

Syllabus for the trade
of

VESSEL NAVIGATOR

(SEMESTER PATTERN)

UNDER
CRAFTSMEN TRAINING SCHEME

Designed in: 2013

By

Government of India
Central Staff Training and Research Institute
Directorate General of Employment & Training
Ministry of Labour & Employment
EN -81, Sector-V, Salt Lake City,
Kolkata-700091

List of Members of trade committee meeting for the trade of **VESSEL NAVIGATOR**
held on 18-10-2011,at Advanced Training Institute, Chennai.

Sl. No.	Name & Designation	Representing Organization	Remarks
1	Shri A. Mahendiran , Director	ATI, Chennai -32	Chairman
2	Shri R.C.Sinha , Director	CIFNET-Kochi	Member
3	Shri S.Harinath Babu, Joint Director of Training	ATI, Chennai -32	Member
4	Shri M.Rajavel, Senior Instructor (Training)	CIFNET-Kochi	Member
5	Shri K.C.Udyaprakash, Senior Instructor(Fishing	CIFNET-Kochi	Member
6	Shri. Makwana, Chief Instructor (Marine Engg)	CIFNET-Kochi	Member
7	Dr.Jomon Joseph, Chief Instructor (Fishing Technology)	CIFNET-Kochi	Member
8	Shri Mariapparaj .P	NATRIP, Global Automotive Research centre, kancheepuram. Tamilnadu-602105	Member
9	Shri Dr.K.Annamali HOD	Dept Auto Engg, M.I.T, Anna University, Chennai.	Member
10	Shri S.Arul Selvan, Assistant professor	Dept Auto Engg, M.I.T, Anna University, Chennai.	Member
11	Shri K.Srinivasa Rao , Deputy Director of Training	ATI, Chennai-32	Member
12	C.Yuvaraj, Assistant Director of Training	ATI, Chennai-32	Member
13	Shri P. Marveldass, Assistant Director of Training	ATI, Chennai-32	Member
14	Shri N.P. Banni Bagi, Training Officer	ATI, Chennai-32	Member
15	Shri R. Rajesh Kanna Training Officer	ATI, Chennai-32	Member

List of members attended the Workshop to finalize the syllabi of existing CTS into Semester Pattern held from 6th to 10th May'2013 at CSTARI, Kolkata.

Sl. No.	Name & Designation	Organisation	Remarks
1.	R.N. Bandyopadhyaya, Director	CSTARI, Kolkata-91	Chairman
2.	K. L. Kuli, Joint Director of Training	CSTARI, Kolkata-91	Member
3.	K. Srinivasa Rao, Joint Director of Training	CSTARI, Kolkata-91	Member
4.	L.K. Mukherjee, Deputy Director of Training	CSTARI, Kolkata-91	Member
5.	Ashoke Rarhi, Deputy Director of Training	ATI-EPI, Dehradun	Member
6.	N. Nath, Assistant Director of Training	CSTARI, Kolkata-91	Member
7.	S. Srinivasu, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
8.	Sharanappa, Assistant Director of Training	ATI-EPI, Hyderabad-13	Member
9.	Ramakrishne Gowda, Assistant Director of Training	FTI, Bangalore	Member
10.	Goutam Das Modak, Assistant Director of Trg./Principal	RVTI, Kolkata-91	Member
11.	Venketesh. Ch. , Principal	Govt. ITI, Dollygunj, Andaman & Nicobar Island	Member
12.	A.K. Ghate, Training Officer	ATI, Mumbai	Member
13.	V.B. Zumbre, Training Officer	ATI, Mumbai	Member
14.	P.M. Radhakrishna pillai, Training Officer	CTI, Chennai-32	Member
15.	A.Jayaraman, Training officer	CTI Chennai-32,	Member
16.	S. Bandyopadhyay, Training Officer	ATI, Kanpur	Member
17.	Suriya Kumari .K , Training Officer	RVTI, Kolkata-91	Member
18.	R.K. Bhattacharyya, Training Officer	RVTI, Trivandrum	Member
19.	Vijay Kumar, Training Officer	ATI, Ludhiana	Member
20.	Anil Kumar, Training Officer	ATI, Ludhiana	Member
21.	Sunil M.K. Training Officer	ATI, Kolkata	Member
22.	Devender, Training Officer	ATI, Kolkata	Member
23.	R. N. Manna, Training Officer	CSTARI, Kolkata-91	Member
24.	Mrs. S. Das, Training Officer	CSTARI, Kolkata-91	Member
25.	Jyoti Balwani, Training Officer	RVTI, Kolkata-91	Member
26.	Pragna H. Ravat, Training Officer	RVTI, Kolkata-91	Member
27.	Sarbojit Neogi, Vocational Instructor	RVTI, Kolkata-91	Member
28.	Nilotpal Saha, Vocational Instructor	I.T.I., Berhampore, Murshidabad, (W.B.)	Member
29.	Vijay Kumar, Data Entry Operator	RVTI, Kolkata-91	Member

GENERAL INFORMATION

1. Name of the Trade : **Vessel Navigator**
2. NCO Code No. :
3. Duration : 2 Years (Four Semesters)
4. Power Norms : 20 Kw
5. Space Norms : 15 Sq Meter / Trainee
6. Entry qualification : Passed 10th class examination under 10+2 system of education with Science and Mathematics or its equivalent.
7. Unit Size : 16 (No. of Trainees)
8. Instructor's/ Trainer's Qualification: a) Tenth Class Passed + NTC + NAC
: b) Preference will be given to a candidate
With Craft Instructor Certificate

Note : At Least One Instructor must have Degree/Diploma in Marine/Mechanical Engg

