भारत सरकार/ GOVERNMENT OF INDIA
पोत परिवहन मंत्रालय / MINISTRY OF SHIPPING
नौवहन महानिदेशालय / DIRECTORATE GENERAL OF SHIPPING
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13 OCT 2011

STCW 2010 CIRCULAR No. 2 of 2011

No: TR/CIR/6(9)/2011 **Dated: 07th October, 2011**

Subject : GUIDELINES FOR THE CONDUCT OF CHIEF MATE (PHASE I and II) COURSE

1. Maritime Safety and efficiency is of utmost concern to the Directorate General of Shipping (DGS), the constituted authority of the Government of India for all maritime affairs.

2. In view of the 2010 amendments to STCW Convention, the revision of existing guidelines for the CHIEF MATE [PHASE I & II] COURSE has been carried out by the DGS in consultation with the training institutes and employers (shipowners and manning agencies).

3. It is expected that training institute would follow these guidelines in letter and spirit.

4. The above guidelines shall come into force on commencement of the CHIEF MATE [PHASE I & II] COURSE w.e.f. 15th September, 2011.

5. The processing fee for the said course is fixed as ` 25,000/- each, which is required to be paid along with the proposal for the approval of the course.

6. This issues with the approval of the Director General of Shipping and ex-officio Addl. Secretary to the Government of India.

[Mahua Sarkar]
DY. DIRECTOR GENERAL OF SHIPPING

To,

1. All Maritime Training Institutes
2. All Academic Council
3. INSA/FOSMA/MASSA
4. Chief Surveyor with the Govt. of India
5. Nautical Advisor to the Govt. of India
6. Shipping Master
7. Computer Cells
8. Guard File
9. Sr. PS to DG[S] for information

GUIDELINES FOR THE CONDUCT OF

CHIEF MATE (PHASE I and II) COURSE

ISSUED BY

THE DIRECTORATE GENERAL OF SHIPPING

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Chief Mate (Phase I and II) Course

1. BASIC DETAILS OF THE COURSE

1.1. Aims:

This course covers part of the education and training required under Regulation II/2 and aims to meet the standards of competence specified in Section A-II/2 of the STCW 2010.

1.2. Objectives:

The objectives of this course are to prepare a candidate to appear for the examinations of Phase I and Phase II of the Certificate of Competency as Chief Mate of a Foreign going Ship.

1.3. Application:

Compliance with these guidelines shall be mandatory for all institutes from **15th September 2011 (since the actual approval was accorded on 12.09.2011).**

2. QUALIFICATION & ELIGIBILITY OF STUDENTS

2.1. Entry Standards:

Hold a certificate of competency as Second Mate of a foreign going ship (Officer in charge of a navigational watch on ships of 500 GT or more) issued by Government of India

and

Have approved sea –going service for a period of not less than 9 months for Phase I and 18 months for Phase II.

2.2. Required Attendance:

The minimum attendance required shall be 90%. However, in exceptional cases, the head of the institution may accept attendance of 75% and above, if he is satisfied that the reasons for reduction from 90% are genuine and that the student's performance in the course has been good. The institute shall keep proper records of attendance. On successful completion of the course, a student will be issued a certificate, by the training institution, as per **Annexure 2**. Students falling short of the required attendance, or unsuccessful in their Internal Assessment Tests, must not be given this certificate or any similar certificate that could be mistaken for such a certificate.

If the attendance of the student is less than 75%, the student shall be required to undertake further training to compensate for the absence period (and in any case this period shall not be less than one month) in subsequent batch to qualify for attendance and re-assessment.

2.3. Course intake limitations:

2.3.1. The number of students should not exceed 40 per class.

2.3.2. For chart work exercises where greater inter-action is necessary, the class should be sub-divided into groups of 20 students per faculty.

3. INFRASTRUCTURE REQUIREMENT

3.1. Physical requirement for classrooms, black/white boards, overhead projector, screen, notice board, faculty room, study environment and teaching equipment are to be provided as per DGS guidelines.

