

Course Curricula

**Under
SKILL DEVELOPMENT INITIATIVE SCHEME (SDIS)**

**Based on
Modular Employable Skills (MES)**

**on
SHIP CONSTRUCTION SECTOR**

**Designed in
2011**

**Government of India
Ministry of Labour & Employment
Directorate General of Employment & Training**

List of members attended the Trade Committee Meeting to design the syllabus for the Sector of **“Ship Construction and Basic Design”** under Skill Development Initiative Scheme (SDIS) based on MES held on **9th November’2011** at Central Staff Training & Research Institute (CSTARI).

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1.	Shri S. J. Amalan, Director	CSTARI, Salt Lake, Kolkata	Chairman
2.	Shri Sougata Saha, Director	Comtel Electronics (P) Ltd.	Member
3.	Shri S. N. Das, Director	Fidere Marine Services Pvt. Ltd.	Member
4.	Shri A. K. Pal, DGM (TTC)	G R S E Ltd. Kolkata	Member
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9.	Shri Tapas Kr. Ghosh, Supdt.	Kolkata Port Trust	Member
10.	Dr. Madhujyoti Mukherjee, Professor (Retd.)	IIT, Kharagpur, Dept. of Naval Architecture	Member
11.	Dr. N.R.Mondal, Professor	IIT, Kharagpur, Dept. of Naval Architecture	Member
12.	Shri Pradip Kr. Biswas, Ex- Director	Inland Water Transport Directorate, Govt. of West Bengal	Member
13.	Shri P. K. Dutta, ADT	CSTARI, Salt Lake, Kolkata	Member
14.	Shri B. Halder, ADT	D. I. T. Govt. of West Bengal	Member
15.	Shri P. K. Mondal, ADT	A T I, Kolkata, (Howrah)	Member
16.	Shri S. B. Sardar, ADT	CSTARI, Salt Lake, Kolkata	Member
17.	Shri Nirmalya Nath, ADT	CSTARI, Salt Lake, Kolkata	Member
18.	Shri R. N. Manna, Trg. Officer	CSTARI, Salt Lake, Kolkata	Member
19.	Shri Gopal Pradhan, Technician	K.K.S. Techno Services	Member
20.	Shri S. K. Nag, Technician	B. K. Engg. Works, Howrah	Member
21.	Shri P. Biswas, D/Man	CSTARI, Salt Lake, Kolkata	Member
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C O N T E N T S

1. List of members of Trade Committee	2
2. Background	4
3. Frame Work for Skill Development based on MES.....	4
4. Introduction.....	5
5. Age of Participants	6
6. Curriculum Development Process	6
7. Development of Soft Skills/ Core Competencies	6
8. Duration of the Programmes	7
9. Pathways to acquire Qualification.....	7
10. Methodology	7
11. Instructional Media Packages.....	8
12. Assessment	8
13. Certificate	8
14. Course Matrix	9
15. Level – I – Module – I. Junior Shipwright Assistant	10 to 11
16. Level – II – Module – I .. Junior Shipwright	12 to 13
17. Level – III – Module – I .. Assistant Shipwright	14 to 16
18. Level – IV – Module – I .. Shipwright	17 to 19

Skill Development based on Modular Employable Skills (MES)

Background

The need for giving emphasis on the Skill Development, especially for the less educated, poor and out of school youth has been highlighted in various forums. The skill level and educational attainment of the work force determines the productivity, income levels as well as the adaptability of the working class in changing environment. Large percentage of population in India is living below poverty line. One of the important causes is lower percentage of skilled persons in the workforce

The skill development at present is taking place mostly in the informal way, i.e. persons acquire skill at the work-place when they help their parents, relatives and employers etc. Such persons do not have a formal certificate and thus earn lower wages and are exploited by employers. They have come through informal system due to socio-economic circumstances of the family and the compulsions of earning a livelihood rather than attending a formal course. While their productivity is low, their contribution to the national GDP cannot be ignored. If the country can create a system of certification which not only recognizes their skills but also provides education and training in a mode that suits their economic compulsions, it will not only benefit the workforce to earn a decent living but also contribute to the national economy by better productivity of this workforce.

Another related problem to be tackled is large number of students drop outs (About 63% of the school students drop out at different stages before reaching Class-X).