**Syllabus for the Trade of
“VESSEL NAVIGATOR” under C.T.S.
(Semester Code No.VEN-01)**

SEMESTER - I

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop calculation and science
1	Practical Navigation	Seamanship, Safety And Watch Keeping introduction to the trade: Familiarisation with institute, Job opportunities in the Marine sector, Machinery used in Trade. Types of work done by the students in the shop floor	CHART WORK Concept of standard & standardization	Fishing Gear Materials, Accessories And Design
2	Practical related to Safety and Health , Demonstration on PPE (Personal Protection Equipments) Demo on First aid and Fire safety, Use of fire extinguishers.	Occupational Safety & Health Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. emergency evacuation procedure, Safe handling of Fuel Spillage, Use of Fire extinguishers, safe disposal of toxic dust, safe handling and Periodic testing of lifting equipment, Authorization of Moving & road	Preparation of charts, various types of charts, description of charts, nautical publications Given variation and deviation of the magnetic compass or gyro error, to convert true courses into compass courses and vice versa. To extract the deviation from sample tube of deviations, hence to convert true courses into magnetic and compass courses.	Different type of fishing boats, general description (10 hrs.) Indigenous type, mechanised boats, modern type of fishing vessels.

		testing vehicles, Environment control of Running indoors engines, Study of Material safety data sheet (MSDS), Safety disposal of Used engine oil, Electrical safety practices. House Keeping – 5S Concept.	To find the compass course between two positions. The use of a single position line in approaching the coast. Reliability of charts	
3	The shape of the earth. Poles, equator, meridians, Parallel of latitude. Position by latitude and longitude. Bearing distance, units of measurement. Difference of latitude difference of longitude, departure, mean and middle latitude, difference of meridional parts and the relationship between them. Use of position lines with or without run. Celestial sphere, Declination, Azimuth, sidereal hour angle, Ediptic, First point of aries, Greenwich and other standard time, apparent time, sidereal time, Equation of time, Relationship between longitude and time. (30 hrs) To prepare neat diagrams for each definitions and make a record book. (30 hrs) T use an azimuth mirror, pelorus (bearing plate) or other instrument for taking bearing (2hrs)	General parts of ship, construction (9 hrs) Definition of main dimensions. The names of the principal parts of a vessel Mid ship section of a vessel, Framing, Beam, Maintaining water tight integrity, Freeing ports, Rudders, steering gear, shell and deck plating, bilge keel, double bottoms, sounding pipes, air pipes, stiffening and strengthening to resist painting, pounding and longitudinal stresses. <u>Practice:-</u> Class room practicals Preparing the drawing Other types of vessels in merchant service (6 hrs)	-do- <u>Practice:</u> To convert compass course to true course and vice-versa. To plot a course between given positions and to measure the distance between them. 6hrs.	Introduction to fishing gear materials (5 hrs) General outline about fishing gear and utilization of fishing gear materials. Classification of fishing gear materials (5 hrs) Natural and synthetic fibres - Origin, sources, extraction and processing details etc. Fishing methods (15 hrs) Important indigenous methods, Beach and shore seines, bag nets, set net and line fishing.
4-7	FISHING GEAR TECHNOLOGY	Fundamentals (5hrs)	-do-	BASIC MATHEMATICS

	<p>PRACTICAL-I AND VIVA VOCE</p> <p>ONBOARD TRAINING-NAVIGATIONAL ASPECTS AND FISHERIES INCLUDING SEAMANSHIP & NAVIGATION AND VIVA VOCE</p> <p>To use a sextant for taking vertical and horizontal angles, to read a sextant both on and off the arc, to correct a sextant into which has been introduced one of more errors of perpendicularity, side or index: to find the index error of a sextant (2hrs)</p>	<p>Basics of Physics - Heat engines - Terminology of I.C. engines - Classifications of I.C. engines Standard marine phrases Terms and meanings (30 hrs) Block co-efficient, Displacement and Dead weight Laws of floating today. Use of displacement and tones per centimetres impression scales to determine weights of cargo or ballast from draught or freeboard. Effect of density of water on draught and freeboard Fresh water allowance. The meaning of the terms Buoyancy and Reserve buoyancy. Centre of gravity, centre of buoyancy. Metacentric height, Righting lever and Righting moment. Stable, unstable and neutral equilibrium. The effect of adding and removing weights on ship's centre of gravity, centre of buoyancy, metacentric height and list. Use of stability and hydrostatic data as</p>		<p>Arithmetic Simple problems on the first four rules Fractions Decimals The Unitary method Time and distance Square root DESIGN Fishing Gear Classification (5hrs) Active fishing gear, Mechanism of capture in each type of fishing gear in relation to type of fish and fishing ground.</p>
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		<p>supplied to fishing vessels and calculations based thereon.</p> <p><u>Practice:-</u> Class room practicals, preparing stability curves. Collect various stability of the institute training (6 hrs)</p>		
8-10	<p>1. Basic netting – mesh bar, mesh size – stretch mesh and cross mesh (Run with the mesh and across) (25 hrs)</p> <p>1. Preparation for sailing</p> <p>2. Watch keeping on the bridge</p> <p>3. Use and maintenance of LSA & FFA</p> <p>4. Fishing gear operation and maintenance</p>	<p>ELEMENTARY MARINE ENGINEERING</p> <p>Principles of operation of I.C. engines (20hrs)</p> <p>Working Principle of four stroke engine - two stroke engine - Cycle of operation - P.V. diagram two stroke - four stroke engines - Valve timing diagram two stroke - four stroke engines - Indicator diagram - Advantages Disadvantages - Difference between two stroke & four stroke engines - Heat balance</p> <p>Understanding the construction of the engines</p> <p>Drawing : P.V. diagram, indicator diagram, valve timing diagram</p>	<p>The effect of current on speed. Allowance for leeway. Given compass course steered, the speed of the ship and direction and rate of currents to find the true course made good. 5 hrs.</p> <p><u>Practice:-</u> To find the compass course to steer by allowing or counteraction current and leeway. 9hrs.</p>	<p>FISHING TECHNIQUES</p> <p>General description- Commercially Important fishing gears (5 hrs)</p> <p>Indigenous and modern fishing gears (eg. Seine net, Bag nets, one boat seines, gill nets, lines, trawl nets purse seines, Japanese type set-nets)</p>
11-16	<p>1. Net making implements – Needle and gauge (5 hrs)</p>	<p>Components of marine diesel engine (25hrs)</p> <p>Identification of</p>	<p>To find the course to steer allowing for a current Given the course steered</p>	<p>Algebra</p> <p>Quadratic equations</p> <p>Simultaneous</p>