3.2. The institute shall have a library-cum-reading room of not less than $36m^2$ in area.

3.3. List of library books and equipment to include the items contained in **Annexure 1**.

4. COURSE DETAILS

4.1. Course duration:

Phase I: 320 hours,

Phase II: 270 hours.

Note: Upgradation Course of 40 hours for conversion from STCW 1995 to STCW 2010 may be done together with Phase I or as a separate module.

4.2. Course outline and curriculum: As per Training and Assessment Programme (TAP) as revised.

4.3. Detailed teaching syllabus: As attached.

(Reference to be made to IMO model course 7.01 as revised.)

5. HOLIDAYS

5.1. Sundays shall be holidays.

5.2. Independence Day and Republic Day shall be compulsory holidays.

5.3. Students shall normally enjoy the holidays observed by the Govt of the state in which the institute is located.

6. FACULTY REQUIREMENT

6.1. Qualifications and experience of course in charge and faculty members:

Certificate of Competency, issued or recognised by the Government of India, as Master of a Foreign Going Ship

and

At least One year experience as Chief Officer and experience as a regular (full time) faculty member for at least two years in Competency Courses or B.Sc Nautical Sciences/

Diploma in Nautical Sciences Course

or

Extra Master Certificate.

6.2. Training of Trainers & Assessors Course:

As per IMO Model Course 3.21

6.3. Visiting faculty members:

Qualifications and experience of visiting faculty members should be the same as that of regular faculty members.

In lieu of the above, a person with specialisation & 3 years experience in the field related to the lecture.

6.4. Age limit for regular faculty members:

As per DGS Guidelines

7. FACULTY STRENGTH

7.1. For a class (maximum 40 students), not less than two Master Mariners (including the course in-charge) shall be the regular (full time) faculty. However, in cases where Institute is also conducting other courses that require Master Mariner faculty, one Master Mariner (including the course in-charge) on regular (full time) basis will suffice provided at least two Master Mariners on regular basis form the faculty for this course.

7.2 A minimum of 50% of the lectures on the weekly timetable shall be delivered by regular (full time) faculty members. Others may be on full-time or on visiting (part time) basis.

8 COURSE DURATION

1. Phase I

Total Teaching hours for above mentioned course is 320 hours @ 30 hours per week

1 week for Assessments (internal and final assessment).

1 week to account for Public holidays and contingencies.

2. Phase II

Total Teaching hours for above mentioned course is 270 hours @ 30 hours per week

1 week for Assessments (internal and final assessment).

0.5 week to account for Public holidays and contingencies.

Note: Upgradation Course of 40 hours for conversion from STCW 1995 to STCW 2010 may be done together with Phase I or as a separate module.

9 ASSESSMENT

The institute shall carry out two written examinations as internal assessment, one of which should be conducted mid way during the course and the other, near the end of the course.

10 QUALITY STANDARDS

As per DGS guidelines.

11 INSPECTIONS

As per DGS guidelines.

12 FEES TO GOVT.

As per DGS guidelines.

ANNEXURE 1

LIBRARY BOOKS, PUBLICATIONS, ETC. TO INCLUDE:

Mandatory International and National Publications

1) STCW 95 as amended in 2010
2) IMO Model Course 7.01 as may be revised
3) SOLAS 1974 as amended
4) MARPOL 73/78 as amended
5) IMO Load Line Convention 1966
6) IMO LSA Code
7) COLREGS 1972 as amended
8) IAMSAR Vol III
9) Code Of Safe Practices For Merchant Seamen
10) DGS Orders, Circulars And MS Notices
11) Indian Merchant Shipping Act
12) Merchant Shipping STCW rules
13) Maritime Labour Convention (MLC)- 2006
14) Polar Code
15) ISM Code
16) ISPS Code
17) Training and Assessment Programme (TAP) published by DG Shipping

Reference Books may include:

