भारत सरकार / GOVERNMENT OF INDIA
पत्तन, पोत परिवहन और जलमार्ग मंत्रालय
MINISTRY OF PORTS, SHIPPING AND WATERWAYS
नौवहन महानिदेशालय, मुंबई
DIRECTORATE GENERAL OF SHIPPING,MUMBAI

DGS - Circular No. 36 of 2025

(STCW Circular No. 03 of 2025)

File No. 25-1041712025 - DGS	Comp. No.: 33029	Date: 10.09.2025
Authorized by Chief Examiner of Master and Mates	Subject: Revised Course Curriculum for NWKO (NCV) Course.	

1. Maritime Safety and Training, Examination and Assessment of Seafarers are paramount to the Directorate General of Shipping (DGS), the competent authority of the Government of India for maritime affairs. The DGS periodically reviews the syllabi of competency courses to ensure that it meets the requirements of the shipping industry.

2. A Syllabus Revision Committee was constituted by the Directorate vide N.T. Wing / EAC Branch Nautical Circular No. 17 of 2024 dated 02.07.2024 for the revision of syllabi for Nautical Competency Courses leading to Certificate of Competency (CoC) examinations.

3. Upon extensive deliberations with the stakeholders by the said committee, the syllabus for the NWKO (NCV) Course has been reviewed and revised. The updated syllabus incorporates all amendments to the STCW Convention till date, including the 2010 Manila Amendments.

4. Based on the recommendations of the committee, the revised course syllabus, course duration, and instructional hours have been finalized. These are enclosed as:
   a. Annexure 1 - Revised Syllabus
   b. Annexure 2 - Standard Format for Certificate of Course Completion
   c. Annexure 3 - NWKO (NCV) - Summary of Examination (Function -wise) (Reference: Table A –II/1) – STCW 2010
   d. Annexure 4 - List of Library Books, Publications, and Reference Materials

9वीं मंज़िल, बीटा बिल्डिंग, आई थिंक टेक्नो कैम्पस, कांजुर गाँव रोड, कांजुरमार्ग (पूर्व) मुंबई- 400042
9th Floor, BETA Building, I-Think Techno Campus, Kanjur Village Road, Kanjurmarg (E), Mumbai-400042
फ़ोन/Tel No.: +91-22-2575 2040/1/2/3 फैक्स/Fax.: +91-22-2575 2029/35 ई-मेल/Email: dgship-dgs@nic.in वेबसाइट/Website: www.dgshipping.gov.in

5. It is expected that all approved maritime training institutes will adhere to these guidelines in letter and spirit.

6. The revised guidelines for NWKO (NCV) Course shall come into force with effect from Sept 2025 onwards. Henceforth, NWKO (NCV) Course shall commence on the 15th day of each month, or the following working day, as prescribed in the Annual Schedule of Courses and Examinations published on the DGS website.

7. This is issued with the approval of the Chief Examiner of Masters and Mates.

10/09/25

(Capt. Ravi Singh Sikarwar)
Nautical Surveyor-cum- DDG (Tech.)

To,

1. DGS Secretariat.
2. Chief Surveyor with the Govt. of India
3. Nautical Advisor to the Govt. of India
4. All Maritime Training Institutes
4. INSA/FOSMA/MASSA/ICCSA
5. Computer Cell

ANNEXURE 1

NWKO (NCV)

DETAILED SYLLABUS

DURATION: 4 MONTHS TOTAL HOURS: 480

SUBJECT : TERRESTRIAL AND COASTAL NAVIGATION (73 HOURS)

Topics	Hours
Competence No. 1: Plan and conduct a passage and determine position	
1. **Terrestrial and Coastal Navigation**	
1.1.1 Define: Shape of earth, Great circle, small circle Earth's axis, Poles, Equator, Latitude, parallels of latitude, Meridians, prime meridian, longitude, Difference of latitude and longitude, Geographic mile, statute mile, nautical mile, compare with kilometre, cable and knots.	2
1.1.2 Charts Explain: Natural scale , Chart datum, Meridional parts, Plan charts Mercator charts, Chart catalogue, Chart folio and Chart Correction log Procedures for correction of charts and Nautical publications including T&P notices using information from Notices to Mariners Exercises on chart correction.	10
1.1.3 Datums 1.1.4 Compass Corrections Explain : Earth's axis of rotation, Directions by gyro and magnetic compass. Deviation, Variation, Compass error (Gyro and Magnetic) How to determine error by Transit bearings.	3
1.1.5 Distances Explain: How to determine distance between two positions on a Mercator chart.	1
1.1.6 Position lines and positions Define : Position line, position circle. Explain: How to determine the position of ship by range and bearing, simultaneous bearings of 2 or more objects. Dead reckoning, Estimated position, Beam distance.	5
1.1.7 Plane and Mercator Sailings Explain : Departure, relation ship with D'long, D'lat, True course and rhumb line.Parallel sailing formula, Plane sailing formula, Use of traverse table, Mercator sailing Exercises based on all of the above.	8

Topics	Hours
1.1.8 Chart work exercises Define: Current, leeway, tidal stream, set, drift. Explain: Effect of wind and current and determine course and distance made good. Course to steer allowing for tidal stream or current or wind. Exercises: Determine position circle by horizontal sextant angle. Determine position by three bearings. Simple geometric applications: Doubling of bow angle, 4 point bearing. Determine position by plotting astronomical PL. Transferring of position circle. Determine position by running fix with leeway and current.	11
1.1.9 Information from Nautical charts, lists of lights and other publications Interpret : Contours, topography, depths, nature of bottom, Traffic lanes, zones Information from navigation chart Last correction. Information from publication 5011 Explain: IALA system of buoyage, Geographical range, luminous range, nominal range, raising and dipping distances. How to determine first/last sighting distances, Exercises on raising, dipping, first sighting and last sighting.	7
1.1.10 Tides Explain : Range, duration of tide, height of tide, spring and neap tides, standard and secondary port. Determination of heights for intermediate times & vice-versa for standard and secondary ports. Use of tidal stream atlas. Procedure to determine tidal stream direction and rate from approach charts.	8
1.1.11 Keeping a log Describe: Procedures for keeping log during ocean passages, coastal navigation and at anchor and in Port.	3
1.1.12 Passage Planning: Plan a passage using the procedures for passage planning. Explain: - Appraisal - Planning - Execution - Monitoring Exercises on passage planning	15
TOTAL	**73**

