and replaces worn or damaged parts and reassembles them as per drawings under guidance of Marine Engineer using hand and portable tools. Installs below deck auxiliaries such as evaporators, stills, heaters, pumps, condensers and boilers and connects them to steam pipe systems. Tests and inspects installed machinery and equipment during dock and sea trials and removes defects, if any. May attend to minor electrical defects. May assist in keeping watch on engine, boiler and other machinery and assist in their operation.

Reference NCO: 7233.0300 - Mechanic, Petrol Engine

4. NSQF LEVEL COMPLIANCE

NSQF level for Marine Engine Fitter 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 Marine Engine Fitter 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	MARINE ENGINE FITTER
NCO-2004	7233.0300
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 10th Class with Science and Mathematics under 10+2 system of Education or its equivalent
Selection of Apprentices	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	01 year
CTS trades eligible for Marine Engine Fitter Apprenticeship	Marine Engine Fitter

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 Marine Engine Fitter 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 including basic electrical. *[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*
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. Filing & fitting of mating components within an accuracy
2. Repair and maintenance of ordinary filters
3. Making of various sheet metal joints
4. Making of simple items using sheet metal bending and folding operations
5. Measurement of cylinder bore for taper and out-of-round,
6. Measurement of wear on crank shaft run out, and valve guide with dial Indicator.
7. Measurement of flatness of the cylinder head
8. Measurement of Cam height, Crankshaft Journal dia, Piston dia, Cylinder bore etc.
9. Performance testing of starter motor
10. Dismantle and assembly of Cylinder head, and other major parts of engine
11. Checking of flywheel and mounting flanges, spigot, bearing

12. Overhauling of cylinder head assembly, use of use of service manual for clearance and other parameters, practice on removing rocker arm assembly manifolds
13. Checking and Testing of Cooling System

Block – II

14. Fabricate simple items using sheet metal, welding, brazing and soldering techniques.
15. Dismantling and assembling of air compressor,
16. Overhauling of injectors and testing of injector and servicing of Fuel Injector pumps.
17. Checking performance engine injectors. Dismantle and replace defective parts and refit back to the engine
18. Over hauling of fuel pump, carburettors fuel filters and air cleaners repair to a car carburettors
19. Maintenance of Air conditioning systems
20. Construction of hydraulic circuits using all frequently used valves like check valves flow control valve, pressure relief valve, directional control valves, hydraulic accumulator, etc.
21. Identify and interpret electrical / electronic system concern. Practice on measuring circuit voltage, ampere and resistance
22. Remove and replace super charger- dismantle and assemble super charger- dismantle & assemble turbo chargers
23. Dismantling and assembling of Transmission shafts and propellers
24. Dismantling and assembling of Boilers
25. Dismantling and assembling of Turbines

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 including basic electrical and	2.1 Explain concept of basic science related to the field such as Material science, Mass, weight, density, speed, velocity, heat & temperature, force, motion, pressure, heat treatment, centre of gravity, friction.
	2.2 Measure dimensions as per drawing