1) A Guide to the Collision Avoidance Rules- Cockcroft
2) A Mariner's guide to preventing collisions- Capt. Y. Chhabra
3) Admiralty Manual of Navigation
4) Admiralty Manual Of Seamanship
5) Advanced Stability for Marine Officers by Capt. C.L.Dubey
6) Arpa By A. Bole
7) Auditing the ISM Code by Mr. Ajoy Chatterjee
8) Basic Marine Engine Reeds Series
9) Bridge Equipment By Capt. A. G. Bhatia
10) Bridge Equipment By Edrich Fernandes
11) Bridge Procedures Guide
12) Bridge Team Management – A Practical Guide – Capt. A. J. Swift
13) Business And Law for the Shipmaster By F.N. Hopkins
14) Cargo Work for Maritime Operations - D.J.House
15) Cargo work- L.G.Taylor
16) Celestial Navigation by Capt. C.L.Dubey
17) Chart Work for Deck Officers by Capt. C.L.Dubey
18) Engineering Knowledge for Deck Officers by J K Dhar
19) ICS Bridge Procedures Guide
20) International Lights, Shapes and Sound Signals - D.A.Moore
21) International Safety Guide For Oil Tankers & Terminals (ISGOTT)
22) Introduction to Marine Engineering By D.A. Taylor
23) Marine Meteorology By Capt H. Subramaniam
24) Maritime legislation and shipboard management by Capt. M.V.Naik and Capt. C.L.Dubey
25) Merchant Ship Construction By D.A. Taylor
26) Meteorology for Mariners- Meteorological Office- HMSO

27) Meteorology for Seafarers- Frampton and Uttridge
28) Multimodal Transport- Dr. Hariharan
29) Nautical Watchkeeping By Capt. H. Subramaniam
30) NAV Basics: Ocean Offshore and Celestial Navigation Vol.2
31) NAV Basics: The Earth, The Sailings, Tides & Passage Planning Vol.1
32) NAV Basics: Watchkeeping & Electronic Navigation Vol.3
33) Nicholl's Seamanship and Nautical knowledge - Cockcroft, A N
34) Practical Navigation By Capt. H. Subramaniam
35) Principles of Navigation by Capt S.S.S. Rewari & Capt. T.K. Joseph
36) Radar & Electronic Navigation By G.J. Sonnenberg
37) Radar Observer's Handbook: for Merchant Navy Officers
38) Reed's General Engineering Knowledge for Marine Engineers, - Jackson L, Morton T.D
39) Reed's instrumentation and control systems. - Jackson, L
40) Safety, Emergency And Environmental Protection By Errol Fernandes
41) Seamanship Techniques - D.J.House
42) Ship Board Operations By H.I. Lavery
43) Ship borne Radar & ARPA By Capt. H. Subramaniam
44) Ship Construction By Capt. Edrich Fernandes
45) Ship Construction By D.J. Eyers
46) Ship Construction Notes By Kemp and Young
47) Ship Stability By D.R. Derret
48) Ship Stability Volumes I, II & III by Capt. H. Subramaniam
49) Ship's Magnetism & Magnetic Compass By Merrifield
50) Shipmaster's Business Self-Examiner, - Maclachlan, Malcolm- Nautical Institute.
51) Stability, Trim and Cargo Calculations on MV Hindship and Oil Tankers by Capt. Joseph and Capt. Rewari
52) Symbols and Abbreviations used on Admiralty Charts (Chart 5011)
53) The Ship handler's Guide By R.W. Rowe
54) The Shipmaster's Business Companion, - Maclachlan, Malcolm- Nautical Institute.
55) The Theory & Practice of Seamanship By Danton

TECHNICAL EQUIPMENT TO INCLUDE:

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

ANNEXURE 2

CHIEF MATE F.G (Phase I/ Phase II)

Forms of Certificate to be issued

Candidate Photograph

Name of the Institution

Full postal address

Phone, Fax, E-mail Address

Certificate No.:

INDOs No. for Institute:

ATTENDANCE CERTIFICATE

This is to certify that Mr. _____,

date of birth _____ C.D.C. No._____P.P. No:_____ of (issuing country) _____ Indian National Database of seafarers (INDos) No:_____ was a student of this college for the Chief Mate F.G Phase I/ Phase II Course from _____ to _____.

His attendance during the above period and his performance in Internal Assessment Tests was satisfactory.