	Viva voce The rigging of fishing vessels, methods of ascertaining proof and safe-working loads of ropes including synthetic fibre and wire ropes with and without certificates of proof loads. Rigging purchases and a knowledge of the power gained their use. (5hrs)	parts Free hand sketch of parts	and distance run to determine the set and rate of the current experienced between two positions.	equations Problems on equations
17-24	1. Basic net making – practice with trawl knot reef knot (square knot double knot etc.) (15hrs) To read, understand and make use of a barometer and thermometer. The instruments supplied by the Meteorological office will be taken as standard. (2hrs) Knots, hitches and bands in common use. Seizing, rackings, rope and chain stoppers. Splicing plated and multi-strand mainla and synthetic fibre rope and wire rope with strict reference to current practice. Slings a stage, rigging and bosun’s chair and pilot ladder. (5hrs) Marking and use of ordinary lead lines. (2hrs)	System of marine diesel engine (30 hrs) Fuel system - Cooling system - Starting system - Lubrication system Understanding the systems and its accessories Free hand sketch of systems	To fix a position on a chart by simultaneous bearings bearing and range, positional information from radio aids to navigation or by any combination applying the necessary correction.	Trigonometry Trigonometrical ratios Compound angles Multiple and sub-multiple angels Product formula and identities
25	Project Work / Industrial visit (Optional)			
26	Examination			

**Syllabus for the Trade of
“VESSEL NAVIGATOR” under C.T.S.
(Semester Code No.VEN-02)**

SEMESTER - II

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop calculation and science
1-2	<p>Practical problems on plane, parallel and Mercator sailing (10hrs)</p> <p>To calculate position arrived, course, distance using Noris tables and without using tables (20 hrs)</p> <p>On board the vessel, Dry dock using the equipments and making report (6 hrs)</p>	<p>Maintenance of vessels including fishing vessels (18 hrs)</p> <p>Safety care and maintenance of all life saving and fire appliances, light and sound signals and safe practices to be followed when fishing.</p> <p>Causes and simple methods of prevention of corrosion in a ship's structure. Hull maintenance, Dry docking, preparation for certificate of inspection.</p>	<p>To find the course to steer allowing for a current Given the course steered and distance run to determine the set and rate of the current experienced between two positions. 5 hrs.</p> <p>Practice:- To find the set and drift experienced during a passage and then to counteract the actual current experienced. 6hrs.</p>	<p>Introduction to fishing gear materials</p> <p>General outline about fishing gear and utilization of fishing gear materials.</p> <p>Classification of fishing gear materials</p> <p>Natural and synthetic fibres - Origin, sources, extraction and processing details etc.</p> <p>MATERIALS Construction details of twines and ropes (5hrs.) Details study about fibre, yarn, strand , ply, twines, rope etc., - Z twist and S twist.</p>
3-4	<p>The use of the traverse tables to obtain the position of the ship at any time, given compass courses, variation deviations and the run recorded by long or calculated by time and estimated speed, allowing for the effects of wind and current, if any (10hrs)</p> <p>To calculate the</p>	<p>Sextant (3 hrs)</p> <p>The construction and use of the marine sextant including the optical principles involved. The detection and correction of sextant errors. The principles and use of the vernier and micrometer scales.</p>	<p>To fix a position on a chart by simultaneous bearings bearing and range, positional information from radio aids to navigation or by any combination applying the necessary correction. 6 hrs.</p> <p>Practice:- To fix the vessel's position by method and to this</p>	<p>DESIGN Selection of fishing gear materials (5 hrs). With relevance to species specific gear, and fishing technique adopted – selection of bio-degradable materials in context of relevance to responsible fishing Netting (5 hrs) Definition of netting-in dispensable items required for fabrication of netting piece, mesh, bar, knot, top mesh, side mesh, use of</p>

	<p>position of the ship at the time of noon of next day using the given information and with the help of traverse tables. (10 hrs)</p> <p>Sextant practicals for taking altitudes and adjusting the errors. Sketch the equipment, use of VSA and HSA (8 hrs)</p>		<p>convert radio bearing to mercator bearing. 9 hrs.</p>	<p>different types of meshes, run of meshes-definition. Shaping (5 hrs) Purpose of shaping, method of shaping braiding and cutting, creasing and baiting, fly-mesh comparative advantages of different methods Mounting (5 hrs) Necessity of mounting, different methods of mounting in relation to type of gear and method of fishing, stapling and receiving, selvedge and its importance</p>
5	<p>FISHING GEAR TECHNOLOGY PRACTICAL-II AND VIVA VOCE</p> <p>Starting, Transportation and finding the error of the equipment (6 hrs)</p>	<p>Chronometer (3 hrs) The use and care of marine chronometer and its errors</p>	-do-	<p>Yarn numbering system (10 hrs). Yarn numbering system of twines, its implication in fishing industry – eg. Direct and indirect system viz. British count, Denier, tex, metric count etc. and their conversions. Chemical and physical properties (5 hrs) Natural and synthetic materials viz., Density, Tenacity, Breaking strength, Elasticity, abrasion, resistance, absorption etc</p> <p>FISHING TECHNIQUES</p>
6-7	<p>1. Shaping of netting by braiding, creasing, baiting (15hrs)</p> <p>2. Shaping of netting by tailoring (20hrs)</p> <p>4. Hanging (mounting) of netting, Top & side mounting,</p>	<p>ELEMENTARY MARINE ENGINEERING</p>	-do-	<p>Modern Fishing methods (25 hrs)</p> <ol style="list-style-type: none"> a) Trawling b) Gill netting c) Long lines d) Purse seining e) Trolling f) Trapping <p>The above topics also to be dealt in context</p>