Frame work for Skill Development based on 'Modular Employable Skills (MES)'

Very few opportunities for skill development are available for the above referred groups (out of school youth & existing workers especially in the informal sector). Most of the existing Skill Development programmes are long term in nature. Poor and less educated persons can not afford long term training programmes due to higher entry qualifications, opportunity cost etc. Therefore, a new frame work for Skill Development for the Informal Sector has been evolved by the DGET to address to the above mentioned problems. The **key features of the new frame work for skill development** are:

- Demand driven Short term training courses based on modular employable skills decided in consultation with Industry
- Flexible delivery mechanism (part time, weekends, full time)
- Different levels of programmes (Foundation level as well as skill up gradation) to meet demands of various target groups
- Central Government will facilitate and promote training while Vocational Training (VT) Providers under the Govt. and Private Sector will provide training
- Optimum utilization of existing infrastructure to make training cost effective.
- Testing of skills of trainees by independent assessing bodies who would not be involved in conduct of the training programme, to ensure that it is done impartially.
- Testing & certification of prior learning (skills of persons acquired informally) The Short Term courses would be based on 'Modular Employable Skills (MES)'.

The **concept for the MES** is :

- Identification of 'minimum skills set' which is sufficient to get an employment in the labour market.
- It allows skills up-gradation, multi-skilling, multi entry and exit, vertical mobility and life long learning opportunities in a flexible manner.
- It also allows recognition of prior learning (certification of skills acquired informally) effectively.
- The modules in a sector when grouped together could lead to a qualification equivalent to National Trade Certificate or higher.
- Courses could be available from level 1 to level 3 in different vocations depending upon the need of the employer organisations

MES would benefit different target groups like :

- *Workers seeking certification of their skills acquired informally*
- *workers seeking skill upgradation*
- *early school drop-outs and unemployed*
- *previously child labour and their family*

INTRODUCTION

Economic growth in India is increasingly supported by robust industrial growth. Ship construction sector is one of the relatively lesser known but significant sectors that support almost all industrial activity. However, notwithstanding its importance and size (INR 4 trillion), it has traditionally not been accorded the attention it deserves as a separate sector in itself. The level of inefficiency in Ship construction Sector activities in the country has been very high across all modes.

The required pace of efficiency and quality improvement will demand rapid development of capabilities of Ship construction Sector service providers. And with Ship construction Sector being a service oriented sector, skill development will emerge as a key capability.

This lack of focus on developing manpower and skills for the Ship construction Sector has resulted in a significant gap in the numbers and quality of manpower in the sector.

This gap, unless addressed urgently, is likely to be a key impediment in the growth of the Ship construction Sector in India and in consequence, could impact growth in industry and manufacturing sectors as well.

This underscores the need identifying areas where such manpower and skill gaps are critical, and developing focused action plans to improve the situation.

A look at the required initiatives for manpower development in the above sector makes it clear that sustainable development of the sector's manpower requires a collaborative public private effort. The level of commitment demonstrated by each stakeholder would largely determine the direction that the sector heads towards.

Age of participants

The minimum age limit for persons to take part in the scheme is 14 years but there is no upper age limit.

Curriculum Development Process

The following procedure is used for developing course curricula

- Identification of Employable Skills set in a sector based on division of work in the labour market.
- Development of training modules corresponding to skills set identified so as to provide training for specific & fit for purpose
- Organization of modules in to a Course Matrix indicating vertical and horizontal mobility. The course matrix depicts pictorially relation among various modules, pre requisites for higher level modules and how one can progress from one level to another.
- Development of detailed curriculum and vetting by a trade committee and by the NCVT (Close involvement of Employers Organizations, State Governments, experts, vocational training providers and other stake holders is ensured at each stage).

Development of Soft Skills/ Core Competencies

Soft skills refer to a cluster of personality traits, social graces, facility with language, and personal habits that make someone a good employee and a compatible co-worker. Soft skills are also sometimes referred to as employability skills, generic skills, key or core competencies. Soft skills complement hard skills, which are the technical requirements of a job.