His name is at Sr. No. _____ in the consolidated list of students of this course sent to the Chief Examiner of Masters and Mates and Principal Officers of all MMDs conducting the respective examination, vide letter No. _____dated_____.

Signature of Student	Date of issue and seal of institute	Signature & name of Course Incharge/HOD	Signature & name of Head of the Institution or Authorized person

. Indian Nationals must fill in only Indian C.D.C. No.

COURSE: *CHIEF MATE (F.G) - PHASE – I*

DETAILED TEACHING SYLLABUS

SUBJECT: *PRACTICAL NAVIGATION*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence No. 1: Plan a voyage and conduct navigation			
1.1 Voyage Planning and Navigation for all Conditions			
1.1.1/ 1.1.2 Coastal Navigation / Ocean Voyages : *Describe* - *Ocean passages for the world, and Sailing directions,* - *Routeing charts, and routeing in accordance with general provisions of ship's routeing* - *Reporting procedures in accordance with general principles for ship reporting systems and with VTS procedures.* - *Planning navigation and plotting courses taken into account restricted waters, meteorological conditions, Ice, Restricted visibility, Traffic separation schemes, vessel traffic service (VTS) areas, and Area of extensive tidal effects.* *Explain* - *Various stages of Passage Planning (Appraisal, Planning, Execution, Monitoring)* *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.* - *How to determine distance off by vertical sextant angle* *Exercises:* - *Determine position by bearings and ranges.* - *Determine position by plotting astronomical position lines.* - *Transferring of position lines* - *Determine position by running fix with leeway and current.* - *Plan a passage between two ports from berth to berth using the procedures for passage planning.* *(No questions on resolution of cocked hat)*	*8*	*20*	
Competence No. 2: Determine position and the accuracy of resultant position fix by any means			
2.1 Position Determination			
2.1.1 Terrestrial navigation: Ability to use appropriate charts, errors in position lines, notices to mariners and other publications.	*2*	*15*	

Explain - *How errors may occur in position fixing and how they are minimized.* *Exercises on* - *Chart correction and other nautical publications including T&P notices using information from Notices to Mariners and corrections using tracings.* - *Mercator Sailing*			
2.1.2 Great-circle sailing: *Explain* - *Spherical triangle* - *Napier's Rules* - *How to transfer GC course to Mercator chart* *Describe* - *Gnomonic, Mercator, Transverse Mercator and Universal Transverse Mercator Chart Projections* *Calculate* - *Position of vertex of GC track* - *Initial course, final course, distance with the stated limiting latitude*	*5*	*15*	
2.1.3 Celestial navigation: *State* - *Kepler's laws of motion* *Define* - *Civil, Nautical and Astronomical Twilights,* *Explain* - *Conditions necessary for twilight all night, continuous daylight or continuous darkness* - *Influence of latitude on duration of twilight* - *Relationship between time and longitude* - *Relationship between time and hour angle* - *Magnitude of Star* - *How to identify stars by means of star chart and star finder* *Calculate* - *Time of meridian altitude of sun* - *Position lines by means of observations of: Sun, Planets and Stars including Pole Star* - *Stars suitable for observation in the twilight period* - *Position based on staggered / simultaneous observations* *(No questions on resolution of cocked hat. No calculations shall be based on ambiguity of time or date, incorrect application of chronometer error, index error or dip, etc.)*	*5*	*20*	
Total duration (hours):	*20*	*70*	