apply in day to day work.*[Different mathematical calculation & science -Work, Power & Energy, Algebra, Geometry & Mensuration, Trigonometry, Heat & Temperature, Levers & Simple machine, graph, Statistics, Centre of gravity, Power transmission, Pressure]*	2.3 Use scale/ tapes to measure for fitting to specification. 2.4 Comply given tolerance. 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. 2.7 Explain basic electricity, insulation & earthing.
3. Interpret specifications, different engineering drawing and apply for different application in the field of work. *[Different engineering drawing-Geometrical construction, Dimensioning, Layout, Method of representation, Symbol, scales, Different Projections, Machined components & different thread forms, Assembly drawing, Sectional views, Estimation of material, Electrical & electronic symbol]*	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.
4. Select and ascertain measuring instrument and measure dimension of components and record data.	4.1 Select appropriate measuring instruments such as micrometers, vernier calipers, dial gauge, bevel protector and height gauge (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 labour welfare legislation and apply such in day to day work to improve productivity & quality.	5.1 Explain the concept of productivity and quality tools and apply during execution of job. 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)	
*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	Importance of trade training, list of tools &Machinery used in the trade.' Occupational Safety & Health Importance of housekeeping & good shop floor practices. Health & Safety: Introduction to safety equipments and their uses. Introduction of first aid, operation of Electrical mains. Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Preventive measures for electrical accidents & steps to be taken in such accidents. Health, Safety and, Environment guidelines. Disposal procedure of waste materials like cotton waste, metal chips/burrs etc. Personal protective Equipments(PPE):- Use of Fire extinguishers. Identification of tools & equipments as per desired specifications for marking & sawing. Selection of material as per application. Marking out lines, gripping suitably in vice jaws, hack-sawing to given dimensions, sawing different types of metals of different sections.	Importance of safety and general precautions observed in the in the industry/shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute system including stores procedures. Soft Skills: its importance and Job area after completion of training. Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Environmentguidelines.Legislations&regulationsasapplicable.Response to emergencies eg; power failure, fire, and system failure. Linear measurements- its units, ividers, calipers, hermaphrodite, centre punch, dot punch, their description and uses of different types of hammers. Description, use and care of 'V' Blocks, marking off table. Measuring standards (English, Metric Units), Angular measurements, subdivisions, try square, ordinary depth gauge, protractor-description, uses and cares. Bench vice types, uses, care & maintenance, vice clamps.
2	Filing- Parallel, Flat and Square (Rough finish). Filing practice: Filing Channel, Surface filing. Marking of straight and parallel lines with odd leg Calipers and steel rule, marking	Files- specifications, description, materials, grades, cuts, file elements, uses. Types of files- convex, taper, needle, care and maintenance of files,

	practice with dividers, odd leg calipers and steelrule (circles, arcs, parallel lines). Marking straight lines and arcs using scribing block and dividers & punching Saw along a straight line, curved line, on different sections of metal. File and saw on M.S. Square and pipe. Straight saw on thick section, M.S. angle and pipes. Filing flat, square, and parallel to an accuracy of 0.5mm.	Special files: types, description. Hacksaw frames and blades, material, parts and grade of blade, care & maintenance. Marking off and layout tools: dividers, scribing block, odd leg calipers, punches- description, classification, types and material. Caliper- Types, Uses, Care & Maintenance. Surface plate and auxiliary marking equipment, 'V' block, angle plates, parallel block, description, types and uses.
3	File steps and finish with smooth file with an accuracy of ± 0.25 mm.	Vernier calipers, graduations, reading, use and care. Micrometer- outside and inside – parts graduation, leading, use and care. Description of Digital micrometer. Vernier height gauge: material construction, parts, graduations (English& Metric) uses, care and maintenance, Vernier micrometer, parts, graduation, use, Care and maintenance. Screw thread micrometer: graduation and use. Dial test indicator, parts, graduation, Method of use, Care and maintenance. Digital dial indicator. Vernier bevel protractor, graduations, reading, use and care, Description of dial Vernier Caliper & Digital vernier caliper Inside micrometer: parts, graduations LC, reading , uses, care and maintenance, Depth Micrometer : parts, graduations ,LC, reading , uses, care and maintenance.
4.	Marking of straight lines, circles, profiles and various geometrical shapes and cutting the sheets with snips. Bend sheet metal into various curvature forms, fold sheet metal at angle stakes. Make simple square	Safety precautions to be observed in a sheet metal workshop, sheets and sizes, Commercializes and various types of metal sheets, coated sheets and their uses as per BIS specifications. Marking and measuring tools, wing compass, Prick punch, snips, types and uses Stakes

	container with wired edge.	types, parts & their uses. Various types of sheet metal joints, their selection and applications, tolerance for various joints, theirs election & application. Wired edges –Types, sizes, and selection for various works. Riveting tools dolly & snaps description and uses. Method of riveting. Shearing machine- description, parts and uses.
5	Marking according to simple blue prints for locating position of holes, scribing lines on chalked surfaces with marking tools, finding center of round bar with the help of 'V' block and marking block. Joining straight line to an arc. Chipping flat surfaces along a marked line. More difficult work in marking out including tangents, templates involving use of vernier protractor.	Chisels- materials, types, cutting angles. Power Saw, band saw, Circular saw machines used for metal sections cutting. Drill- material, types, parts and sizes (fraction, metric, number, letter drill). Drill angle-cutting angle for different materials, cutting speed feed for different materials. Drill holding devices- their uses. Counter sink, counter bore and spot facing- tools and nomenclature. Determining whole size. Drilling machine: Sensitive (bench type, pillar type) upright, radial, gang and multi spindle drilling machine.
6	Make & assemble simple job by different basic fitting operations. File thin metal to an accuracy of 0.5 mm. Chipping, Chamfering, grooving and slotting. Make riveted lap and butt joint. Use of counter sunk head rivet.	Physical properties of engineering material: colour, weight, structure, and conductivity, magnetic properties, fusibility, specific gravity. Mechanical properties: ductility, malleability hardness, brittleness, toughness, tenacity, and elasticity. Cast Iron: types, properties and uses. Wrought iron- : properties and uses. Steel: types, properties and uses. Composition of ferrous alloy like HSS, stainless steel etc. Non-ferrous metals (copper, aluminum, tin, lead, zinc) properties and uses. Aluminium and its alloys. Uses, advantages and limitation.
7	Drill through & blind holes, Drill holes at an angle using swivel table of	Description of tap, material, types and using method of hand tap. Taps-