	different methods Hanging ratio. (10 hrs)			of cod of conduct for responsible fishing.
8	VIVA VOCE Fishing Technique	Power Development (2 hrs) Power - IHP - BHP - FHP - SHP - EHP - Power rating	-do-	Non textiles or hardware materials Glass, Aluminium, Iron etc. relevance to fabrication of fishing gear accessories. Classification of floats Different types of floats, its buoyancy, extra. Buoyancy, selection and purpose related to different fishing gear deployed Fishing gear accessories Thimbles, shackles, danleno swivel, G link assembly C and cut links, recessed link, purse ring, cod end ring etc. – purpose and uses MARINE FISHERIES& FISH PROCESSING
9-11	Onboard Training Navigational Aspects And Fisheries Including Seamanship & Navigation And Viva Voce Starting procedure, watch keeping and overhauling	Engine handling (10 hrs) Operation - Preparation for starting - Watch keeping the running - Precaution for stopping - Maintenance - Scheduled maintenance - Preventive maintenance - Break down maintenance	Fixing the position by means of horizontal angles. Three point bearing method, Right ahead method.	MARINE FISHERIES Introduction to Marine Environments (5 hrs) Ecology, Habitat, Biosphere, Biotope, Ecosystem, Estuaries etc. Physical and chemical factors (biotic & abiotic), and their importance, Inshore and Offshore regions, Pelagic and benthic zones, continental shelf, continental slope, Littoral and deep sea, Sandy, rocky and muddy shores and characteristics of the organisms in these zones Marine Population its

				interaction in the Ecosystem (5 hrs) Plankton, Nekton and Benthos Role of plankton, and benthos in Fisheries
12-13	<p>1.Use and maintenance of LSA & FFA</p> <p>2.Navigational lights, sound signals</p> <p>3.Anchoring procedures and anchor watch</p> <p>4.Safety precaution while fishing</p> <p>Field visit for acquainting with the system</p> <p>Free hand sketch of systems</p>	<p>Power Transmission (20 hrs)</p> <p>Gear Box -</p> <p>Intermediate shaft -</p> <p>Stern tube -</p> <p>Propeller</p>	-do-	<p>FISH PROCESSING (10HRS)</p> <p>Handling and transport of fish (4 hrs)</p> <p>Handling fish and prawns onboard the fishing vessel – people involved in the process, washing and sorting, supply of clean water, evisceration, time, bleeding, packing and transport, containers for transport, transportation of live fish, personal hygiene in fish handling</p> <p>Spoilage of fish (4 hrs)</p> <p>Principal constituents (biochemical) of fish, Microbiology of a tropical fish, Post mortem changes in fish, Assessment of freshness of a fish and the methods, Fish spoilage –Agencies of the spoilage of fish – Bacterial spoilage, Enzymatic spoilage, Spoilage in fresh water and marine fishes</p>
14	<p>Viva voce</p> <p>Field visit and on board training in dry dock</p>	<p>Dry docking procedures (5 hrs)</p> <p>Dry docking procedure – preparation before docking and undocking – preparation of defect list – safety procedure for entering and working in confined</p>	-do-	<p>Steel wire ropes</p> <p>Construction, specification, material, braking load, maintenance and preservation – combination rope, construction material, detail etc.</p> <p>Sinkers</p> <p>Material selection, purpose and different</p>

		spaces / welding / cleaning etc.		types, uses. Important fishing gears (General description) Indigenous and modern fishing gears (eg. Seine net, Bag nets, one boat seines, gill nets, lines, trawl nets purse seines, Japanese type setnets)
15	Preparations of getting under way. Duties prior to proceeding to sea, making harbour, berthing alongside quays, jetties, or other ships and securing to buoys. (4hrs)	NAVAL ARCHITECTURE AND SHIP CONSTRUCTION-I	Navigation and voyage planning in all conditions. Making land fall or proceeding along the coast in thick and clear weather.	Preservation of fishing gear material With special reference to fishing gear fabrication twines ropes, nettings, steel wire rope etc. – process viz. tanning, tarring, drying, Dyeing etc. – Classification of preservatives, its method, process and procedures etc. – Uses for different kind of fishing gear
16-17	Helm orders, conning the fishing vessel. Effects of propellers on the steering of a fishing vessel. Stopping, going astern knowledge of manoeuvring capabilities of fishing vessels including turning circles, stopping distances etc. effects of wind and currents on handling of fishing vessels. Turning of fishing vessel short round. Emergency manoeuvres. Bringing a fishing vessel to single anchor in an urgency. Man overboard. (10hrs)	Hydrostatics (8 hrs) Density - Relative density - pressure exerted by a liquid - load on an immersed plane - centre of pressure - load diagram - sheering force on bulkhead stiffeners Calculation on hydro pressure, load etc.	-do-	Different aspects of fishing gear design Need for different designs, basic principles to be followed in designing, designing in relation to fish, gear, and method reading of design and preparation of design. By-catch reduction devices (BRDS) viz. TED, Separator panels, Rigid grid etc. in relevance to the code of conduct for responsible fishing. Behaviour and distribution of targeted species, Fishing design, current, visibility and other factors.

18	The duties of the watch keeping officer at sea, at anchor and at open roads. (3hrs)	Displacement, TPC, coefficients of form (8 hrs) Archimedes principle – displacement – tonne per cm immersion – coefficient of form – wetted surface area – similar figures – shearing force and bending moment Calculation of displacement, TPC, coefficient, W.S.A etc.	-do-	Fishing gear Selectivity Significance of fishing gear selectivity, trawl gear, determination of cod end mesh size - Recent advances in trawl fisheries and mesh selectivity – Selective trawl, square mesh and cod end, optimum mesh size for multi species trawl fisheries, gill net, advances in hook selectivity.
19	Anchors and cables: their use and stowage (3hrs)	Centre of gravity (4 hrs) Centre of gravity – effect of addition of mass – effect of movement of mass – effect of suspended mass	-do-	APPLIED MATHEMATICS Trigonometry Heights and distances Basics of spherical Trigonometry
20-21	Knowledge of the use of all deck appliances including emergency steering gear (2hrs) Class room practical Sketch a cross section of ship and mark various stability parameters	Stability of ships (8 hrs) Statically stability at small angles of heel – calculation of BM – metacentric diagram – inclining experiment – free surface effect – stability of large angles of heel – stability of a wall-sided vessel, Centre of gravity, Centre of buoyancy, Equilibrium of ships, Angle of loll, Metacentre, Metacentric ht. Righting lever, Righting moment, Block coefficient, Reserve buoyancy, Effect of density on draft, Basic problems related to	To find the time and height of high and low water at standard ports.	Mensuration Area of 2 dimensional plane figures Three dimensional solids – Volume, Lateral surface area and Total surface area – cube, cuboid, cylinder, cone and sphere