COURSE: *CHIEF MATE (F.G) - PHASE – I*

DETAILED TEACHING SYLLABUS

SUBJECT: *METEOROLOGY*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence No. 8: Forecast weather and oceanographic conditions			
8.1 Meteorology			
8.1.1 The atmosphere: *Explain* - *Diurnal variation of temperature* - *Relative humidity* - *Lapse rate* - *Adiabatic changes* - *Diurnal variation of pressure* - *Geostrophic wind* - *Gradient and cyclostrophic winds.* *Describe* - *Characteristics and location of Doldrums, ITCZ, Trade winds, Westerlies, Polar Easterlies, and Sub tropical oceanic highs.*	*2*		
8.1.2 Climatology: *Explain* - *General distribution of surface temperature and Surface current* *Describe* - *Characteristics and weather associated with various types of clouds.* - *Characteristics and weather associated with various Air Masses* - *Causes of global warming* - *Depletion of the Ozone layer* - *Accumulation of Greenhouse gas* - *Effects of Global warming* ➢ *Change in weather patterns* ➢ *Melting of the Ice Cap*	*2*		
8.1.3 Tropical revolving storms: *Explain* - *Regions and seasons of greatest frequency of TRS* - *Local nomenclature of TRS* - *Conditions associated with formation of TRS* - *Factors affecting movement of TRS* - *Factors associated with decay of TRS* *Describe* - *Characteristics of TRS* - *Signs which give warning of an approaching TRS* - *Messages require to be sent as per SOLAS* *Sketch and describe* - *Typical and possible track of TRS*	*6*		

- *Cross section through a TRS showing areas of cloud and precipitation* - *Plan of TRS showing isobars, wind circulation, track, path, eye, trough line, dangerous semi circle, dangerous quadrant and navigable semi circle for both hemispheres.* *Explain* - *Reasons for naming of dangerous semi circle* - *Method of determining in which sector of TRS a ship is situated.* - *Method of determining vortex of a TRS* - *Correct avoidance procedure when in the vicinity of TRS* *Frontal and Non frontal depressions* *Define* - *Family of depressions, trough, anti-cyclone, ridge, col* *Sketch and describe* - *Structure of typical frontal zone* - *Warm front, Cold front, Line squall* *Explain* - *Frontogenesis, Frontolysis, Occlusion* - *Weather associated with: cold front, warm front, line squall and ITCZ* - *Formation of frontal and non frontal depression* *Sketch and describe* - *Distribution of weather in a depression* - *Isobars and wind circulation in a depression* - *Cross section through warm and cold occlusions* - *Synoptic pattern of anti cyclone, Synoptic pattern of ridge, Synoptic pattern of col*			
8.1.4 Weather forecasting: *Explain* - *Synoptic and Prognostic charts along with their use.* - *Interpreting isobaric patterns and codes on a Synoptic weather chart* - *How to determine geostrophic and surface wind speeds from the charts* - *Purpose of Maritime Forecast Code* - *Data given by MARFOR* *List* - *Information given in wave charts* - *Information given in ice charts* - *Information given by weather fax charts* - *Information given in shipping forecasts*	*6*		
8.2 Oceanography			
8 .2.1 Ocean currents: *Explain* - *Drift current, gradient current, upwelling current* - *General pattern of surface water circulation* - *Principal individual currents and their names*	*2*		

- *Information available on current rose* - *Vector Mean current* - *Current data present in current atlases and routeing charts* *Describe* - *Use of data available from all of above for passage plan* - *Characteristics and weather associated with various ocean currents.*			
8.2.2 Waves: *Define* - *Wave, significant wave height, average wave height, fetch, swell* *Explain* - *Importance of Wind force, duration, fetch in formation and growth of waves* - *The method of estimating wave heights and wave periods* - *Factors affecting wave height and direction* - *Information available from wind rose* - *The method of estimating wave length of the wave*	*2*		
8.2.3 Ice on the sea: *Define* - *Ice tongue, Ice shelf, Pack Ice and Fast Ice* *Explain* - *Formation of Sea Ice* - *Formation of Icebergs from floating glaciers, ice shelf's and characteristics of each* - *Normal seasons and probable tracks of bergs from origin to decay (North Atlantic only)* - *Outer limits of the area in which icebergs may be encountered* - *Reasons for decay of icebergs* - *Areas affected by sea ice* - *Precautions to be taken when navigating near ice* - *Purpose, Duties and Responsibilities of International Ice Patrol* - *Freezing spray and actions to minimize the effects* *State* - *Signs which may indicate proximity of ice on clear days and nights* - *The range at which observer may expect ice visually in varying conditions of visibility* - *Limitations of radar as a means of detecting ice* *Describe* - *Factors which may give rise to ice accretion* - *Use of Mariners Hand Book to estimate rate of ice accretion* - *Methods of reducing ice accretion* - *Report to be made under International conventions when ice is encountered.* *List*	*3*		