SUBJECT : CELESTIAL NAVIGATION (32 HOURS)

Topics	Hours
Competence No. 1: Plan and conduct a passage and determine position	
1.2 Celestial Navigation:	
1.2.1 Solar system Define: - Perihelion and aphelion - Solstices and equinoxes Earth-moon system: Define: - Apogee, perigee, conjunction, opposition, elongation Explain: - Solar and lunar eclipses - Phases of Moon	3
1.2.2 Celestial sphere and equinoctial system of co-ordinates Define: - Celestial sphere - Celestial poles - Celestial meridian - Equinoctial - Obliquity of ecliptic - Declination - First point of Aries	2
1.2.3 Hour angle Explain : - GHA, LHA, RA, SHA - Rate of change – Sun - 'v' corrections, 'd' correction - GP of the body	2
1.2.4 Daily motion and horizontal system of co-ordinates Explain: - Rational horizon - Zenith, Nadir - Vertical circle, Prime vertical - Elevated pole - Depressed pole - True altitude - True zenith distance - Polar distance - Azimuth - PZX triangle Draw figures on the plane of rational horizon	2

1.2.5 Sextant and altitude corrections Explain: - Reading a sextant, Errors of Sextant - Index error, how to determine - Visible, Sensible, and rational horizon - Observed altitude - Dip - Apparent altitude - Refraction - Semi-diameter and parallax - Use of Altitude correction tables - True altitude - True Zenith distance	2
1.2.6 Amplitude - theoretical and visible sunrise and sun set - calculation of true amplitude	2
1.2.7 Time Explain: - mean solar day - GMT, LMT and longitude relationship - Zone and standard times	1
1.2.8 Nautical Almanac Explain: - Information in Nautical Almanac and using it for celestial observations - Use of tables of corrections, incremental corrections - How to determine LHA of Sun, given GMT date and time, Longitude of observer	3
1.2.9 Latitude by meridian altitude of Sun Explain: - Relationship between altitude of pole and latitude Calculation of latitude by meridian altitude	2.5
1.2.10 Pole Star observations Explain: - Use of a_0, a_1, a_2 corrections Calculation of azimuth and position line, and position through which PL passes	2.5
1.2.11 Position fixing (Sun) Explain determination of PL by - Ex-Meridian of Sun - Longitude by chronometer - Intercept method - True azimuth of a body - Position by staggered observations. No calculations shall be based on ambiguity of time or date, incorrect application of hronometer error, index error or dip, etc.	8
1.2.12 Errors of compasses – Azimuths and Amplitudes Explain: - Determination of compass error by Celestial observations (Sun only)	2
TOTAL	**32**

SUBJECT : METEOROLOGY (30 HOURS)

Topics	Hours
Competence No. 1: Plan and conduct a passage and determine position	
1.4 Meteorology	
1.4.1 Ship borne meteorological instruments Explain: Principle, use, working, errors ,care and maintenance of following Aneroid barometer Barograph Hygrometer Stevenson's Screen Whirling Psychrometer Anemometer	4
1.4.2 The atmosphere, its composition and physical properties Explain: Troposphere, Tropopause, Stratosphere, Stratopause Insolation, Water vapour, Evaporation Condensation, Latent heat, Dew point, Absolute humidity, Relative humidity, and Vapour pressure	2
1.4.3 Atmospheric pressure Define: Pressure Explain: Change of pressure with height Average pressure Isobar, Isallobar Basic Units of pressure Barometric tendency	2
1.4.4 Wind Define: Wind Explain: Beaufort scale of wind force Pressure gradient force Coriolis force Buys-Ballot's Law Geostrophic wind, Gradient wind Use of geostrophic wind scale Difference between True wind and apparent wind Pressure distribution and wind Information available from wind rose Exercises on determining True wind velocity by using vector diagram, given the apparent wind, ships course and speed.	4
1.4.5 Cloud and precipitation Explain: Formation of clouds by turbulence, Orographic lifting, convection, convergence Describe: Ten basic cloud types Classification of clouds as per height Define: Rain, drizzle, hail	3

1.4.6 Visibility State: Visibility is reduced by presence of particles in the atmosphere Define: Fog, Mist and haze Explain: Formation of fog, mist, haze Different types of fog, seasons and areas Effect of fog, mist, haze Describe: Methods of estimating visibility at sea, by day and by night.	3
1.4.7 Climatology: The wind and pressure systems over the oceans Sketch and Explain: Mean surface pressure distribution Mean surface wind distribution Describe characteristics and location of: Doldrums, Inter-tropical convergence zones, Trade winds Monsoons, Explain with examples: Land and sea breeze Anabatic and katabatic winds Local winds	3
1.4.8 Sea and swell: Define: Sea waves, swell, storm surge Tsunami and bore tides	1
1.4.9 Weather Systems: Define: Air mass, depression. Explain: Formation of air mass, source region Structure of depressions, Define: Cyclone, Anticyclone, Col, Ridge, Trough Describe: Weather associated with Ridge, Col, Trough, Cyclone and Anticyclone Explain: How to identify depression, ridge, col, anticyclone on synoptic or prognostic chart	3

1.4.10. Weather Reports and Forecasting : Describe: Organisation, function and objectives of WMO Sources of weather information. Information flow between ships and meteorological offices. Various services provided by meteorological offices. Weather bulletins and contents of each section. Weather routeing services. Types of information received by facsimile receiver including storm warnings Recording and reporting weather : Explain: Need for meteorological Codes Use of Code and De-code book Procedure for Coding/ Decoding of weather messages Weather forecasting: Interpret: Symbols and Isobaric patterns on weather charts and facsimile charts Weather associated with the synoptic features. Explain: Basic concepts of weather routeing Use of climatological information from routeing charts How meteorological forecasts, synoptic and prognostic charts are used to modify route plan Advantages of shore based routeing	5
TOTAL	**30**

SUBJECT : BRIDGE EQUIPMENT (30 HOURS)