		draft and density, TPC, FWA.		
22	On board sketch the effect of the propellers and show how the fishing vessel turned in a short round	Manoeuvring : (4 hrs) Types of propellers, Effect of propellers, Shallow water effect, Turning a vessel in a short round, squat Introduction of fishing crafts (1 hour) Boat Building materials (3 hrs) Steel, Fibre glass, other composite materials, wood, Characteristics of Boat Building timbers Carpentry joints	-do-	Describing motion Speed, velocity and acceleration – definition, formulae and problems
23-24	Plotting Free hand drawing	Terms in boat building (2 hrs) General descriptions Importance of lofting in boat building (2 hrs) Caulking and stopping (1hour) Wheel house and other superstructures, rigging (1 hour) Sheathing (1 hour) Underwater fittings (1hour) Painting and varnishes (1hour)	-do-	Energy conservation Fishing gear and modern methods/ Modern fishing vessels and its technology Fishing accessories Fishing accessories – winch, gurdie, Rollers, Line-haulers, Power blocks, Purse seines
25	Project Work / Industrial Visit (Optional)			
26	Examination			

**Syllabus for the Trade of
“VESSEL NAVIGATOR” under C.T.S.
(Semester Code No.VEN-03)**

SEMESTER - III

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop calculation and science
1-3	<p>To find the latitude by meridian altitude of a heavenly body. (10 hrs)</p> <p>Take the meridian altitude and to calculate the observed latitude and position line using nautical almanac. (10 hrs)</p> <p>Parts, checking the error</p> <p>Find the deviation, deviation card preparation (4 hrs)</p>	<p>Magnetic Compass (3 hrs)</p> <p>The use and care of magnetic compasses.</p> <p>Magnetic and non-magnetic materials and their effect on the compass.</p> <p>Checking compasses.</p> <p>Practical limitation of the magnetic compass, flux gate compass.</p>	<p>To fix the position by bearings of one or more objects with the run between, allowing for a current and to find the distance at which the ship will pass a given point. 5hrs</p> <p><u>Practice:-</u> To fix the vessel's position by running fix method with or without current. 6hrs.</p>	<p>MATERIALS</p> <p>Non textiles or hardware materials (5 hrs)</p> <p>Glass, Aluminium, Iron etc. relevance to fabrication of fishing gear accessories</p> <p>Classification of floats (5 hrs).</p> <p>Different types of floats, its buoyancy, extra. Buoyancy, selection and purpose related to different fishing gear deployed</p> <p>Fishing gear accessories (5 hrs).</p> <p>Thimbles, shackles, danleno swivel, G link assembly C and cut links, recessed link, purse ring, cod end ring etc. – purpose and uses</p> <p>Sinkers (5 hrs)</p> <p>Material selection, purpose and different types, uses.</p> <p>DESIGN</p> <p>Otter boards</p>

				(10hrs) Basic principles function & design of of Otter boards, Kites, different kinds of Otter board and construction of otter boards. Size and power of the otter board in relation to type of fishing, size of gear, depth of operation
4-5	To find position line and position through which it passes from an observation of sun Or star out of the meridian. (10hrs) To work our the problems by various methods such as long by chord, Intercept, ex-meridian. (10hrs) Starting, stopping, finding the error (4 Hrs)	Gyro Compass (3 hrs) An elementary knowledge of the use and care of marine gyro compasses, including the procedure for starting and stopping. Routine oiling and cleaning and its effects. Routine operational checks. Application of latitude and speed error.	The use of position lines and circles obtained by any method. 4 hrs. <u>Practice:-</u> To fix the position with the help of position lines and circles. 6 hrs.	Introduction to Marine Environments Ecology, Habitat, Biosphere, Biotope, Ecosystem, Estuaries etc. Physical and chemical factors (biotic & abiotic), and their importance, Inshore and Offshore regions, Pelagic and benthic zones, continental shelf, continental slope, Littoral and deep sea, Sandy, rocky and muddy shores and characteristics of the organisms in these zones
6-7	FISHING GEAR TECHNOLOGY PRACTICAL-III AND VIVA VOCE Taking the bearing and finding the error (4 hrs)	Bearing Instruments (3 hrs) The construction and use of azimuth mirrors. Procedure for checking accuracy of azimuth mirrors. The	Use of sailing directions, Admiralty catalogue of charts and list of lights. To understand the use of Notices of	Marine Population its interaction in the Ecosystem Plankton, Nekton and Benthos Role of plankton, and benthos in

		construction and use of a Pelourus.	Mariners and to be familiar with the process of chart correction. To understand the dangers of placing implicit reliance upon floating navigational aids. To understand the use of Decca lattice charts and Decca correction sheets. <u>Practice:-</u> Refer the nautical publications and make a record for each one them.	Fisheries Marine Capture Fisheries Difference between Cartilaginous and bony fishes
8-9	Joining of netting (10hrs)	Maintenance of navigational records (3 hrs) Prepare various navigation records (4 hrs)	Information given on a chart or plan particularly about Buoys, lights, Radio Beacons, Navigational Aids, depths and nature of bottom, use of soundings, recognition of the coast and Radar responsive targets – depth and height contours	Code of conduct for responsible fishing (10hrs) Selective fishing gear and practices – Environment and eco-friendly fishing gears and enhancement of resources. Energy conservation (5hrs) Fishing gear and modern methods/ Modern fishing vessels and its technology Fishing Technique
10-12	Mending (15hrs)	Naval architecture and Ship construction - ii	Use of sailing directions, Admiralty catalogue of charts and list of lights. To	Marine Fisheries And Fish Processing Marine Fisheries Marine Capture Fisheries (11 hrs)