Soft Skills are integral to workplace competency and, as such, must be considered in the design, customization, delivery and assessment of vocational training programmes in an integrated and holistic way, as represented diagrammatically below. Soft skills are very important in business. Soft skills are now recognized as key for making businesses more profitable and better places to work. Increasingly, companies aren't just assessing their current staff and future recruits on their technical skills but also on a whole host of soft skills. Especially, Service economy and the ascendance of work teams in large organizations put a new premium on people skills and relationship- building. It is essential to be technically sound, but one should also have the ability to convey the idea to the masses in the simplest possible manner. Hence, systematic efforts should be made to develop soft skills during the training programme. Positive attitudes have to be developed in the trainees by properly guiding them and setting up examples of good attitudes by demonstrated behaviors and by the environment provided during training. Some important **soft skills / core competencies** to be developed are:

1. Punctuality, discipline and honesty
2. Cordial relationship and Cooperation with co-workers and team Work
3. Positive attitude and behavior
4. Work ethics and dependability
5. Self esteem and confidence
6. Self-motivation and initiative
7. Flexibility/ adaptability
8. Communication Skills
9. Respect for rules and regulations

10. Concern for quality
11. Concern for health and hygiene
12. Responsibility and accountability
13. Care of equipment and tools
14. Safety consciousness and safe working practices
15. Learn continuously
16. Concern for environment and waste disposal
17. Ability to bear stress and work under pressure.

Following competencies should also be developed during level-II and higher courses:

1. Ability for planning, organizing and coordinating
2. Creative thinking, problem solving and decision making
3. Leadership, delegating, appraising, motivating
4. Negotiation
5. Time management ability

In addition to above, **livelihood skills** like how to apply for a job, facing an interview, opening/ operating an bank account may also be covered.

Duration of the Programmes

Time taken to gain the qualification will vary according to the pathway taken and will be kept very flexible for persons with different backgrounds and experience. Duration has been prescribed in hours in the curriculum of individual module, which are based on the content and requirements of a MES Module. However, some persons may take more time than the prescribed time. They should be provided reasonable time to complete the course.

Pathways to acquire Qualification:

Access to the qualification could be through:

- An approved training programme;
- Or**
- A combination of an approved training programme plus recognition of prior learning including credit transfer;
- Or**
- The recognition of prior learning that provides evidence of the achievement of the competencies for the qualification.

Methodology

The training methods to be used should be appropriate to the development of competencies. The focus of the programme is on “performing” and not on “Knowing”. Lecturing will be restricted to the minimum necessary and emphasis to be given for ‘hands on training’.

The training methods will be individual centered to make each person a competent one. Opportunities for individual work will be provided. The learning process will be

continuously monitored and feedback will be provided on individual basis. Demonstrations using different models, audio visual aids and equipment will be used intensively.

Instructional Media Packages

In order to maintain quality of training uniformly all over the country, instructional media packages (IMPs) will be developed by the National Instructional Media Institute (NIMI), Chennai.

Assessment

DGE&T will appoint assessing bodies to assess the competencies of the trained persons. The assessing body will be an independent agency, which will not be involved in conducting the training programmes. This, in turn, will ensure quality of training and credibility of the scheme. Keeping in view the target of providing training/testing of one million persons through out the country and to avoid monopoly, more than one assessing bodies will be appointed for a sector or an area.

Certificate

Successful persons will be awarded certificates issued by National Council for Vocational Training (NCVT).

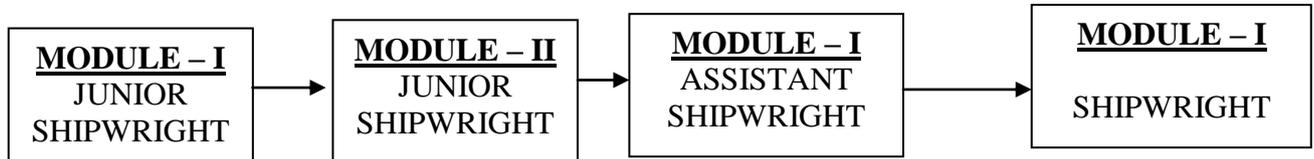
COURSE MATRIX IN SHIP CONSTRUCTION

Level- I

Level- II

Level- III

Level- IV



**LEVEL- I
MODULE-I**

1. Name of Module : **Junior Shipwright Assistant**
 2. Sector : Ship Construction
 3. Code : SPC – 101
 4. Entry qualification : 8th standard and above 14 years
 5. Terminal competency : After completion of this course the participants would acquire elementary knowledge of ships & vessels & function of,
 A) Junior Shipwright
 B) Naval Fitter, Marker & Welder
6. Duration : 600 hours
7. Qualification for Instructors:- Diploma in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Eight years.

OR

Degree in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Five years.