Topics	Hours
Competence No. 1: Plan and conduct a passage and determine position	
1.3 Electronic Systems of Position Fixing	
1.3.1 Global Positioning System **(GPS)** Explain: Working principle System configuration and frequencies used C/A and P codes How Position is determined Contents of Navigation message Various DOP's used Errors and alarms of GPS (Emphasize on accuracy of GPS fix in confined waters) Accuracy obtainable with GPS and how accuracy can be downgraded. WGS 84 datum- why GPS position cannot be directly plotted on the navigation chart Datum shifts Working principle of DGPS and its limitations Brief on Indian Navic System	5
1.3.2 Electronic Charts Display and Information System **(ECDIS)** Compare: ECDIS and paper charts Raster and Vector charts ECS and ECDIS	1
1.3.3.Automatic Identification System **(AIS)** Explain: Purpose of AIS The Principle Frequencies used Types of messages and time interval Information displayed on AIS screen Limitations of AIS Precautions during use of AIS for collision avoidance.	2
1.3.4.Long Range Identification and Tracking **(LRIT)** Explain: Purpose of LRIT Data transmitted by LRIT Authorised receivers of data Difference between LRIT and AIS Components of LRIT (CSP, ASP, DDP, IDE, IDC, Data Centers)	1
1.3.5 Voyage Data Recorder and Simplified Voyage Data Recorder **(VDR & S-VDR)** Explain: Purpose of VDR Data recorded on VDR Duration of data stored Modules of VDR Data recorded on S-VDR. Saving and retrieval of data in case if incident and training purpose	1
Echo-sounders and Speed Measurement	

1.3.6 Echo sounders Draw a block diagram Explain: Echo sounder as a valuable navigational aid Basic principle Effect of density, temperature and pressure on velocity of sound and the limits in which the true value may lie Ranging and Phasing Danger of wrong phasing Inaccuracies of equipment, scale error and measures to eliminate them. False echoes Errors due to Trim, List & positioning Various alarms and settings	2
1.3.7 Speed log Differentiate between ground reference speed and water reference speed. Electro magnetic log Explain: Principle The Errors Describe : Basic principle Doppler speed log Explain: Principle The Limitations Janus configuration Dual axis configuration and its uses during docking operations Calibration of the log List: The main error sources of Doppler log Describe: How ship's speed is transmitted to remote displays (block diagram) Draw: A Sketch showing how indication of distance run is derived from a speed log	3
Compass – Magnetic and gyro 1.3.8 The magnetism of the earth Explain: Earth as magnet, Magnetic poles, Variation and annual change	1
1.3.9 The magnetic compass Knowledge of the principles of magnetic compass Describe: Construction of Magnetic compass card: Liquid and Dry Explain: Lubber line, its purpose Deviation & Effect of heading Need for regular checking of error Describe: Procedure to determine Compass error Sketch: Section through compass, binnacle to show location of various correctors	4
1.3.10 Gyro-compass Knowledge of the principles of gyro compass Explain: Free gyroscope Gyroscopic inertia Precession of the axis Rate of precession is proportional to the torque Tilt & drift: Rate of drift and tilt North seeking ability of gyro compass	3

Procedure to determine Gyro compass error Alarms and controls State: Settling time of gyro compass Latitude and Steaming errors List: The equipment getting heading inputs from gyro compass.	
1.3.11 Automatic pilot Explain: The principle Various settings of the auto-pilot for optimal performance The procedures for change over and factors to take into account for change over Various alarms The need for regular checking and test of auto pilot The regulation regarding the use of auto pilot States: The automatic pilot should be included in the steering gear testing prior to ship's departure.	3
Steering control systems 1.3.12 Knowledge of steering control systems, operational procedures, and change over from manual to auto and vice-versa: Explain: Procedure for testing of steering system. Follow-up, Non follow-up	4
1.3.13 Emergency Steering	
TOTAL	**30**

SUBJECT : BRIDGE WATCHKEEPING & EMERGENCIES (93 HOURS)

Topics	Hours
Competence No. 2: Maintain a safe navigational watch	
Watch-keeping	
2.1.1 Describe: Watch-keeping Arrangements in accordance with the situations any limitation in qualifications or fitness of individuals individual roles, responsibility and team roles shall be established effective use of the resources available, such as information, installations/equipment and other personnel understand functions, operation and handling of installations/equipment Sharing of information from equipments Need for appropriate communication Bridge manning levels	3
2.1.2 Collision Regulations: Define: General definitions which apply to COLREGS as set in Rule 3. Vessel underway Vessel making way Explain: A proper lookout Full appraisal of situation and risk of collision Factors to take into account in determining safe speed Dangers of making assumptions on scanty information Actions to avoid collision in different situations Monitoring the situation till past and clear The structure and content of Rules, application and intent of COLREG 72 rules 1 to 41	16
2.1.3 Keeping a safe navigational watch as per Section A-VIII/2 and B-VIII/2 of STCW: Describe: Principles to be observed in keeping safe Navigational watch Navigational equipment Navigational duties and responsibilities Procedure for handing over and taking over watches Navigation with pilot embarked Navigation in coastal waters Action on receiving storm warning, Entries in logbook. Responsibilities of navigating officers with pilot embarked especially with respect to his advisory capacity and Master's command Explain: Circumstances in which the OOW should call Master, extra lookouts Explain: Need for periodic checks of navigational equipment Bridge Navigation Watch Alarm System Ship Security Alert System Contents of Bridge Procedures Guide Hours of work and rest	12

2.1.4 Keeping an effective anchor watch Describe: Procedures for handing over taking over watches. Action on receiving storm warning Explain: Entries to be made in deck logbook. Monitoring of weather information and prevalent circumstances especially if wind force increasing upto Beaufort Scale 5 and above	2
2.2 Effective bridge team work procedures Explain: Effective bridge team work procedures Principles of team work Proper lookout Frequency and extent of monitoring of traffic Maintain record of movement and activities related to safe navigation Effective communications Situational awareness Cultural awareness	4
2.3 The use of routeing in accordance with the General Provisions of Ship's Routeing including weather routeing	3
2.4 The use of reporting in accordance with general principles for ship reporting systems and with VTS reporting procedures.	3
2.5 Describe Navigational Equipment and Techniques used for safe navigation in restricted visibility Explain: Procedures for embarkation/ disembarkation of Pilot. Rigging a pilot ladder / combination ladder.	2
2.6 Bridge resource management principles: Explain: Allocation, assignment, and prioritization of resources Effective communication Assertiveness and leadership Maintaining situational awareness	5
5.1 Contingency plans for response to emergencies: List Contents of muster list, State: Duties are assigned for operation of remote controls:- M.E. Stop Ventilation Lubrication and fuel oil transfer pumps CO_2 discharge W/T doors Describe Importance of good communication between command team and emergency teams. Explain: Safety, Urgency and Distress signals and when to transmit. Actions to take to deal with:- Rescue of victims from enclosed spaces Heavy weather damage Rescue of survivors from another ship Leakages and spills of dangerous cargo.	4
Explain: Operation and use of :- EPIRB, SART, EEBD, TPA, Immersion suits, **LTA**	