			<p>understand the use of Notices of Mariners and to be familiar with the process of chart correction. To understand the dangers of placing implicit reliance upon floating navigational aids.</p> <p>To understand the use of Decca lattice charts and Decca correction sheets.</p>	<p>Difference between Cartilaginous and bony fishes, An elementary study of a typical fish, General character of fishes – its various vital systems. Marine fishes and fishery resources of India, pelagic, mid-water and benthic fisheries. Fish Processing Fish Preservation methods – post harvest methods (10 hrs) Fish thawing, Chilling and Curing methods – icing and its types, freezing and different types, freezing in fish and prawns, salting and drying and its different types, smoking, its different types, canning and its problems, Irradiation preservation and other preservation methods, Seafood quality assurance systems in India – IPQC and HACCP standard</p>
13-15	<p>Marine Fisheries, Fish Processing Use and upkeep of sounding appliances, use and care of light and</p>	<p>Construction Backbone assembly , Building stock, making the moulds, Rabbet building of</p>	-do-	<p>Fish Behaviour and population Migration of fishes. Regular horizontal</p>

	<p>sound, signalling equipment including pyrotechnic light (3hrs)</p>	<p>wood Hull planking - different types Framing and longitudinal Deck beams and carlings Knees, Riders and pointer, Deck planking Floor timbers and Engine bearers Stern tube arrangements, Bulkhead Construction of model boat Ship Construction Stresses in ship structure. Longitudinal bending in still water and waves – transverse bending – stresses when docking – pounding – panting</p>		<p>migrations – Anadromous, Catadromous, regular Vertical Migration, Physical, Chemical and Biological aspects of fish migration Fish Finding Equipments</p>
16-17	<p>Onboard Training- Navigational Aspects And Fisheries Including Seamanship & Navigation And Viva Voce The use and care of life-saving appliances including handling characteristic, construction and stowage of life-rafts. Emergency signal, abandon ship signal, bending setting and taking in life boat sails, management of boats under oars, sails, power and in heavy weather, recovering boats at sea. Beaching or landing. Survival procedure in life-boats and life rafts. The use and care of rocket and line throwing apparatus. (10hrs)</p>	<p>Engine installation, alignment (5hrs) Bottom and side framing Double bottom – internal structure – side framing – tank side bracket – beam knees – web frames Free hand sketches</p>	<p>To convert compass course to true course and vice-versa. To plot a course between given positions and to measure the distance between them. To find the compass course to steer by allowing or counteraction current and leeway To find the set and drift experienced during a passage and then to counteract the actual current experienced.</p>	<p>Fish Behavior and population Other behavior of fishes. Shoaling behavior of fishes, Shoaling behavior of oil sardine, mackerel, tuna Fish Population study. Fish stock – Abundance of fish and factors limiting abundance, Catch per Unit Effect index (CPUE)</p>

18	1. International collision regulations 2. Marine pollution The use and care of fire appliance including the smoke helmet, emergency fire pump and self-contained breathing apparatus (5hrs)	Tanks and plumbing work (3hrs) Deck fittings (2 hrs) Shell and decks Shell plating – bulwarks – deck plating – beams – deck guarders and pillars discontinuities – hatches – hatch corners Free hand sketches	-do-	Elementary Acoustics (10 hrs) Sound waves and propagation of sound, Velocity, wavelength, reflection, echo, ultrasound, range, measuring distance by sound. Principle of Echo sounding, Block diagram, main parts of echo sounder, controls & operation.
19-20	Action to be taken on discovering a fire – in port – at sea (5hrs)	Bulk heads Water tight bulk head – water tight doors – non-water tight – bulkhead Free hand sketches GENERAL METEOROLOGY Composition and vertical structure of Atmosphere, weather and climate, Properties of atmospheric temperature – lapse rate, DALR, SALR, Diurnal variation of atmospheric temperature, Isotherms, Atmospheric pressure, Barometric tendency, isallobars	-do-	Identification of selected planktonic organisms phyto and zooplankton benthic organisms. Elementary study of fish and its various parts scales, fins etc. and basic identification methods
21-22	Knowledge of the precautions to be observed to prevent pollution of the marine environment (4hrs)	Fore end arrangements Stem plating – anchor – cable arrangement Free hand sketches Water vapour in the atmosphere, Humidity, Fohn wind	To fix the vessel's position by method and to this convert radio bearing to Mercator bearing. To fix the vessel's position	Handling and transport of fish Handling fish and prawns onboard the fishing vessel – people involved in the process, washing and

		<p>effect, Visibility, Mist and Fog, Types of fog, Hydrological cycle- Evaporation, condensation, precipitation, Types of precipitation Clouds, Formation and Classification of clouds</p>	<p>by running fix method with or without current. To fix the position with the help of position lines and circles.</p>	<p>sorting, supply of clean water, evisceration, time, bleeding, packing and transport, containers for transport, transportation of live fish, personal hygiene in fish handling Spoilage of fish Principal constituents (biochemical) of fish, Microbiology of a tropical fish, Post mortem changes in fish, Assessment of freshness of a fish and the methods, Fish spoilage – Agencies of the spoilage of fish – Bacterial spoilage, Enzymatic spoilage, Spoilage in fresh water and marine fishes.</p>
23-24	<p>The use and care of fire appliance including the smoke helmet, emergency fire pump and self – contained breathing apparatus (5hrs)</p>	<p>Aft end arrangements Transom stern – stern frame and rudder – ship tunnel - Kort nozzle – fixed pitch propeller – variable pitch propeller Free hand sketches Fish hold Insulated fish hold. Free hand sketches Reading drawing on various constructional</p>	-do-	<p>methods – post harvest methods Fish thawing, Chilling and Curing methods – icing and its types, freezing and different types, freezing in fish and prawns, salting and drying and its different types, smoking, its different types, canning and its</p>