	drilling machine. Cutting threads using dies.	British standard and metric /BIS. Determination of tap drill size. Tap wrench: types and their uses. Removal of broken tap, studs (tap stud extractor). Dies: British standard, metric and BIS standard, material, parts, types Grinding wheel Types & Specification (Abrasive type, grit size, grade, structures & bond) use, mounting and dressing.
8	Cutting & Threading of pipe. Flaring of pipes and pipe joints. Fitting of pipes as per sketch.	Pipes and pipe fitting- commonly used pipes. Pipe schedule and standard sizes. Use of tools such as pipe cutters, pipe wrenches, pipe dies, and tap, pipe bending machine etc. Conditions used for pipe work to be followed.
9-10	Welding - Striking and maintaining arc, laying Straight-line beads by Manual Metal Arc welding. Setting up of Oxy-acetylene flames and making fusion runs with and without filler rod. Practice to make straight beads and "T' joint by Gas and Arc welding. Making square butt joint on MS by brazing. Make straight cutting by Gas	Safety-importance of safety and general precautions observed in a welding shop. Precautions in electric and gas welding. (Before during and after welding). Welding Machines and Accessories. Description, method of operating CO2 welding. Method of operating Gas welding equipment: Types of Joints-Butt and fillet. Oxygen acetylene cutting-machine parts, uses, method of handling, cutting torch-description, parts, function and uses. Description of brazing process and its application. Metallurgical and metal working processes such as Heat treatment, various heat treatment methods -normalizing, annealing, hardening, case hardening and tempering.
11	Identification of major components of diesel engine and its accessories. Different types of Starting and Stopping Method of Diesel Engine.	Introduction to Engine: Description of internal & external combustion engines, Classification of IC engines, Principle& working of 2&4-stroke

		diesel engine (Compression ignition Engine (C.I)& sparking nition engine(S.I) ,differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification. General Description of Motor Vehicles
12	Basic electrical and electronics Identify and interpret electrical/electronic system concern. Practice on measuring circuit voltage, ampere and resistance. Practice on measuring voltage drop. Practice on installing crimp connector and terminal end. Practice on soldering wires. Practice on testing fuses and relays- test diodes	General principles of electrical engineering- structure of atoms- voltage- current- fuses- electrical conduction- current direction- types of current- voltage drop- resistance- PTC and NTC resistors- types of resistors- ohm's law-resistor circuits- Electromagnetism-electromagnetic induction- description of multi meter- function and types of relays- semiconductors- N type and P type semiconductors- description of diodes and transistors. Safety recautions to be observed while working with electrical equipment.
13	BATTERY Remove and connect battery terminal from a battery- clean terminals- check voltage of a battery- check cranking voltage- check charging voltage- top up distilled water up to the level- connecting two batteries in series- charging a battery – test battery- specific gravity test.	Purpose of battery- types- construction and Working principle of a lead acid battery-maintenance free batteries- battery ratings- battery charging methods- trouble shooting a battery.
	Internal Assessment/Examination 03days	

Marine Engine Fitter

BASIC TRAINING (Block – II)