Course contents

Sl. No.	Practical Competencies	Sl. No.	Underpinning knowledge (Theory)
1.	<u>SHIP THEORY (FAMILIARIZATION)</u> Technical information of ship like port, starboard, forward aft-double bottom tanks, load line etc.	1.	Acquaintance with steel structure: Joist, Angle, Beam etc.
2.	<u>TYPES OF SHIPS (FAMILIARIZATION)</u> Passenger, cargo, container, oil tanker, OBO (oil, bulk, ore) reefer cargo, car carrier etc	2.	Auto CAD tools Learning.
3.	<u>MAJOR EQUIPMENTS OF SHIP (FAMILIARIZATION)</u> Main Engine, Gear Box, Auxiliary Engine, Rudder and steering arrangement, Shaft, Propeller and main engine foundation.	3.	Strength of materials: simple stress & strain. Shear Force & Bending Moment.
4.	<u>DECK MACHINERIES (FAMILIARIZATION)</u>	4.	Basic Ship Theory Introduction to ships, terminologies,

	Bilge Pump, Fuel Oil Transfer Pump, Anchor windlass, Anchor, Anchor Chain, Chain Stoppers, Chain Lockers, Boat Lifting Davit, Winches, Mooring Ropes.		principle of floatation, area, volume moment, Speed, Knot, launching, Docking, Grounding, Lofting,
5.	<u>NAVIGATION SYSTEM (FAMILIARIZATION)</u> Navigation Lights, Search Light, Communication equipments, Compass, Radio, Rudder Indicator, Alarm Bell, Call Bell, Fog Horn, Public Address System, VHF, Radar	5.	General Knowledge in Safety, Pollution Control, Personal Safety, Waste Management.
6.	<u>RIGGING ARRANGEMENT:</u> Sling, Chain, D-Circle, Mooring Ropes, Knots, Safety Precautions	6.	GLOSSARY OF TERMS
7.	<u>SAFETY ITEMS:</u> LSA, FFA, Heavy duty Gloves, Apron	7.	Knowledge of different organizations such as Classification Society, Registering Authority, ILO, IMO, BIS etc and their activities

Tools required:

Equipment for batch of 20 trainees

1. One Desk Top Computer between two candidates.
2. Practice drawing sheets (as on required basis).
3. Planning sheets and other documents (as on required basis).
4. Calculators – one per trainee.
5. Electric tester
6. Wire brush
7. Gloves

Scope of job of the passed out candidates:

The candidates may be engaged at following domain after certification:

1. Ship yards & allied industry
2. Ship owner
3. Port
4. Consulting firms.

**LEVEL- II
MODULE-I**

1. Name of Module : **Junior Shipwright**
 2. Sector : Ship Construction
 3. Code : SPC – 202
 4. Entry qualification : 8th + SPC101
 5. Terminal competency : After completion of this course the participants would acquire elementary knowledge of ships & vessels & function of :
 A) Shipwright
 B) Naval Fitter, Marker & Welder
6. Duration : 600 hours
7. Qualification for Instructors:- Diploma in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Eight years.

OR

Degree in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Five years.

Course contents

Sl. No.	Practical Competencies	Sl. No.	Underpinning knowledge (Theory)
1.	<u>TYPES OF SHIPS</u> Passenger, cargo, container, oil tanker, OBO (oil, bulk, ore) reefer cargo, car carrier etc	1.	Basic Ship Theory – I Introduction to ships, terminologies, principle of floatation, area, volume moment.
2.	Geometrical & Technical Drawing	2.	Auto CAD tools Learning.
3.	Projection: Orthographic projection of 1 st and 3 rd angle., Isometric views & Isometric Projection, Lofting/ Ship Lines	3.	Strength of materials: simple stress & strain. Young’s modulus. Welding Technology. Mechanical properties of metal.
4.	Ship design laboratory I: Application of Autocad in ship drawing, general arrangement plan, lines plan and bonjean and hydrostatic curves.	4.	Applied mechanics, C.G. & moment of inertia, Friction, Viscosity, Study of Steel Table & terminology of Steel Table, Hydrofoil section, integration rules, small angle stability, hydrostatics, large angle stability, capacity plan, launching, damage stability