5.2.1 Stranding Describe Actions to be taken after stranding Stop Engines Inform Master and E/R Sound General Alarm Lights and shapes Warning ships in the vicinity Assessing Initial damage Sounding of compartments Control of W/ T doors Sounding depths all round the ship using hand-lead Measures to prevent pollution as per SOPEP Assist Master Assess damage to the vessel Assess damage stability	2
5.2.2 Contingency planning (Collision): Describe: Command team, emergency team, back-up team, Engine room team. Actions to be taken after collision:- Stop Engines Inform Master and E/R Sound General Alarm Lights and shapes Warning ships in the vicinity Assessing Initial damage Sounding of compartments Control of W/ T doors Measures to prevent pollution as per SOPEP Prepare Survival crafts Stand-by for assisting other vessel Assist Master	2
5.2.3 Protection and safety of passengers: Explain Procedures for: Warning the passengers, Mustering and Roll call. Evacuating all passengers, Instructing/Training passengers during drills	1
5.2.4 Limiting damage following a fire or explosion: Explain : Actions on detecting fire(Galley, Accommodation, E.R., Cargo spaces) Alarms Muster and Roll call Control of ventilation Fire fighting equipment Fixed fire detection and extinguishing systems Boundary cooling Man entry First aid Assessment of damage and control measures Explain: Fire Control plan and its location Importance of drills and practice.	2

5.2.5 Procedure for abandoning ship: State: Verbal order by Master for abandoning ship. Actions: Muster and Roll call Extra blanket, Immersion Suits/TPA and provisions and fresh water Prepare survival crafts SART, EPIRB and VHF hand held radios Additional Pyrotechnics and signals Marshalling of survival crafts	3
5.2.6 Use of emergency steering Describe: Typical arrangement of auxiliary steering. Change over from bridge to steering compartment	1
5.2.7 Arrangements for towing and being taken in tow : Explain: Emergency towing requirements Contents of ETB Communications between two ships Methods of securing towing wire Preparations made by disabled ship	2
5.2.8 Rescue of persons from sea or from a vessel in distress State: Waiting for day light, Provide a lee, Describe Methods of rescue when sea conditions are too dangerous to use boat Use of scramble nets Preparation of rescue boats and equipment First aid measures and medical care Recovery of rescue boats	3
6.1 Measures for assisting a vessel in distress Describe: Contents of IAMSAR, Various search pattern Signals to be made by ships & aircraft	5
6.2 Man-overboard procedures Describe: Initial actions, Use of man-overboard function in GPS Williamson, Single, Scharnow's Turn Preparations for rescuing man, Picking up man Picking up boat.	5
Competence No. 9: Manoeuvre the ship	

9.1 Explain the Effects of : Displacement, draught, trim, speed and under-keel clearance on turning circles and stopping distances Outline: Provision and display of Manoeuvring DATA Define: Advance, transfer, drift angle, Tactical diameter, track reach, Head reach, side reach, Turning circles of a ship Compare: Turning circles for different speeds, load conditions Stopping distances in load and ballast conditions	4
9.2 Effect of wind and current on ship handling Explain: Pivot point of vessel Effect of wind depends on Wind strength, relative direction, windage area of ship, draft, trim Describe: Effect of current on motion of the ship	3
9.3 Squat and shallow-water and similar effects Define : Shallow water as depth less than 1.5 times draught Squat Blockage factor Bank cushion and suction effects State : Shallow water effect as- Increase in turning radius, reduction in speed, reduction of UKC, trim change, increased vibrations	3
9.4 Proper procedures for anchoring and mooring Describe Procedures for clearing anchors Safety measures by anchor party Procedure for anchoring Correct terminology for communication Use of anchor buoys Marking of the cable Sealing of spurling pipes Securing anchors for sea. Explain: Mooring plan Optimum mooring pattern and rope leads. Dangers of using different rope types in one mooring system. Use of fenders	3
TOTAL	**93**

SUBJECT : CARGO HANDLING & STOWAGE (60 HOURS)

Topics	Hours
Competence No. 10: Monitor the loading, stowage, securing and unloading of cargoes and their care during the voyage	
10.1 Dry Cargoes WIDS on bulk carrier	
10.1.1 Inspection and preparation of holds Explain: Need for inspection of holds Items to be inspected Importance of cleaning holds Checking weather tightness of hatch covers Use of dunnage& spar ceiling Disposal requirements of dunnage Importance of checking bilge suction Use of deodorising wash Blanking of ballast lines	2
10.1.2 Segregation and separation of cargoes: Explain: Segregation of different cargoes with reference to dangerous goods, dry, wet, delicate, dirty, valuable cargo Separation between parcels of cargo and methods of separation Separation between parcels of cargo for different ports	1
10.1.3 Securing cargoes: Explain: Contents of Lashing Code and Cargo Securing Manual Need for solid stow and securing Methods of blocking, lashing, shoring and trimming of cargo Method of securing heavy loads, vehicles, containers	1
10.1.4 Ventilation and control of sweat : Explain: Need for ventilation of cargo spaces Ship sweat and cargo sweat, and differentiate between them Factors affecting sweat Control of sweat by ventilation Operation of ventilation system Cargoes requiring special ventilation	2
10.1.5 Deck cargo : Explain: Dangerous Cargoes not permitted below deck Various types of Deck Cargo Efficient means of securing of deck cargoes Need of battening of cargo before loading deck cargo Safe access to equipment and spaces Unobstructed view from the navigating bridge Maximum permissible load Effect on stability due to absorption of water IMO code of safe practise for ships carrying timber deck cargo Hazards in carriage of Timber cargo Lashing arrangement of Timber cargo	2