Duration: (03) Three Months

Week No.	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
1	**General Shop Safety** First aid and fire safety use of fire extinguishers. Identify fuels, oils and chemicals used in the engines and accessories – handling of shop safety equipment –handling of safety devices – first aid – practice hazard waste disposal	Importance of safety and general precautions observed in the industry / shop floor. All necessary guidance to be provided to the new comers to become familiar with the working of Industry system stores procedures. Introduction of first aid, operation of electrical mains. Behavior based safety, unsafe act & situations
2	BASIC WELDING AND SHEET METAL Practice on heating, cutting using welding torch. Practice on making rectangular tray. Pipe bending fitting nipples unions in pipes soldering and brazing of pipes	Basis of gas welding, constructional and working principle of gas and acetylene welding equipment. Sheet metal operations shearing, bending drawing, squeezing. Sheet metal joints Fastening methods – riveting soldering brazing. Fluxes used on common joints sheet and wire gauges different types of pipe fittings.
3	FASTENERS AND BEARINGS Practice on general cleaning, checking and on loosening and tightening of various types of screwing joints using screwing tools, removal of broken stud / bolt from blind hole. Remove and replace bearings from the given jobs	Threads – thread categorization – types of threads – types of screwed joints – types of nuts – property classes of bolts- screw locking arrangements – types and description of screwing tools- description and types different types of bearings.
4-5	Practice on Checking engine oil, Draining engine oil replacing oil filter refilling engine oil, overhauling of oil pump, oil coolers, air cleaners and air filters and adjust oil pressure relief valves, repairs to oil flow pipe lines and unions if necessary	Explain lubrication system, functions of oil, Viscosity and its grade as per SAE, oil additives, synthetic oils,
6-7	Practice on start engine adjust idling	Explain different types Marine &

	Speed and damping device pneumatic governor and venture control unit checking performance of engine with offload adjusting timings start engine – adjusting Idle speed of the engine fitted with mechanical governor checking – high speed operation of the engine Checking performance for missing cylinder by isolating defective injectors and test dismantle and replace defective parts and reassemble and refit back to the engine	Stationary engine
8	SHAFTING AND PROPELLERS Transmission system – Transmits power from the engine to the propeller, Propeller Mounting Propeller and cone completing the arrangement.	Working principle of propeller Shaft & transmission of power Propeller maintenance
9-10	Removing starter motor from vehicle, and performance test for pull – in test, Hold – in test Pinion (Plunger) return test, No-Load performance test. Solenoid test for hold in coil open circuit, Armature test – Grounded test, open circuit test, pull-in coil open circuit test, field coil test. Inspections of brush length wear as per service manual. Trouble shooting, Possible causes and remedy for starter motor not running, starting motor running, but not cranking engine. Growler testing for rotors. Checking starting system, Jump – starting a vehicle	Explain starting system. Explain working of growler machine and its working
11-12	Checking a charging system for the cause of under charge, no charge, and over charge conditions. Removing &replacing an alternator, trouble shooting, possible causes and	Explain charging system. Explain Procedure of replacing alternator

	remedy for warning lamp does not glow when ignition switch is on warning lamp 'on' while the alternator is running, warning lamp glows 'dim' while the alternator is running, warning lamp flickers considerably.	
13	Identify and interpret electrical / electronic system concern. Practice on measuring circuit voltage, ampere and resistance. Practice on measuring voltage drop. Practice on installing crimp connector and terminal end. Practice on soldering wires practice on testing fuses and relays – test diodes	General principals of electrical engineering- structure of atoms – voltage – current –fuses – electrical conduction – current direction – types of current – voltage drop – resistance PTC and NTC resistors- types of resistors ohm's law resistor circuits – electro magnetism – electromagnetic induction – description of multi meter – function and types of relays semiconductors – N type and P type semi conductors description of diodes and transistors. Safety precautions to be observed while working with electrical equipment.
	Internal 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.*