- *Information in radio messages reporting dangerous ice* - *Information in radio messages reporting conditions leading to ice accretion* - *Different types of ice, icebergs,* - *Limits of icebergs,* - *Accumulation of ice on ships.*			
8.3 Weather Routeing: - *Information of current,* - *Wind and ice to select an optimum route,* - *Use of wave charts to select the best route,* - *Weather routeing services available to shipping.* *Describe* - *Climatological routeing* - *Optimum (least time routing)* - *Data presented in sailing directions and Mariner's Hand Book* - *Construction of Ship's Performance Curves*	*2*		
8 .4 Calculation of tides for standard and secondary ports	*1*	*3*	
8.5 Use of all appropriate nautical publications on tides and currents: *Explain* - *Routeing charts,* - *Tide tables,* - *Current and tidal stream atlases.*	*1*		
TOTAL	*27*	*3*	

COURSE: *CHIEF MATE (F.G) - PHASE – I*

DETAILED TEACHING SYLLABUS

SUBJECT: *CARGO HANDLING & STOWAGE*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence No. 12: Plan and ensure safe loading, stowage, securing, care during the voyage and unloading of cargoes			
12.1 Dry Cargoes:			
12.1.1 Timber deck cargoes: *Explain* - *Contents of Code of safe practice for ships carrying timber deck cargoes.* - *Stowage and securing of deck timber cargoes* - *Hazards involved with the carriage of deck timber cargo* - *Need for regular inspection of lashing arrangements* - *Need for controlling height of deck cargo* - *Need for provision of walkways and access to the top of the cargo.* *Describe* - *Action if cargo is lost overboard* - *Stability criteria to be fulfilled* - *Rolling period test for determining ship's stability and limitations of the method.*	*2*		
12.1.2 Loading, stowage and discharge of heavy lifts: *Explain* - *Load density* - *Need for spreading of the load over an area* - *Use of Shoring* - *Hazards and Precautions while handling a heavy lift* - *Methods of securing heavy lift (below deck and above deck)* - *Need for adequate initial GM*	*1*		
12.1.3 Procedures for receiving, tallying and delivering cargo: *Describe* - *Mate's receipts,* - *Bill of Lading (Information available and different types of B/L)* - *Charter Parties* - *Note of protest*	*1*		
12.1.4 Care of cargo during carriage: *Prepare* - *Cargo Plan given hatch dimensions, stowage factor, load density, broken stowage (maximum 4 cargoes)*	*2*	*2*	

Describe - *Preparation of cargo spaces prior loading* - *Precautions to avoid Crushing and Chafing damage and state which cargoes are liable to be affected.* - *How to protect cargoes which are liable to freeze* - *Ship and Cargo sweat, and need for Ventilation* - *Importance of and information available from Code of safe practice for cargo stowage and securing* - *Importance of and information available from Cargo Securing Manual* - *Securing arrangements of* • *rolled steel* • *steel coils* • *steel plates* • *vehicles* • *containers* - *Inspection and tightening of lashings* - *Importance of log book entries*			
12.1.5 Container Carriers: *Explain* - *Types and marking of containers,* - *Bay plans and stack weight,* - *Anti-heeling tanks* - *Torsional stresses* - *Lashing and Securing of containers* - *Container code (CSC).* *Describe* - *Procedures for loading and carriage of Refrigerated containers.*	*3*		
12.1.6 Car Carriers, Reefer ships and Ro-Ro Ships: *Car Carriers and Ro-Ro Ships:* *Describe* - *Stowage and Securing arrangements of vehicles* - *Procedures for Loading and discharging vehicles* - *Procedure for lowering and hoisting ramps,* - *Procedure for setting up and stowing retractable vehicle decks,* - *Procedures for opening, closing and securing hull openings* - *General precautions to be observed whilst working cargo* *Explain* - *Need to monitor atmosphere in ro-ro spaces* *Reefer Ships* *Define* - *Cooled, Frozen, Chilled Cargoes* *Describe* - *General outline of refrigeration systems*	*3*		