		<p>stages of a ship Pressure and wind Systems- Buys Ballots law, Coriolis</p>		<p>problems, Fish Preservation methods – post harvest methods Irradiation preservation and other preservation methods, Seafood quality assurance systems in India – IPQC and HACCP standard Value added products Pickling of fish, Mass Min and Serum production, Canning of oil sardine, Tuna and prawn, Fish sausages and kneaded products, Fish protein concentrates, Marine oils and Fish meals, Marine algal products, Utilization of fish byproducts – fish maws, fish oils, shark skin leather, fish glue, Bache-de-mer, chitosen from prawn waste and squilla, Indian standard for fish and fishery products</p>
25	Project Work / Industrial Visit (Optional)			
26	Examination			

**Syllabus for the Trade of
“VESSEL NAVIGATOR” under C.T.S.
(Semester Code No.VEN-04)**

SEMESTER - IV

Week No.	Trade Practical	Trade Theory	Engineering Drawing	Workshop calculation and science
1-4	<p>To find the true bearing of a heavenly body, the compass error and hence the deviation of the magnetic compass of the direction of the ship's head. (5hrs)</p> <p>To calculate the compass error and deviation using amplitude and azimuth method. (5hrs) practical – preparing the stability curve (4hrs)</p>	<p>Basic knowledge of IMCO recommendations concerning the stability of fishing vessels and use of stability data provided on board (5 Hrs)</p>	<p>Fixing the position by means of horizontal angles. Three point bearing method, Right ahead method. 5hrs</p> <p><u>Practice:-</u> To fix the position by three point method and to find the course to steer by right ahead method. 9 hrs.</p>	<p>MATERIALS Steel wire ropes (10hrs) Construction, specification, material, braking load, maintenance and preservation – combination rope, construction material, detail etc. Preservation of fishing gear material (10 hrs) With special reference to fishing gear fabrication twines, ropes, nettings, steel wire rope etc. – process viz. tanning, tarring, Dyeing etc. – Classification of preservatives, its method, process and procedures etc. – Uses for different kind of fishing gear Sweep lines (5hrs) Design details, construction and its impact on herding fishes and trawl mouth opening. Gear testing (5 hrs) Purpose, methods, instrument for testing</p>
9-10	<p>Fishing Gear Technology Practical-Iv And Viva Voce On board practicals while fishing and prepare record (2hr)</p>	<p>Loading and discharging operation with special regard to heeling moments due to gear during fishing operations (3 hr)</p>	<p>To find the time and height of high and low water at standard ports. 5hrs. <u>Practice:-</u> To find the height of tide or time of tide using Indian</p>	<p>FISHING TECHNIQUES</p>

			tide tables. 9 hrs.	
11-13	Splicing – rope splicing and wire rope splicing. (10hrs) On board practicals during fishing trip and make a report (4hrs) Viva voce A full knowledge of the content and application of the Collusion Regulations (25hrs)	General knowledge of the measures designed for the protection of the crew on decks, superstructure, at deck opening and on stairway and ladders. (2 hr)	Information given on a chart or plan particularly about Buoys, lights, Radio Beacons, Navigational Aids, depths and nature of bottom, use of soundings, recognition of the coast and Radar responsive targets – depth and height contours. 4 hrs. <u>Practice:-</u> To prepare a comprehensive details with the help of chart abbreviation book. 9 hrs.	Deck equipments Deck equipments – winch, gurdie, Rollers, Line-haulers, Power blocks, Purse seines, davite, gallows (single and double) fair leads, derricks, Pulley system, Mast rigging Deck lay out Various types of deck layouts for different types of fishing including combinations. 1. Gill netters – Bow pickers, tern picker and reel gill netter 2. Trawler - Stern trawler, side trawler and outrigger trawler 3. Purse seiner 4. Long liner 5. Combination vessels etc. (Trawler - purse seiner, trawler gill netter, multipurpose)
14-16	Fabrication of model nets (25hrs) Workshop practicals and dry dock. And prepare the observation (2hrs) Distress and pilot signals, penalties for misuse. International life-saving signals (2hrs)	General ideas of welding, types of weld, precautions taken (3 hrs)	Refer the nautical publications and make a record for each one them.	Mensuration Area of 2 dimensional plane figures Three dimensional solids – Volume, Lateral surface area and Total surface area – cube, cuboids, cylinder, cone and sphere Algebra Quadratic equations Simultaneous equations Problems on equations
17-19	Fish Finding Equipments A knowledge of the contents of 'Merchant	MARINE METEOROLGY	-do-	MARINE FISHERIES Fish Behaviour and

	Shipping Notices' and 'Notices to Mariners'. The use of Notices to Mariners and Merchant ship search and resume manual (MERSAR) (2hrs)			<p>population</p> <p>Migration of fishes (10 hrs)</p> <p>Regular horizontal migrations – Anadromous, Catadromous, regular Vertical Migration, Physical, Chemical and Biological aspects of fish migration</p> <p>Other behaviour of fishes (6 hrs)</p> <p>Shoaling behaviour of fishes, Shoaling behaviour of oil sardine, mackerel, tuna</p> <p>Fish Population study (3 hrs)</p> <p>Fish stock – Abundance of fish and factors limiting abundance, Catch per Unit Effect index (CPUE)</p>
20-22	Onboard Training- Navigational Aspects And Fisheries Including Seamanship & Navigation And Viva Voce The IALA system of buoyage. Precautions while using floating navigational aids. E.g. buoys, light vessel etc. (4hrs)	General circulation of atmosphere over the earth, ITCZ, Thermal equator, Trade winds, coriolis force, seasons, Buys Ballots law, Pressure and wind distribution over Indian Ocean sector, Monsoon winds, wind pattern during SW and NE monsoon period over Indian sub continent and adjacent areas, Norwesters and Elephantas	Chart Work	<p>Fish Processing Value added products (2 hrs.)</p> <p>Pickling of fish, Mas Min and Surumi production, Canning of oil sardine, Tuna and prawn, Fish sausages and kneaded products, Fish protein concentrates, Marine oils and Fish meals, Marine algal products, Utilisation of fish byproducts – fish maws, fish oils, shark skin leather, fish glue, bache-de-mer, chitosen from prawn waste and squilla, idian standard for fish and fishery products.</p>
23-24	1. Operation Navigational	Tropical Revolving	Fixing the position	Trigonometry