9. SYLLABUS - CORE SKILLS

9.1 WORKSHOP CALCULATION SCIENCE & ENGINEERING DRAWING

Block– I

Topic No.	Engineering Drawing (30 Hrs)	Workshop Science & Calculation (20 Hrs)
1.	Engineering Drawing: Introduction and its importance Different types of standards used in engineering drawing. Drawing Instruments: their uses Drawing board, T-Square, Drafter (Drafting M/c), Set Squares, Protractor, Drawing Instrument Box (Compass, Dividers, Scale, Diagonal Scales etc.), Pencils of different Grades, Drawing pins / Clips.	**Units & Measurements-** FPS, CGS, MKS/SI unit, unit of length, Mass and time. Fundamentals and derived units Conversion of units and applied problems.
2.	**Lines :** types and applications in Drawing as per BIS SP:46-2003 Drawing geometrical object using all types of lines. **Drawing of Geometrical Figures:** Angle, Triangle, Square, Rectangle and Circle. **Letters: -** Lettering styles, Single stroke letters and numbers as per IS standard. Lettering practice	**Material Science** : properties -Physical & Mechanical, Types -Ferrous & Non-Ferrous, difference between Ferrous and Non-Ferrous metals
3.	**Dimensioning**- Types of dimension, elements of dimensions, Methods of indicating Values, Arrangement, Alignment and indication of dimensions. **Scales**:-Types use and construction. Representative factor of scale.	**Mass .Weight and Density** : Mass, Unit of Mass, Weight, difference between mass and weight, Density, unit of density,
4.	Method of presentation of Engineering Drawing - Pictorial View - Orthogonal View - Isometric view	**Speed and Velocity:** Rest and motion, speed, velocity, difference between speed and velocity, acceleration, retardation. Average Velocity, Acceleration & Retardation. Related problems. Circular Motion: Relation between circular motion and Linear motion, Centrifugal force, Centripetal force

5.	**Constructions: -** Draw proportionate free hand sketches of plane figures. Sketch horizontal, vertical and inclined line by free hand, Draw circles by free hand using square and radial line method, Draw arcs and ellipse by free hand	**Ratio & Proportion** : Simple calculation on related problems. **Percentage:** Introduction, Simple calculation.
6.	Projections: Concept of axes plane and quadrant. Orthographic projections Method of first angle and third angle projections (definition and difference) Symbol of 1st angle and 3rd angle projection as per IS specification. Free hand Drawing of Orthographic projection from isometric/3D view of geometrical blocks	**Work, Power and Energy:** work, unit of work, power, unit of power, Horse power of engines, mechanical efficiency, energy, use of energy, potential and kinetic energy, examples of potential energy and kinetic energy. Meaning of H.P., I.H.P., B.H.P., and F.H.P. and CC and Torque.

B. Block- II

Topic No.	a) Engineering Drawing (30Hrs)	b) Workshop Science & Calculation (20 Hrs)
1.	**Screw :-** Its Types and Sizes, Screw thread, their standard forms as per BIS, external and internal thread.	**Algebra:** Addition, Subtraction, Multiplication, Division, Algebraic formula, Linear equations (with two variables).
2.	**Rivets and Joints:-** Prepare a drawing sheet on rivets nomenclature and Joints.	**Heat & Temperature:** Heat and temperature, their units, difference between heat and temperature, boiling point, melting point, scale of temperature, relation between different scale of temperature, Thermometer, pyrometer, transmission of heat, conduction, convection, radiation.
3.	Free hand Sketches for simple pipe line with general fittings.	**Mensuration:** Area and perimeter of square, rectangle, parallelogram, triangle, circle, semi circle, Volume of solids - cube, cuboid, cylinder and Sphere. Surface area of solids -cube, cuboid, cylinder and Sphere. Volume of cut-out solids: hollow cylinders, frustum of cone, block section. Volume of simple solid blocks.
4.	Reading of drawing. Simple exercises related to missing lines, dimensions. How to make queries.	**Basic Electricity:** Introduction, use of electricity, how electricity is produced, Types of current_ AC, DC, their comparison, voltage, resistance, their units. Conductor, insulator, Types of connections - series, parallel, electric power, Horse power, energy, unit of electrical energy. Concept of earthling.
5.	Simple exercises related to trade related symbols. Basic electrical and electronic symbols	**Simple machines Transmission of power:** - Transmission of power by belt, pulleys & gear drive. **Heat treatment process: -** Heat treatment and advantages. Annealing, Normalizing, Hardening, Tempering.
6.	Free hand sketch of trade related components / parts /cutting tool indicating angles.	**Trigonometry:** Trigonometrical ratios, measurement of angles. Trigonometric tables. Finding the value of unknown sides and angles of a triangle by Trigonometrical method. Finding

		height and distance by trigonometry. Application of trigonometry in shop problems. (viz. taper angle calculation). Calculate the area of triangle by using trigonometry and application of Pythagoras theorem.
7.	Free hand sketch of trade related components / parts /cutting tool indicating angles.	**Concept of pressure** - **Definition**:-Force, Pressure, and their units, atmospheric pressure, gauges used for measuring pressure, problems. Introduction to pneumatics & hydraulics systems.
8.	**Simple exercises related to trade related Test Papers. Solution of NCVT test papers.**	