(Vapour absorption and Brine cooling) - *Preparation of cargo space for carriage of refrigerated cargoes.* - *Care, monitoring and records of cargo during passage* - *Inspection of cargo and brine traps* - *General precautions to be observed whilst working cargo*			
12.2 Cargo-handling Gear and Hatch Covers :			
12.2.1 Requirements applicable to cargo-handling gear: *Define* - *Competent person, authorised person, responsible person, loose gear, lifting appliance.* *Explain* - *Contents of Register for Ship's Lifting appliances and cargo handling gear (Chain Register)* *Describe* - *Duties of the Dock Safety Inspector* *State* - *The requirements of guarding dangerous parts of the machinery.*	*4*		
12.2.2 Maintenance of cargo gear: *Describe* - *Requirements for testing of lifting appliances and loose gear before they are used for the first time* - *Requirements for Periodic thorough examination and inspection of cargo gear* - *Annealing of loose gear* - *Maintenance of wire ropes, blocks, shackles, hooks, sheaves, pulleys and slings*	*1*		
12.2.3 Maintenance of hatch covers: *Describe* - *Procedures to check weather tightness of hatch covers* - *Securing of hatch pontoons* - *Maintenance and use of Side cleats and cross-joint wedge mechanism* *Explain* - *Importance of clear drainage channels and drain holes.* - *Importance of compression bars and sealing gaskets* - *Need to check hydraulic system for leakages*	*1*		
12.3 Keeping a Watch in Port			
12.3.1 Arrangements necessary for appropriate and effective deck watches to be maintained for the purpose of safety under normal circumstances *Explain* - *Procedures for effective port watch keeping* *List*	*4*		

- *The items to be checked regarding safety of life, cargo, property, environment and security during a deck watch.* - *The circumstances in which to call Master* - *The items included in Chief Officer's Standing Orders/ Night Orders*			
Competence No. 13: Assess reported defects and damage to cargo spaces, hatch covers and ballast tanks and take appropriate action:			
13.1 Knowledge of the limitations on strength of the vital constructional parts of a standard bulk carrier and ability to interpret given figures for bending moments and shear forces. – *Outlines and describes the common damage/defects that may occur on watertight transverse bulkheads situated at the ends of dry cargo holds of a bulk carrier* – *States that cracks may often be found at or near the connection of the stool of the transverse bulkhead and the tanktop in bulk carriers having combination cargo/ballast holds*	*1.5*		
13.2 Ability to explain how to avoid the detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling. *Explain* - *Actions to be taken to avoid the detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling*	*1.5*		
Competence No. 14: Carriage of dangerous cargoes			
14.1 Dangerous, Hazardous and Harmful Cargoes:			
14 1.1 Dangerous goods in packaged form (SOLAS Ch. VII, IMDG Code and MARPOL Annex III) *Explain* - *Classification of IMDG cargo* - *Use of IMDG Code* - *MFAG* - *EmS* - *Segregation table* - *Precautions when handling dangerous goods,* - *Dangerous cargo manifest,* - *Inspections before loading dangerous goods* - *Dangerous goods carried in containers* - *Construction of magazine for carriage of explosives* - *Limitations on carriage of explosives* - *Compatibility of Class 1 cargoes*	*9*		
14 1.2 Solid bulk cargoes: *Define* - *Angle of Repose* - *Flow Moisture Point* - *Transportable Moisture Limit* - *Flow point*	*9*		