5.	Ship design laboratory II: Hydrostatic calculation, intact stability & cross curves.	5.	Basic Ship Theory – II Beam theory, Loads acting on ship, ship structural arrangement, midship sections
6.	Ship design laboratory III: Rudder and steering arrangement, shafting and main engine foundation, Deck machineries, Cargo Handling Gears, doors, hatches, Scuttles, Port holes, Ship side valves etc.	6.	Rudder and steering arrangement, shafting and main engine foundation, Deck machineries, Cargo Handling Gears, doors, hatches, Scuttles, etc.
7.	Material testing: Ultrasonography, X-ray, Dye Penetration etc	7.	Diff types of Tests on material

Tools required:

Equipment for batch of 20 trainees

1. One Desk Top Computer between two candidates.
2. Practice drawing sheets (as on required basis).
3. Planning sheets and other documents (as on required basis).
4. Calculators – one per trainee.
5. Tie-up with Industry for practical training.

Scope of job of the passed out candidates:

The candidates may be engaged at following domain after certification:

1. Ship yards & allied industry
2. Ship owner
3. Port
4. Consulting firms.

**LEVEL- III
MODULE-I**

1. Name of Module : **Asst. Shipwright**
 2. Sector : Ship Construction
 3. Code : SPC-303
 4. Entry qualification : 8th + SPC 202
 5. Terminal competency : After completion of this course the participants would acquire elementary knowledge of ships & vessels & function of :-
 A) Jr. Naval Architect / Shipwright
 B) Naval Fitter, Marker & Welder
 6. Duration : 720 hours
 7. Qualification for Instructors :- Diploma in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Eight years.

OR

Degree in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Five years.

Course contents

Sl. No.	Practical Competencies	Sl. No.	Underpinning knowledge (Theory)
1.	Shipyard facilities: various shops and production facilities, and their layout. Explain the principles workshop layout.	1.	<p>Practical ship construction</p> <p><input type="checkbox"/> Lofting, prefabrication, construction on skid, erection, building berth, keel sighting, alignment, launching preparation and procedure.</p> <p><input type="checkbox"/> Machinery installation, shaft alignment, engine girder, ‘A’ bracket installation, other equipment foundation.</p> <p>Familiarization with thrush block,</p> <p><input type="checkbox"/> Familiarization with various aspect of ship repair.</p>

2.	Constructional drawings / Lofting	2.	<p>Resistance, powering, propulsion</p> <p><input type="checkbox"/> Type of Resistances, model testing, wake and thrust, methods of propulsions, hull efficiency.</p> <p>Noise and cavitations, corrosion including cathodic protection, marine growth & its effects.</p>
3.	Check measurements of components/machined/parts/structures and piping, manholes, ventilation & various enclosed spaces, compatibility of power & engine alignment, knowledge of weight & space management	3.	<p>Elementary ship design</p> <p><input type="checkbox"/> Qualitative requirement, preliminary studies, principal dimensions, displacement, deadweight, compatibility of power, engine alignment, weight and space consideration, classification / statutory drawings and construction drawings, tests and trials.</p>
4.	Preparation of displacement sheet and hydrostatic, Preparation of Tonnage booklet, Preparation of stability booklet, Damage stability assessment and Preparation of damage stability booklet, Hydrostatic curves of stability and Cross curves, Wind heeling curves / effect.	4.	<p>Marine engineering and machinery/system layout</p> <p><input type="checkbox"/> Prime movers, compressors, deck machinery, steering gear, stern tube sealing, parts of stern gear, ship systems – fuel, L.O., sea and fresh water, bilge, ballast, FFA, LSA & LSS, ventilation, air conditioning and refrigeration.</p> <p><input type="checkbox"/> Electrical system, generators, emergency generators, navigation aids, details of machineries of E. Room,</p>
5.	Ship design laboratory IV: Hull form design, space allocation, preliminary structural design of ship using rule book. Scantling calculation, Mid-ship section, longitudinal construction & shell expansion drawings. Capacity plan, docking plan.	5.	<p>Knowledge of Preparation of displacement sheet and hydrostatic, Preparation of Tonnage booklet, Preparation of stability booklet, Damage stability assessment and Preparation of damage stability booklet, Hydrostatic curves of stability and Cross curves, Wind heeling curves / effect.</p>

6.	Mid-ship section, Longitudinal construction, shell – expansion drawing	6.	Basic Industrial engineering <input type="checkbox"/> Plant layout, material handling, inventory control of spares & consumables. <input type="checkbox"/> Project implementation, work measurement, forecasting, routing and scheduling, CPM and PERT, ergonomics and value engineering.
7.	Docking plan & laying Blocks, slipway, Docking & undocking, preparation for hauling in and hauling out.	7.	Knowledge of Docking plan & laying of Block, Slipway, Docking & Undocking, Preparation for hauling in & hauling out.