9.2 EMPLOYABILITY SKILLS

Topic No.	Topic	Duration (in hours)
	English Literacy	**7**
1.	**Reading** Reading and understanding simple sentences about self, work and environment	
2.	**Writing** Construction of simple sentences Writing simple English	
3.	**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. 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.	
	I.T. Literacy	**10**
1.	**Basics of Computer** Introduction, Computer and its applications, Hardware and peripherals, Switching on-Starting and shutting down of computer.	
2.	**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. Use of External memory like pen drive, CD, DVD etc,	
3.	**Computer Networking and INTERNET** 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.	
	Communication Skill	**18**
1.	**Introduction to Communication Skills** Communication and its importance Principles of Effective communication Types of communication - verbal, nonverbal, written, email, talking on phone.	

	Nonverbal communication - components-Para-language Body - language Barriers to communication and dealing with barriers.	
2.	**Listening Skills** Listening-hearing and listening, effective listening, barriers to effective listening guidelines for effective listening.	
3.	**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.	
4.	**Facing Interviews** Manners, Etiquettes, Dress code for an interview Do's & Don'ts for an interview	
	Entrepreneurship skill	**8**
1.	**Concept of Entrepreneurship** Entrepreneurship- Entrepreneurship - Enterprises:-Conceptual issue. Source of business ideas, Entrepreneurial opportunities, The process of setting up a business.	
2.	**Institutions Support** 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.	
	Productivity	
1.	**Productivity** Definition, Necessity.	
2.	**Affecting Factors** Skills, Working Aids, Automation, Environment, Motivation How improves or slows down.	
3.	**Personal Finance Management** Banking processes, Handling ATM, KYC registration, safe cash handling, Personal risk and Insurance.	
	Occupational Safety, Health & Environment Education	**6**
1.	**Safety & Health** Introduction to Occupational Safety and Health importance of safety and health at workplace.	

2.	**Occupational Hazards** Basic Hazards, Chemical Hazards, Vibro-acoustic Hazards, Mechanical Hazards, Electrical Hazards, Thermal Hazards. Occupational health, Occupational hygienic, Occupational Diseases/ Disorders & its prevention.	
3.	**Accident & safety** Basic principles for protective equipment. Accident Prevention techniques - control of accidents andsafety measures.	
4.	**First Aid** Care of injured & Sick at the workplaces, First-Aid & Transportation of sick person	
	Labour Welfare Legislation	
1.	**Welfare Acts** Benefits guaranteed under various acts- Factories Act, Apprenticeship Act, Employees State Insurance Act (ESI), Employees Provident Fund Act.	
	Quality Tools	**6**
1.	**Quality Consciousness :** Meaning of quality, Quality Characteristic	
2.	**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.	
3.	**House Keeping :** Purpose of Housekeeping, Practice of good Housekeeping.	
4.	**Quality Tools :** Basic quality tools with a few examples	

10. DETAILS OF COMPETENCIES (ON-JOB TRAINING)

BROAD LEARNING TO BE COVERED IN INDUSTRY FOR TURNER TRADE:

1. Safety and best practices /Basic Industrial Culture (5S, KAIZEN, etc.)
2. Record keeping and documentation
3. Making components observing different metal removing procedure and perform different fitting job.
4. Assembling of different components as per requirement and check functionality.
5. Carryout maintenance of different machines including hydraulics & pneumatics system.

Note: Actual training will depend on the existing facilities available in the establishments.

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

Block – I

1. Filing & fitting of mating components within an accuracy
2. Repair and maintenance of ordinary filters
3. Making of various sheet metal joints
4. Making of simple items using sheet metal bending and folding operations
5. Measurement of cylinder bore for taper and out-of-round,
6. Measurement of wear on crank shaft run out, and valve guide with dial Indicator.
7. Measurement of flatness of the cylinder head
8. Measurement of Cam height, Crankshaft Journal dia, Piston dia, Cylinder bore etc.
9. Performance testing of starter motor
10. Dismantle and assembly of Cylinder head, and other major parts of engine
11. Checking of flywheel and mounting flanges, spigot, bearing
12. Overhauling of cylinder head assembly, use of use of service manual for clearance and other parameters, practice on removing rocker arm assembly manifolds
13. Checking and Testing of Cooling System

