SYLLABUS FOR WORKSHOP CALCULATION & SCIENCE

OF

MARINE FITTER

(SEMESTER PATTERN)

UNDER

CRAFTSMEN TRAINING SCHEME

Re-Designed

in

2015

By

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Directorate General of Training

CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE

Block - EN - 81 SECTOR - V, SALT LAKE CITY, KOLKATA - 700 091

Syllabus of Workshop calculation and science for 3rd semester – Duration: 42 hours

MARINE FITTER

Sl. No.	Workshop calculation and science
	WORKSHOP TECHNOLOGY
1.	**Heat treatment** of iron and steel – Description and purpose of heat treatment – principle methods of heat treatment.
2.	**Pattern making and foundry works** General description, casting processes, types of pattern, moulding sand, How to make mould, defects in casting
3.	**Fastenings** General description – classification of fasting - Rivets and riveting – keys: different types and purposes, Cotter joints: different types and purposes, Pin joints: different types and purposes, nut & bolts: different types and purposes – construction of nuts bolts, rivets, screw threads, shaft keys.
4.	**Power transmission** Types of belt drive – types of pulleys – jockey pulley or rider pulley Chain drive – types of clutches – types of gear drive – cam drive – rope drive
5.	**Bearings** General description – different kinds of bearings and purposes – material of each bearings
6.	**Sheet metal** General description, method of operation types of tools and materials- Carrying out job works
7.	**Lathe** General description - classification of lathe and uses. Parts of lathe, feed mechanism, tumbler gear mechanism, method of holding the work and attachments, steady rest, follower rest, catch plate and carriers, lathe tools, different methods of taper turning, Carrying out jobs on the machine Calculation of thread cutting, taper turning etc.
	HYDRUALICS II
1.	Types of hydraulic pump, mechanical working arrangement, fluid operation dynamic pressure – positive displacement – fixed and variable displacement Reciprocation pump – gear pump – vane pump – piston type pump – Centrifugal pump - Free hand sketch of all pumps and accessories –Discharge capacity, power of pumps calculations –operational level
2.	**Motors Hydraulic Motors** – types – working arrangement – high speed low torque – Low speed high torque motors.- vane motors – gear motors – radial piston motor – axial piston motor – internal gear motor – power and efficiency- Free hand sketch of

	all motor and accessories- Power and capacity calculations – operational level
3.	Practice Dismantling and assembling of pumps Field visit to acquaint systems Dismantling and assembling of all motors Dismantling and assembling of filters
4.	**Control system** direction control – pressure control – volume control – pressure relief valve – brake valve– rotary valve– spool control valve– pressure regulator– check valve– solenoid valve Other devices Tank and accessories– piping– strainers– oil seals– filters- oil cooler- Free hand sketch
	NAVAL ARCHITECTURE AND SHIP CONSTRUCTION
5.	**Hydrostatics** - 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.
6.	**Displacement, TPC, coefficients of form** 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. **Centre of gravity** Centre of gravity – effect of addition of mass – effect of movement of mass – effect of suspended mass
7.	**Stability of ships** Statical 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 draft and density, TPC, FWA. Class room practical's Sketch a cross section of ship and mark. various stability parameters
8.	**Maneuvering** Types of propellers, Effect of propellers, Shallow water effect, turning a vessel in a short round, squat.- Sketch the effect of the propellers and stow how the fishing I vessels turned in a short round
9.	**Introduction of fishing crafts** **Boat Building materials** Steel, Fibre glass, other composite materials, wood**,** Characteristics of Boat Building timbers Terms in boat building - General descriptions

Syllabus of Workshop calculation and science for 4th semester – Duration: 42 hours

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	HYDRUALICS AND PNEUMATICS III
1.	**General**– Hydraulic circuit – closed system – open system – power units - – desirable properties of hydraulic oil and its grades – loss of head – cavitations – air purging
2.	**Deck Machineries** Trawl winch – Wind lass – Net drum- purse seine winch – triplex winch- power block – line hauler – cargo winch – gun wale roller – side thrusters - Construction, working principle, circuit diagram Free hand sketch Power and capacity calculations – operational level
3.	**Trouble shooting** – cause and remedies
4.	**Introduction to Pneumatics** Pneumatic system and physical units, Basic requirements for pneumatic system, Air compressor, pneumatic cylinder and air motor valves, circuits, Hydro pneumatics- Free hand sketch
	FISHING TECHNIQUE
5.	**Operation of fishing gear** A brief introduction about various types of gear now being used Local visit (Fishing villages and fishing harbour)
6.	Fishing without gear Method of using, knife, shovels and picks for catching Molluscs and crabs
7.	Wounding gear Harpoon, spear, blow pipe and bow and arrow
8.	Stupefying **Dynamiting, poisoning and electric fishing**
9.	**Code of conduct for responsible fishing** Selective fishing gear and practices – Environmentally, eco-friendly gear and enhancement of resources **Fish Traps** To catch fishes by attracting them to the desired cages, Fyke net, Plunge basket, crab pot.
10.	**Traps for jumping fishes** Changadam, Raft, etc.
11.	**Bag nets with fixed mouth** Dol net (Bombay) Stake net (Kerala backwaters)
12.	**Dragged gear**