10.1.6 Refrigerated cargo : Explain Chilled and frozen cargoes with examples. Preparation of holds Dunnaging requirements Inspections of the cargo, Use of brine traps, Purpose of temperature recording.	2
10.1.7 Container cargo: Explain: Arrangement of a container ship, and how the position of container is designated Factors affecting a container stow Stability, trim, list, stresses, stack height, weight, dangerous goods, special requirements, out of gauge containers Types, sizes and markings of containers Sketch and describe: Securing and lashing arrangement of containers	3
10.1.8. Ro- Ro Vehicles: Explain: Preparation of the car decks for the loading of trailers and vehicles, Floating decks. Procedures for opening, closing, securing of bow, stern and side doors and ramps	2
Care and maintain the systems. Maintaining water-tight integrity of the cargo decks.	
10.2 Cargo Handling	
10.2.1 Cargo-handling equipment : Describe: Care and maintenance of cargo slings, topping lifts, cargo runners, cargo blocks and derrick fittings. Explain: Use of snotters, canvas slings, vehicle slings, trays, pallets, nets, hooks and slings. Rigging plan Precautions to be observed when using forklifts on ships. Precautions in the use of deck cranes and grabs	3
10.2.2 Cargo-handling safety: Explain: Need for inspection of cargo gear prior work. Safe working load, breaking strength of a gear. Precautions during cargo operations. When to condemn a wire rope. Effect of heavy lift on sea worthiness and stability of the ship. Effective communication during loading and discharging. Dock safety regulations. Calculate : Safe working load, breaking strength, using various tackles and purchases (wire, chain and ropes)	4
10.2.3 Deep tank cargoes: Describe: Procedures for cleaning and preparation of deep tanks for loading Securing of deep tank lids	1
10.2.4 Keeping a safe deck watch in port Describe: Duties of the Officer on Cargo Watch	2

10.3 Dangerous, Hazardous and Harmful (Marine Pollutants) Cargoes	
10.3.1 Dangerous goods in packaged form : Explain: Classification of IMDG cargo. Properties, characteristics of substances covered by different classes. Marking, Labelling and placarding of dangerous goods. Information to be available prior commencement of cargo work (quantity, types of package, proper shipping name, classification, stowage, segregation and any special measures) Use of IMDG code (Volumes, parts and details of Dangerous Goods List) Precautions to be taken while working with IMDG cargo, Preparation of space, precautions to be observed during loading and discharging of explosives. Maximum quantity of explosives that can be carried. MFAG, EmS, IMGS. Stowage and segregation requirements as per segregation tables	3
10.3.2 Keeping a safe deck watch in port when carrying hazardous cargo : Define: Hazardous cargo Explain: Special requirements when carrying hazardous cargo Procedure for entry into enclosed spaces and permit to work and for rescue.	1
10.3.3 Bulk cargoes (other than grain): Explain: Contents and objective and information available in IMSBC code. Define: Angle of repose, flow moisture point, flow state, transportable moisture limit. Describe: Preparations of holds prior to loading bulk cargoes Separation between bulk cargoes/ package of dangerous goods Hazards associated with bulk cargoes and precautions prior, during and after loading of Coal, sulphur, iron ore, urea	2
10.3.4 Bulk grain cargoes: Define: Grain, Filled compartment, Partly filled compartment. Explain: Purpose and contents of International Grain code. Need for Inspection of holds for insect or rodent infestation. Preparation of hold and decks for carriage. Trimming of partly and filled compartments. How saucers or bundling arrangement reduces shift of grain. How surface of partly filled compartment secured against shift. Use of shifting boards. How to separate different grain cargoes loaded in same Compartment.	2

10.4 Oil, Chemical and Gas Tanker Piping and Pumping Arrangements **10.4.1 Tanker arrangement :** Sketch and Describe General arrangement of Cargo tanks Pump rooms Slop tanks Deep tanks Cofferdams Peak tanks Re-liquefaction system on a gas carrier Explain: Properties of various tank coatings and maintenance of same	2
10.4.2 Cargo piping systems : Sketch and describe: Direct pipe line and ring-main system, Piping arrangement in pump room Explain: Arrangement and use of deck lines, drop lines, stripping lines, cross overs, by passes, master valves, tank suction valves.	2
10.4.3 Cargo pumps : Describe: Centrifugal pump, deep well pump, reciprocating pump and Eductors	2
Hazards of oil, chemical, gas cargoes	2
10.5 Precautions before Entering Enclosed or Contaminated Spaces : Explain: Potentially dangerous space (cargo, fuel and ballast tanks, pump rooms, cofferdams, duct keels) Hazards in an enclosed space Procedures to be followed prior entry in such spaces Use of various instruments to check the gases in a compartment and calibration of same	2

10.6 Stowage Calculations **10.6.1 Cargo calculations and cargo plans:** Define : Bale and Grain capacity, Stowage factor, broken stowage, Load density, Ullage. Calculate: Quantity of cargo based on volume and height of space, broken stowage, stowage factor, load density and density of cargo Quantity of cargo using ASTM tables given density at 15 degrees Centigrade in vacuum, dimensions of the cargo space and ullage at observed temperature. (no list/ no trim) Using WRF, weight of cargo in tank. Explain: Quarter mean draft is equal to hydrostatic draft for a vessel with negligible list and trim. State: Quarter Mean draft=(F+A+6M)/ 8 Calculate: Displacement of the ship given six sided drafts and density of water using hydrostatic tables and quarter mean draft. Explain: Information available on cargo plans. How to prepare a cargo plan.	10
10.6.2 Heavy lifts Explain: Heavy lift Effect of heavy lifts on the seaworthiness. Effect of heavy lift on ships stability. Precautions while operating heavy lifts	1
Competence No. 11: Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks	
(11.1-11.3, 11.5-11.7) **Damage and Defects** Explain: Effect of loads on ships structure Various stresses on ship during motion in seaway Factors affecting corrosion of structure Need to inspect ships structure Critical areas &elements to be inspected Schedule of inspection and recording Enhanced survey programme. **11.4 Corrosion in cargo spaces and ballast tanks** Explain: Causes of corrosion in cargo and ballast spaces How to identify corrosion How to prevent/reduce corrosion	6
TOTAL	**60**

SUBJECT : SHIP CONSTRUCTION (30 HOURS)

Topics	Hours
Competence 13: Maintain sea-worthiness of the ship	
13.1. Ship construction(Including corrosion and maintenance of Hull and fittings)	
13.1.1 Ship dimensions and form Illustrate : Mid-ship section General cargo ships, Oil, chemical and gas tankers, Bulk carriers, Combination carriers, Container ships, Ro-Ro ships Passenger ships Side elevation and plan layout of General cargo ships, Oil, chemical and gas tankers, Bulk carriers, Showing holds/ tanks, engine room, hatchways, DB tanks, peak tanks and position of bulkheads Define: Camber, Rise of floor, Flare, Shear, Rake, Parallel middle body	6
13.1.2 Ship stresses Explain: Hogging Sagging Racking Panting Pounding Slamming Torsion stresses Localized loading Water pressure loads on ship's hull Liguid pressure loads on tank structures Shear Force and Bending moments Describe: Constructional features to compensate for above stresses	3