Tools required:

Equipment for batch of 25 trainees

1. One Desk Top Computer between two candidates.
2. Practice drawing sheets (as on required basis).
3. Planning sheets and other documents (as on required basis).
4. Calculators – one per trainee.
5. Mig / Tig Welding Rectifier
6. Tie-up with Industry for practical training

Scope of job of the passed out candidates:

The candidates may be engaged at following domain after certification:

1. Ship yards & allied industry
2. Ship owner
3. Port
4. Consulting firms.

**LEVEL- IV
MODULE-I**

1. Name of Module : **Shipwright**
 2. Sector : Ship Construction
 3. Code : SPC - 404
 4. Entry qualification : 8th + SPC 303
5. Terminal competency : After completion of this course the participants would acquire elementary knowledge of ships & vessels & function of :-
 A) Naval Architect/ Marine Engineers
 B) Shipyards, Ship Builders and hand over / take-over of ship/ Vessels and acquaintance with:
 • Statutory regulatory rule and regulation by classification society and Govt. Statutory body i.e. MMD, IWT
6. Duration : 600 hours
7. Qualification for Instructors :- Diploma in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Eight years.

OR

Degree in Mechanical Engg./ Marine Engg. / Naval Architecture with marine experience in shipyards/ workshops / ships for a period of not less than Five years.

Course contents

Sl. No.	Practical Competencies	Sl. No.	Underpinning knowledge (Theory)
1.	Inclining experiment.	1.	Acquaintance with Rules and regulation of various classification society and statutory body. MARPOL, SOLAS, including IMO/ ILO conventions
2.	Sea trials: Preliminary sea trial contractors sea trials Speed test Endurance test Maneuvering test Crash stop astern and ahead test Astern test The turning circle to port and stbd at max. RPM and corresponding tactical diameter shall be	2.	Knowledge of practical aspects of Sea Trial: Speed test Endurance test Maneuvering test Crash stop astern and ahead test Astern test The turning circle to port and stbd at max. RPM and corresponding tactical diameter shall be work out.

	<p>work out.</p> <p>Other test: Anchor windlass test Test of adjustment of navigational equipment and instruments. Starting test of main engines. Fire fighting trials. Air conditioning and ventilation trials. Refrigeration trials.</p> <p><u>In absence of the above facilities, the whole syllabus to be completed in the classroom through simulation.</u></p>		<p>Other test: Anchor windlass test Test of adjustment of navigational equipment and instruments. Starting test of main engines. Fire fighting trials. Air conditioning and ventilation trials. Refrigeration trials.</p>
3.	Operation and maintenance and reporting thereof operation, troubleshooting and maintenance of marine engines and others equipments.	3.	Basic knowledge of: Operation and maintenance and reporting thereof operation, troubleshooting and maintenance of marine engines and others equipments.
4.	Laws of comparison of resistance & remedial measures	4.	Ship strength to meet the loading conditions as stipulated
5.	Marking of Load line and draft marks	5.	Knowledge of Laws of comparison of resistance & remedial measures
6.	Implement of Carving & Marking notes on ship as per statutory authority	6.	Knowledge of Load Line assignment
7.	Preparation of Delivery Protocols and related documents such as sea trial report, sets of drawings, inventory w.r.t. spares & consumables, precision tools and their calibration records etc	7.	Knowledge of Carving & Marking notes
8.	Preparation of delivery Protocols to be followed on board ship – such as location of spares, tools, precision measuring items & gauges, various tanks & its contents, reception facilities for different grades of oil/fuel.	8.	Knowledge of Preparation of Delivery Protocols and related documents

Tools required:

Equipment for batch of 25 trainees

1. One Desk Top Computer between two candidates.
2. Practice drawing sheets (as on required basis).
3. Planning sheets and other documents (as on required basis).
4. Calculators – one per trainee.
5. IRS/ LRS/ship registration rule books with updated version
6. Tie-up with Industry/Shipping company for practical training.

Scope of job of the passed out candidates:

The candidates may be engaged at following domain after certification:

1. Ship yards & allied industry
2. Ship owner
3. Port
4. Consulting firms.