	Beam trawl, otter trawl Bull trawl On board practical training.
13.	**Surrounding gear** To catch shoaling fishes, purse seine and ring net **Encircling gear** To catch shoaling fishes purse-seine and ring net **Dip or lift nets** Hand dip net, Chinese dip net
14.	**Falling nets** Cast nets, with strings and string-less **Gill and tangle nets** To catch fishes by gilling and entangling Set and drift gill nets Trammel nets **Energy conservation** Fishing gear and methods, vessel technology. Various fishing techniques followed during fishing operation.
15.	**Elementary Acoustics** Sound waves and propagation of sound, Velocity, wavelength, reflection, echo, ultrasound, range, measuring distance by sound. **Fish finding equipments** Principle of Echo sounding, Block diagram of echo sounder, operation, main parts of echo sounder, controls, video echo sounders and features, SONAR and NET SONDE Errors of Echo sounders.
16.	**Parts of ship** Principal dimensions, Port, star board, beam, bow Quarter free board, draft Bulwork etc. On board practicals Identification of parts on board the fishing vessel and make sketches **Rope works, Types of ropes, care and maintenance of synthetic and wire ropes (6 hrs)** Knots and splices, breaking strength, working load, and problems connected therewith. On board, class room. Practicals on making different types of knots and splices such as eye slice , short splice , back splice and long splice
	SEAMANSHIP AND NAVIGATION
17.	**Blocks & purchases** Types of blocks, frictional resistance and problems connected therewith different types of tackles, safety practices to be followed, care and maintenance of blocks and tackles. On board, class room. Identification of blocks and tackles. Practical on marking different tackle and to calculate safe working load **Chart, Latitudes, longitudes, Fixing position on the chart, setting course and finding the distance. (8 hrs)** Abbreviations and symbols Using chart, Fix the vessels position on a navigational charts and measure the course and distance between two given position. Identification of various symbols and abbreviations on chart **Lead lines (2 hrs)** Deep sea lead line and hand lead line. On board Fabricate a handle lead line on a given rope and make proper makings
18.	**Sea Anchor, Fire fighting** Fire muster, Fire drill, care and maintenance of Fire fighting appliances. Principles of Fire fighting, Fire triangle, Engine room fire etc. Prevention of fire, principles of fire fighting, fire extinguishers and fire hoses. On board and class room. Prepare a must list for a fishing vessels. Practicals on operation and refilling of extinguishers. **Life saving appliances (10 hrs)** Life jacket, life buoy, Life raft, class 'C' boat, Rescue boat, EPIRB, SART, life boat its care and maintenance On board and class room Practicals on using life buoy and life jacket. Inflate the life

	raft and identify the parts and equipments. Using the SART .
19.	**Accidents** Grounding, Beaching, Refloat. Collision and leaks, man overboard Class room and on board Prepare a collision mate model. **Distress signals & its penalty, procedure for sending distress call** Procedure for sending urgency and safety messages. Identify the various distress signals such as a hand flare , parachute ,smoke float and sketch the equipment and mark the parts. **Buoyage system** Buoyage and wreck marking system On board and class room
	NAVAL ARCHITECTURE AND SHIP CONSTRUCTION
20.	**Importance of lofting in boat building Construction** Backbone assembly Building stock, making the moulds Rabbet building of 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
21.	Engine installation, alignment Tanks and plumbing work Deck fittings
22.	**Stresses in ship structure** Longitudinal bending in still water and waves – transverse bending – stresses when docking – pounding – panting Free hand sketches **Bottom and side framing** Double bottom – internal structure – side framing – tank side bracket – beam knees – web frames Free hand sketches **Shell and decks** Shell plating – bulwarks – deck plating – beams – deck gurders and pillars discontinuities – hatches – hatch corners Free hand sketches **Bulk heads** Water tight bulk head – water tight doors – non-water tight – bulkhead Free hand sketches **Fore end arrangements** Stem plating – anchor – cable arrangement Free hand sketches **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 **Caulking and stopping** Wheel house and other superstructures, rigging Sheathing) Underwater fittings Painting and varnishes
	WORKSHOP TECHNOLOGY
23.	**Drilling machine -** General description and uses. Types of drilling machine, feed mechanism, method of holding the drill, chucks. Carrying out jobs on the machine
24.	**Grinding machine -** General description uses & method of operation – precaution. Carrying out jobs on the machine
25.	**Arbour Press & hydraulic press** General description, uses & method of operation Carrying out jobs on the machine
26.	**Engine room and workshop lay out, Workshop layout**