13.1.3 Hull structure : Explain: Standard steel sections (flat plate, offset bulb plate, equal angle, unequal angle, channel, tee). Structural components on ship plans. Frames, floors, beams, knees, brackets, shell plating, decks, tank tops, bulkheads Stiffeners, Pillars, Girders, Coamings, Bulwarks and Breast hook. Stress concentration in the deck round hatch opening Loss of strength at hatch opening Why transverse bulkheads have vertical corrugations and longitudinal bulkheads have horizontal corrugations. Bilge keel Sketch and label: Double bottom structure for longitudinal and transverse framing. Combined system of framing on transverse sections of the ship A plane bulkhead showing connections to sides, deck and double bottom Corrugated bulkhead Duct keel Deck edge, attachment between shear strake and stringer plate Connection of superstructures to the hull at the ship side	6
13.1.4 Bow and stern : Explain with Sketch Stern frame Panting and pounding arrangements Transom stern showing connections to the stern frame	2
13.1.5 Fittings : Sketch and describe: Weather tightness of the hatches, coamings and cross joints including cleating arrangements Transverse section showing arrangement of hatch coamings, and deep webs Hatch corner and structural arrangements in plan view Openings in oil, chemical, gas tankers, Chain lockers and attachment of cables, Bilge piping system, strum box Ballast system, sounding and air pipes Deck freeing arrangements, freeing ports, scuppers and open rails Hold drainage systems and related structure Typical mooring / anchoring arrangement in forecastle showing the leads of mooring Fire main arrangement Describe Roller, multi angle, pedestal and panama fair lead Mooring bitts showing their attachment to the decks Cable stopper	5

13.1.6 Rudders and propellers : Sketch and describe Rudders: balanced, semi-balanced Propeller: Boss, Rake, Skew, Face, Back, tip, radius, pitch Stern tube- oil and water lubricated Explain: Purpose of rudder carrier and pintles Rudder trunking Arrangement of watertight gland around the rudder stock Controllable pitch propeller	5
13.1.7 Load lines and draught marks Define: Deck line, freeboard, Plimsoll line FP, AP, LBP, LOA, Moulded depth, Breadth, Draft Sketch Load lines of a vessel. Use of loadline zone chart	3
TOTAL	**30**

SUBJECT : SHIP STABILITY (30 HOURS)

Topics	Hours
Competence 13: Maintain sea-worthiness of the ship	
13.2 Stability	
13.2.1 Displacement : Explain: Archimedes Principle- When mass of a ship changes, mass of water displaced changes by equal amount Graph or scale can be drawn to show relationship between displacement and draft Define: Light displacement, load displacement, dead weight Draft, Mean draft and hydrostatic draft Block co-efficient Water plane area co-efficient TPC Explain: Use of deadweight scale Why TPC changes with draft and density. Use of TPC to determine change in draft after loading / unloading Calculations based on above	2
13.2.2 Buoyancy : Explain: Buoyancy and displacement, reserve buoyancy, freeboard. Define: Centre of buoyancy, KB and LCB. Explain: Why KB and LCB change with draft, heel and trim.	2
13.2.3 Fresh water allowance : Explain why draft changes with density. Define: FWA and DWA. Explain: How to Calculate of FWA and DWA.	2
13.2.4 Staticalstability : Define: Righting lever, Righting moment Explain: How variations in draft affect GZ and stability of ship. Calculate GZ values based on displacement, draft and density.	2

13.2.5 Initial stability : Up to 10^0 angle of heel Define: Transverse metacentre: State for small angles of heel meta centre can be considered as fixed point. Explain: KM is dependent on draft. KM-KG=GM (metacentric height) For small heel GZ= GM Sin θ For a ship to be stable, GZ should be positive. Use of hydrostatic curves to find KM. Effect of movement of 'G' on values of GZ. State: That for a normal ship, the minimum initial GM should not be less than 0.15 meters Calculate GM of the ship given weights and centre of gravity of various compartments.	5
13.2.6 Angle of loll : Define: Capsizing lever Angle of loll Explain: Why ship rolls about angle of loll. Corrective actions.	2
13.2.7 Movement of the centre of gravity: Define: Centre of gravity, KG, LCG Explain: Effect on position of centre of gravity of a ship due to loading, discharging, shifting of weight, and when lifted by ship's gear GG1= (w X d) / Final W Effect of consumption of bunkers and fresh water on KG Absorption of water/ moisture by deck cargo Exercises on shift of 'G'(including ship stability booklet	3
13.2.8 List and its correction : Explain: Listing moment Why vessel lists due to transverse shift of 'G' Tan angle of list = GG1 / GM Why angle of list changes due to change in draft and KG Reduction of range of stability due to list Increase in draft due to list Exercises on list.(including ship stability booklet)	2
13.2.9 Effect of slack tanks: Explain: How centre of gravity of the liquid shifts in a partly filled tank when vessel rolls or lists. Free surface effect Free surface effect depends on breadth of the tank, and underwater volume of ship.	3
FSM=(Moment of inertia X density of liquid) Free surface moment How to determine FSC FSC= Total FSM /W Effect of subdivision on free surface moment. GM fluid Exercises on FSC and GM fluid.	