	<p>equipments and communication equipments</p> <p>2. Fishing gear operation and maintenance</p> <p>3. Safety precaution while fishing</p> <p>4. Various fishing technique followed during fishing operation</p> <p>The examiner may ask the candidate questions arising out of the written work. if it is deemed necessary on account of weakness shown by the candidate.</p>	<p>storms (TRS) – cyclones and anticyclones and their directions in N.H. and S.H. structure of cyclone, origin tracks and life span of TRS, Parts of TRS- eye, eye wall, outer storm area, weather conditions, Ideal conditions for the formation of cyclone, prediction of cyclone, storm warning signals, weather reporting system for fishermen. Storm surges</p> <p>General aspects of ocean waves and tides, wave classification and wave parameters, tidal currents, flood and ebb tides, spring and neap tides, tsunamis</p>	<p>by means of horizontal angles. Three point bearing method, Right ahead method. 5hrs</p> <p><u>Practice:-</u> To fix the position by three point method and to find the course to steer by right ahead method. 9 hrs.</p>	<p>Trigonometric ratios Compound angles Multiple and sub-multiple angles Product formula and identities Heights and distances Describing motion Definition of Speed, velocity and acceleration Different formula on speed, velocity and acceleration. Different problems on speed, velocity and acceleration Fish Finding Equipment Fish finding equipments (20hrs) Modern echo sounders and features, SONAR, NET Sonar, Communication Equipments, Marine RADAR, GPS, AIS and NAVTEX</p>
25	Revision			
26	Examination			

**LIST OF TOOLS AND EQUIPMENT FOR 16 TRAINEES + ONE
FOR THE TRADE OF "VESSEL NAVIGATOR"**

Sl. No.	Name of the Item	Quantity
1	Motor Vessel of length not less than 25 m and BHP not less than 500	2 nos.
1	Sextant	17 Nos.
2	Parallel scales	17 Nos.
3	Pylorus	2 Nos.
4	Azimuth mirrors	17 Nos.
5	Magnetic compass	17 Nos.
6	Binocular	17Nos.
7	Telescope	17 Nos.
8	Self igniting light	17Nos.
9	Magnetic board for ROR	17Nos.
10	Patent log	17 Nos.
11	Small Admiralty stock anchor	10 Nos.
12	Mast head light, side lights	17 set
13	Diving set	17 Nos.
14	Jet nozzle & coupling	17 Nos.
15	Hydrostatic release gear unit	17Nos.
16	Inflatable life jackets	17Nos.
17	Block models	2 Set
18	Anemometer	2Nos.
19	Rule of the Road - display board	2 Nos.
20	DCP - extinguisher	2 Nos.
21	AFFF - 9 Its "	2 Nos.
22	C02 - Water type extinguisher	2 Nos.
23	AFFF 50 Its.	2 Nos.
24	Lifebuoy	2 Nos.
25	Life jackets	17 Nos.
26	Life rafts for demonstration purpose	2 Nos.
27	Navigational charts of East & West coast of India	20 Nos.
28	Chart tables	17 Nos.
29	Instructional charts 5059, 5060, 5061 and 5062 (17 Nos. Each)	17Nos
30	Various display boards for position fixing and signals.	5 nos.
31	EPIRB	2 Nos.
32	SART	2 Nos.
33	Self contained breathing apparatus	2 Nos.
34	International shore connection	2 Nos.
35	Chronometer	2 Nos.
36	GPS (2 channel)	2 Nos.
37	Adjustable net making stand provided with cup hooks.	2 set
38	Different type of live models in glass showcase. Live models representing stern trawling operation, side trawling operation, out - rigger trawling operation, multi-rig trawl operation, Bull or pair trawl operation (all bottom trawling operations) Gill net operation , purse-seine net operation, long line operation and Mid water trawling operation.	2 set

39	A live model of purse-seine net with facilities to operational technique such as pursing the net as in original operation.	2 set
40	A live model trawl net fixed with T.E.D. (Turtle Excluder Device)	2 set
41	Live model nets of different type of trawl nets like two seam trawl, four seam trawl, multi seam trawl and rope trawl. Different sizes of live model of gill nets and purse-seine nets.	2 set
42	Different type of live model of Otter boards like flat rectangular wooden otter board, oval otter board, " V " shape otter board (steel) Hydrofoil otter boards etc.	2 set
43	One unit of Tuna long line gear with all accessories like float, float line, main line, branch line, snap clip, swivel, sekiyama, snood wire and tuna hook.	2 set
44	Different type of fishing hooks like mustad tuna hooks, shark hooks, kalava hooks etc.	2 set
45	Samples of different type of twines and ropes like P.P. rope, P.E. rope, HDPE ropes, PE twines, HDPE twines, Nylon twines with different specifications.	2 set
46	Display boards showing	2 set
	a. Modern classification of fishing gear and indigenous fishing gear.	2 set
	b. Classification of fishing gear materials and accessories.	2 set
	c. Display showing " Tailoring " like point cut, bar cut, mesh cut or "T" cut etc.	2 set
	d. Display showing "baiting " "creasing " and Fly mesh etc.	2 set
	e. Display showing different type of mountings, splicing like eye splice, long splice, short splice etc.	2 set
47	Twine twister machines.	2 set
48	Twine wounding spool.	2 set
49	Live models of fish trap, lobster trap, Fyke Nets	2 set
50	Spotters like artificial jigs, "G" link assembly, "D: shackle, Swivels, different type of sinkers, different type of floats like aluminium, glass, rubber, sponge corks, sponge corks , PVC floats etc.	2 set
51	Different type of net making needles and mesh gauges.	2 set