Block – II

1. Fabricate simple items using sheet metal, welding, brazing and soldering techniques.
2. Dismantling and assembling of air compressor,.
3. Overhauling of injectors and testing of injector and servicing of Fuel Injector pumps.
4. Checking performance engine injectors. dismantle and replace defective parts and refit back to the engine
5. Over hauling of fuel pump, carburetors fuel filters and air cleaners repair to a car carburetors
6. Maintenance of Air conditioning systems

Marine Engine Fitter

7. Construction of hydraulic circuits using all frequently used valves like check valves flow control valve, pressure relief valve, directional control valves, hydraulic accumulator, etc.
8. Identify and interpret electrical / electronic system concern. Practice on measuring circuit voltage, ampere and resistance
9. Remove and replace super charger- dismantle and assemble super charger- dismantle & assemble turbo chargers
10. Dismantling and assembling of Transmission shafts and propellers
11. Dismantling and assembling of Boilers
12. Dismantling and assembling of Turbines
13. Erecting of overhauled Engines.

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 industry.

ANNEXURE – I

MARINE ENGINE FITTER			
LIST OF TOOLS AND EQUIPMENT for Basic Training (For 20 Apprentices)			
A. TRAINEES TOOL KIT			
Sl. no.	**Name of the Tool &Equipments**	**Specification**	**Quantity**
1.	Hammer Ball peen	0.75 Kg	21 Nos.
2.	Chisel cold flat	19 mm X 200 mm	21 Nos.
3.	Steel rule	15 cm (English and Metric)	21 Nos.
4.	Screw driver	15 cm	21 Nos.
5.	Screw driver	30 cm 9mm Blade	21 Nos.
6.	Screw driver	20 cm 9mm Blade	21 Nos.
7.	Spanner D.E.	set of 12 metric 8-32 mm	21 Nos.
8.	Pliers combination	15 cm	21 Nos.
9.	Centre Punch		21 Nos.
10.	Hand File Flat	200 mm (Second Cut)	21 Nos.
11.	Ring spanner	set of 12 metric 8-32 mm	21 Nos.
12.	Steel tool box with locks and keys		21 Nos.
13.	Safety goggles		21 Nos.
14.	Safety Helmets		21 Nos.
15.	Hand Gloves (Leather)		21 Nos.
B. GENERAL Machinery Shop Outfit (As per the table)			
16.	Rule Steel	30cm	2
17.	Dividers Spring	15 cm	2
18.	Prick Punch	15 cm	4
19.	Chisel cross cut	9x3 mm	4
20.	Hammer ball Peen	0.5 Kg	4
21.	Hammer copper	1 Kg with blade	2
22.	Engineer square	15 cm blade	4
23.	Scriber	15 cm	4
24.	Scriber block universal		1
25.	Marking out tables	90 cm x 60 cm x 90 cm (high)	1
26.	Surface plate	60 x 60 cm blade	1
27.	Angle Plate		1
28.	Hacksaw frame		4
29.	V - block	75 x 38 mm pair with clamps	2
30.	Punch hollow	set of 6	2 sets
31.	Number Punch	set 3mm	1 set
32.	Letter Punch	set 3 mm	1 set