13.2.11 Trim : Define: Trim Centre of flotation as pivot point/ tipping centre MCTC Trimming moment (TM) Explain: Trim = TM/ MCTC Use of hydrostatic tables to find LCF, MCTC Exercises on Calculation in Salt water due to loading/discharging/shifting(box shaped vessel) Final trim, forward and aft drafts	3
13.2.12 Actions to be taken in the event of partial loss of intact buoyancy : closing of watertight doors Cross flooding arrangement.	0.5
13.2.13 State: Information available from the loadicators.	0.5
13.2.14 Ships stability criteria Effect on ships behaviour of Large GM(Stiff), Low GM (Tender) Explain Stable, Neutral and Unstable equilibrium	1
13.2.15 Use of stability booklet and hydrostatic data Calculations based on hydrostatic data.	2
TOTAL	**30**

SUBJECT : SHIP SAFETY & ENVIRONMENTAL PROTECTION (45 HOURS)

Topics	Hours
12.1 Knowledge of the precaution to be taken to prevent pollution of the Marine environment Explain: Precautions to be taken during:- Bunkering Loading/ discharging Oil, Chemicals and hazardous cargoes Tank cleaning Pumping out bilges. Purging and Gas freeing	3
12.2 Knowledge of anti-pollution procedures & all associated equipment	
12.2.1/ 12.2.2 **The International Convention for the Prevention of Pollution from Ships.** Explain: MARPOL-73/78 : Contents and Purpose	2
12.2.3/ 12.2.5 Control of oil from machinery spaces Explain: Oil and water mixture Particularly Sea sensitive areas (PSSA) Discharge provisions for oil and oily waste from machinery spaces outside special areas and within special areas, Bilge water holding tank Oil water separator. Oil discharge, monitoring and control system	3
12.2.6 Oil Record Book (Part I, Machinery Space Operations) and Part II (Cargo and ballast operations): Describe: Entries to be made Need to maintain records **12.2.7 Prevent accidental pollution by oil:** Describe : Checklist while bunkering / transferring oil Precautions during any oil operations. Shipboard Oil Pollution Emergency Plan (SOPEP) and associated equipment	1 2
12.2.4/ 12.2.8 Prevent accidental pollution by Chemicals Explain: Contents of MARPOL Annex II Chemical discharge criteria in special and other areas. Monitoring and control system Need to maintain records Cargo Record Book for Chemical Cargoes SMPEP and associated equipment	2
12.2.9 Operating procedures of anti-pollution equipment: Describe and Sketch (BLOCK Diagram wherever applicable) Sewage treatment plant Incinerator Comminutor and grinder Ballast water treatment plant **Sewage: Annex IV** Explain: Discharge criteria Holding tanks	1.5

12.2.10 Garbage Management System, Ballast Water Management and their discharge criteria **1) Garbage: Annex V** Explain: Special areas Discharge criteria Garbage management plan Entries in Garbage record book **2) Ballast Water Management** Explain: Discharge criteria. Ballast water management plan Testing of ballast Methods of control of organisms	1.5 1 1
12.2.11 Annex VI - Air pollution Describe: Control measures Special areas Volatile Organic Compounds(VOC) management plan	1
12.3 Proactive measures Explain: Proactive measures to protect the marine environment	1
Competence-No. 17: Monitor compliance with legislative requirements	
17.1 IMO/ILO Conventions and Codes Explain: Contents, objectives, application and latest amendments : SOLAS 1974, as amended MARPOL 73/78, as amended Load Line ISM Code ISPS Code STCW 78, as amended MLC 2006,as amended	2
17.2 Safe working practices : Describe: Contents, Objectives of: Code of Safe Working Practices Describe: Precautions and procedures to follow:- Working aloft Working over side Entry in enclosed spaces Handling ropes and wires Berthing and un-berthing Hot work, Welding Boarding arrangement for pilots Explain: Safety Committee Explain the Importance of record keeping and action tacking , safety meeting minutes to be reviewed, corrected and approved by the meeting participants and by shore office/Marine superintended in-charge of the vessel Duties of Safety officer Permit to Work systems Personal Protective Equipments (PPE) and uses. Actions in case of oil spill on deck	4

17.3 Indian Merchant Shipping Act and Rules: Describe: Statutory surveys Statutory certificates, Other Certificates Preparations for SEQ surveys Validity of Certificates Territorial water, Inland sea Contiguous zone Base line Continental shelf and EEZ	4
17.4 Classification Society Explain: Role of Classification Societies. Surveys conducted Certificates issued and validity Need for intermediate verification	2
18.1 Shipboard personnel management and training. Explain: Effective communication Assertiveness, leadership, Motivation Competent Person: Experience, Knowledge, Skills, Attitude, Age. Fatigue, Stress Control of human errors Situational awareness Need for familiarisation with work environment and procedures. Cultural Awareness	2
18.2 International and National Laws and Conventions Explain: Need for MLC 2006 Titles of MLC 2006 List of Items to be inspected (DMLC 1 &2) Duties and responsibility of seafarer Certificate and validity.	2
18.3 Task and workload management: Explain: How to:- Plan and coordinate Assign work to personnel Manage Time and resources Prioritise	3
18.4 Effective resource management: Explain: Allocation, assignment, and prioritization of resources	3
18.5 Decision-making techniques: Explain: Need for Situation and risk assessment What is risk assessment When, Why and Who should do the risk assessment How to identify and consider generated options. How to select course of action How to evaluate outcome Review of effectiveness	3
TOTAL	**45**

SUBJECT : SIGNALS (13 HOURS)

Topics	Hours
Competence No. 7: Use of IMO Standard Marine Communication phrases and use English in written and oral form.	
7.1 English language.	
7.1.1 Adequate knowledge of the English language to enable the officer: to use charts and other nautical publications to understand Meteorological information and messages concerning ships safety and operation to communicate with other ships coast stations and VTS centres. to perform the officer's duties also with a multilingual crew 7.2 Standard Marine Communication Phrases 7.2.1. Use and understand the IMO Standard Marine Communication Phrases (SMCP)	2
Competence No. 8: Transmit and receive information by visual signalling	
8.1 Signalling by Morse Code (Transmission & reception): To recognise Morse symbols for the alphabet and numerals, transmit and receive single letter signals or numerals by Morse light (at the rate of 8 characters per minute) as specified in the International code of signals, Ability to transmit and receive groups of distress, urgency & safety signals	8
8.2 Using International Code of Signals: Recognition of International codes flags and pendants, purpose of International code of signals, meanings of single-letter Flag signals, International Code Signal of distress	3
TOTAL	**13**

TERRESTRIAL AND COASTAL NAVIGATION	73
CELESTIAL NAVIGATION	32
METEOROLOGY	30
BRIDGE EQUIPMENT	30
BRIDGE WATCHKEEPING & EMERGENCIES	93
CARGO HANDLING & STOWAGE	60
SHIP CONSTRUCTION	30
SHIP STABILITY	30
SHIP SAFETY & ENVIRONMENTAL PROTECTION	45
SIGNALS	13
GENDER SENSITIZATION	6
INTERNAL ASSESSMENT (MCIAWE &FCIAWE)	36
FEEDBACK	2
TOTAL	**480**

ANNEXURE – 2

Certificate No.

Name of the Institution

Full postal address

Phone, Fax,

E-mail Address

THIS IS TO CERTIFY THAT _____

Date of Birth _____

Indian National Database of Seafarers (INDoS No.) _____

has successfully completed a training course held from _____ to_____ for:

Competency Course for NWKO-NCV

Course is approved by the Directorate General of Shipping and meets the requirements laid down in Regulation I/3, II/1 and Section A-II/1 & Table A-II/1(as applicable for Officer Incharge of a Navigational Watch on ships of between 500 and 6000 gross tonnage engaged in Near Coastal Voyages) of the STCW Convention, 1978, as amended.

The Candidate has also met the additional criterion specified in the STCW Convention specific to the issue of the Certificate.

This certificate is issued under the authority of the Directorate General of Shipping, Ministry of Ports, Shipping and Waterways, Government of India.

Date of Issue : _____

Date of Expiry : NA

_____

Signature of Candidate

_____

Name and Signature of Course In-charge

_____

Name and Signature of Dean / Principal

ANNEXURE - 3

NWKO (NCV) - SUMMARY OF EXAMINATION (FUNCTION WISE) REFERENCE TABLE A –II/1 – STCW 2010

APPENDIX M-II/5C

FUNCTION: NAVIGATION AT OPERATIONAL LEVEL

NO.	SUBJECT	COMPETENCIES COVERED	MODE OF EXAMINATION	DURATION OF EXAM	MAXIMUM MARKS	PASS MARKS
1	Terrestrial and Coastal Navigation	1	Written	3 Hours	200	140
2	Celestial Navigation	1	Written	3 Hours	200	140
3	Meteorology	1	Written	2 Hours	100	50
4	Bridge Watchkeeping&Emergencies	1,2,4,5,6,9	Written	3 Hours	200	100
5	Radar Observer Simulator Course	3	Modular	2 Weeks Course		
6	ARPA Simulator Course	3	Modular	1 Week Course		
7	Signals and communications	7,8	Visual and Oral	1 Hour	100	70
8	ECDIS	7	Modular	1 week		
9	Orals	1,2,4,5,6,9				

FUNCTION: CARGO HANDLING & STOWAGE AT OPERATIONAL LEVEL

NO.	SUBJECT	COMPETENCIES COVERED	MODE OF EXAMINATION	DURATION OF EXAM	MAXIMUM MARKS	PASS MARKS
1	Cargo Handling and Stowage	10,11	Written	3 Hours	200	120
2	Orals	10,11				

FUNCTION: CONTROLLING THE OPERATION OF THE SHIP & CARE FOR PERSONS ON BOARD AT THE OPERATIONL LEVEL

NO.	SUBJECT	COMPETENCIES COVERED	MODE OF EXAMINATION	DURATION OF EXAM	MAXIMUM MARKS	PASS MARKS
1	Ship Construction, Stability, Ship Safety and Environmental Protection	12,13,17,18	Written	3 Hours	200	120
2	Advanced Fire Fighting Course	14,19	Modular	1 Week Course		
3	Proficiency in Survival Craft & Rescue Boats	15,19	Modular	1 Week Course		
4	Medical First Aid Course	16,19	Modular	1 Week Course		
5	Orals	12,13,17,18				

ANNEXURE- 4

LIBRARY BOOKS, PUBLICATIONS ETC. TO INCLUDE

Mandatory International and National Publications

1. STCW 1978, as amended
2. IMO Model Course 7.03, as amended
3. SOLAS 1974, as amended
4. MARPOL 73/78, as amended
5. IMO Load Line Convention 1966, as amended
6. IMO LSA Code, as amended
7. COLREGS 1972, as amended
8. IAMSAR Vol III
9. ICS Bridge Procedures Guide
10. The Shiphandler's Guide By R.W. Rowe
11. Code of Safe Practices For Merchant Seamen
12. DGS Orders, Circulars And MS Notices
13. International Safety Guide for Oil Tankers & Terminals (ISGOTT)
14. Admiralty Manual of Seamanship
15. Admiralty Manual of Navigation
16. Training Examination and Assessment Programme (TEAP) published by DG Shipping

Reference Books may include :

1. The Theory & Practice of Seamanship by G. Danton
2. Nautical Watchkeeping by Capt. H. Subramaniam
3. Ship Board Operations by H.I. Lavery
4. Stability, Trim and Cargo Calculations on MV Hindship and Oil Tankers by Jos and Rewari
5. Ship Stability Volumes I, II & III by Capt. H. Subramaniam
6. Ship Stability by CaptD.R. Derrett
7. Merchant Ship Construction by D.A. Taylor
8. Ship Construction by D.J. Eyers
9. Ship Construction Notes by Kemp and Young
10. Ship Construction by Capt. Edirch Fernandes
11. Safety, Emergency and Environmental Protection by Errol Fernandes
12. Practical Navigation by Capt. H. Subramaniam
13. Ship borne Radar & ARPA by Capt. H. Subramaniam
14. ARPA by A. Bole
15. Radar &Electronic Navigation by G.J. Sonnenberg
16. Bridge Equipment by Edrich Fernandes
17. Ship's Magnetism & Magnetic Compass by Merrifield
18. Ship's Magnetic Compass by Joseph & Rewari
19. Marine Gyro Compass by Frost & Grant
20. Bridge Equipment by Capt. A.G. Bhatia
21. Marine Meteorology by Capt. H. Subramaniam
22. Basic Marine Engine Reeds Series
23. Introduction to Marine Engineering by D.A. Taylor
24. Engineering Knowledge for Deck Officers by J.K. Dhar

25. Business and Law for the Shipmaster by F.N. Hopkins
26. Indian Merchant Shipping Act
27. Chartwork for Deck Officers by Capt. C.L. Dubey
28. Chartwork By Capt. S.S. Choudhary
29. Celestial Navigation by Capt. S.S. Choudhary
30. Chartwork by Capt. S.K. Puri
31. Radar and AIS by Dr. Andy Norris (Nautical Institute)
32. IMDG Code
33. IBC Code
34. ISMBC
35. BLU Code
36. Grain Code
37. IGC Code
38. STCW Code
39. Timber Code
40. Basics stability for marine officers by Capt. C.L. Dubey

TECHNICAL EQUIPMENT TO INCLUDE:

1 Magnetic Compass in a Binnacle with corrections
2 Gyro Compass (Not necessarily operational)
3 Marine sextant.