33.	Hand vice	150 mm	2
34.	Screw driver	Electrician type 20cm size	2
35.	File, flat	35cm bustard	2
36.	File, flat	25 cm second cut	2
37.	File flat	20 cm smooth	2
38.	File flat safe edge	25 cm smooth	2
39.	File, triangular	15 cm second cut	2
40.	File, half round	40 cm second cut	2
41.	File round	30 cm, Second cut	2
42.	File square	20 cm second cut	2
43.	Screw Pitch Gauge (BSW,BSP,BSF and Metric)		1 Set Each
44.	Drill, Twist, metric	3mm to 12mm by 1mm parallel shank	1 set
45.	Taps and Dies complete set in box B.A., B.S.W. ,BSF		1 set
46.	H.S.S Hand reamer, adjustable	10.5 mm to 11.25 mm 11.25 mm to 12.75 mm 12.78mm to 14.25 mm and 14.25 to 15.75mm	1set
47.	Scraper, flat	25 cm handled	2
48.	Scraper half round	25cm	2
49.	Scraper triangular	25cm	2
50.	Micrometer outside	0 to 150mm	1 set
51.	Micrometer (Inside)	25mm to 150mm	1 set
52.	Vernier caliper set	25 or 20 cm inside outside Depth to read both inches and in mm	1
53.	Hammer planishing		2
54.	Setting hammer		2
55.	Mallet (Wooden)		2
56.	Double open ended ignition spanner of B.A.	0x 1 to 8x9 set of 5 Spanner, Clyburn 15cm	1 set
57.	Adjustable Spanner	6inch, 12inch &18 inches	1 each
58.	Box spanner	set up to 32 mm	1 set
59.	Spanners ring of set of 6 S.I.		1 set
60.	Spanner for sparking plug		1 set
61.	Pipe Ranches Stilson type	6,12, 18 inches	2 each
62.	Set of Allen Key	1 mm to 12 mm by 1mm	2 set
63.	Double open ended spanner American A/F	size from 7.5 mm x 99 mm to 19 mm x 20.5 mm set of 6	1
64.	Torque Wrench		2
65.	Drill Drift	10mm x 150mm	2

66.	Grease Gun		As required
67.	Oil Can	0.5 liter	As required
68.	Chain block	1 ton capacity	1
69.	Tray cleaning	45 x 30 cm	1
70.	Drilling machine pillar type capacity	upto 20mm dia with	1
71.	Motor		As required
72.	Valve Grinding Stick (consumable)		6
73.	Valve seat cutting tools complete with guide & pilot bar(all angle) in a box		1 set
74.	Extractor stud “ezy out” Type		1 set
75.	Compression gauge		1
76.	Oil Stone (consumable)		2
77.	Piston Ring Remover and compressing tool		1 set each
78.	Fire extinguisher CO_2, Mechanical Foam		1 each
79.	Fire buckets and stands		1
80.	Tachometer (counting type)		1
81.	Puller	set 6 inch & 12 inch	1 set
82.	Lifting jack mechanical	3 ton	2 Nos.
83.	Injection testing set (Hand operated)		1
84.	Injection cleaning kit		2 sets
85.	Tube Expander with cutter (for copper tubes)		1 Set
C. GENERAL Machinery			
86.	Bench Grinder	with two 17.5 cm wheels	1
87.	Arbor press hand operated	2 ton capacity	1
88.	Diesel engine cut away model two show working parts for		1
89.	demonstration	(One 2 stroke & one 4 stroke)	
90.	Diesel engine	4 stroke Multi cylinder 4/6 vehicular type	1
91.	Indian Make contemporary model		
92.	Petrol engine (Running condition, car type) Indian make		1
93.	Diesel engine (Running condition) Stationary type		1
94.	Petrol engine vertical	(2 stroke)	1

95.	Portable Hand Blower Electrically Operated		1
96.	Battery charger		1
97.	Hydrometer (consumable tool)		1
D.	**WORKSHOP FURNITURE**		
98.	Work bench	250x120x75 with four vices of 12.5 cm	4
99.	Locker with 8 drawers (standard size)		2
100.	Metal Rack	180x150x45cm	2
101.	Steel almirah / cupboard		1
102.	Black board and easel		1
103.	Instructor's Desk or table		1
104.	Chair		1

INFRASTRUCTURE FOR WORKSHOP CALCULATION & SCIENCE AND ENGINEERING DRAWING

TRADE: MARINE ENGINEE FITTER

LIST OF TOOLS& EQUIPMENTS FOR -20APPRENTICES

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		20+1 set
2.	Set square celluloid 45^o	250 X 1.5 mm	20+1 set
3.	Set square celluloid 30^o-60^o	250 X 1.5 mm	20+1 set
4.	Mini drafter		20+1 set
5.	Drawing board	700mm x500 mm IS: 1444	20+1 set
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	Workplace hygiene	Attendance/ Punctuality	Ability to follow Manuals/ Written instructions	Application of Knowledge	Skills to handle tools & equipment	Economical use of materials	Speed in doing work	Quality in workmanship	VIVA	**Total internal assessment Marks**	**Result (Y/N)**
Maximum Marks (Total 100 Marks)			**15**	**5**	**10**	**5**	**10**	**10**	**5**	**10**	**15**	**15**		
1														
2														