- *Stowage Factor* - *Load Density* *Describe* - *Preparation for holds for loading* *Explain* - *Purpose and objectives of IMSBC code* - *Classification of cargoes as per IMSBC Code* - *Main hazards and precautions with the shipment of bulk solids (Ores, Urea, Concentrates, Sulphur, Coal, HBI/DRI)* - *Documentation required prior loading* - *Maximum allowable weight for single and adjacent holds* - *Block Loading* - *Purpose and objectives of Bulk carrier loading and unloading (BLU) code* - *Test for determining angle of Repose and FMP on board.* - *Precautions to be taken prior entering cargo holds*			
14 1.3 Grain Cargoes (SOLAS Ch. VI, IMO grain code) *Define* - *Grain* - *Filled and Partly filled compartments* - *Trimmed and untrimmed cargo* *Explain* *-Preparation of holds for carriage of grain cargo* *-Securing free grain surface in partly filled compartment,* *-Use of Shifting boards* *-Document of Authorisation* *-Grain loading stability criteria in detail* *-Contents of Grain loading stability booklet.* *-Methods to reduce Grain heeling moments in order to meet Grain stability criteria.* *Calculations on Grain stability*	*3*	*1*	
14 1.4 Arrangements necessary to ensure a safe deck watch is maintained when carrying hazardous cargo *Explain* - *The various hazards in carriage of dangerous goods* - *Safety precautions during cargo operations*	*1*		
14 .2 Outline knowledge of Tanker Operations :			
14 .2.1 Terms and definitions: *Define* - *Crude oil,* - *Refined products,* - *Spiked crude,* - *Sour crude,* - *Reid vapour pressure,* - *Upper and lower flammable limits* - *Pour point*	*2*		

Explain - *Flammability diagram* - *TLV* - *Tanker arrangement (tanks, pump rooms, slop tanks, cofferdams, deep tanks)* - *Cargo piping system (Free flow, Ring main, Direct)* - *Cargo pumps (Centrifugal, Reciprocating, Eductors)*			
14.2.2 International Safety Guide for Oil Tankers and Terminals (ISGOTT) *Explain* - *Contents and application of the ISGOTT*	*1*		
14 .2.3 Oil tanker operations and related pollution-prevention regulations: *Define* - *Segregated ballast,* - *Clean ballast,* - *Dirty ballast,* - *Slop tank,* *Describe with sketch* - *Inert gas system,* - *PV valve* - *PV breaker* *Describe* - *Hazards involved in COW,* - *Cleaning, purging and gas freeing procedures* *List* - *Items of pre-arrival checklist* - *Items of COW checklist* *Describe* - *Loading and discharging operations on a tanker.* - *Procedure for man entry in enclosed spaces on tanker* *Explain* - *The use of O_2 analyser, Explosimeter, Tank scope, Draeger tubes*	*7*		
14 .2.4 Chemical tankers (SOLAS Chapter VII, MARPOL Annex II, IBC Code): *Define* - *Type 1, Type 2 and Type 3 chemical tankers* *Explain* - *Various categories (X,Y,Z, OS) of cargoes* - *Hazards associated with chemical cargoes and control measures* - *Various types of tank coatings* - *Purpose and use of IBC and BCH code.* - *Purpose and objective of P & A manual* - *Equipment for evaluation of tank atmosphere (flammable gas detector, O_2 analyser and measurement of concentration of toxic gas)* - *Threshold limit value (TLV) of product*	*4*		

- *Odour threshold* - *Information available in cargo data sheets* - *With the aid of a simple diagram, a "closed circuit" loading operation using a vapour- return line* *List* - *Items of pre-arrival checklist* - *Entries made in Cargo Record Book* *Sketch and describe* - *Independent, integral, gravity and pressure cargo tanks* - *Typical tank arrangements with piping*			
14 .2.5 Tank cleaning and control of pollution in chemical tankers: *Describe* - *Hazards involved with tank cleaning* - *Use of slop tanks,* - *Cycle of a tank washing system* - *Discharge criteria as per Annex II of MARPOL 73/78.*	*2*		
14 .2.6/ 14.2.7 Gas tankers :(Ch. VII of SOLAS, SIGTTO and IGC Code) LNG, LPG, LEG and chemical gases in bulk *Define* - *Type A, Type B and Type C tanks* *State* - *Each cargo tank is fitted with high level alarm and auto- shut off.* *Explain* - *Purpose and objectives of IGC Code* - *Hazards of gas cargoes and control measures adopted* - *The terms- Boiling point, cargo area, cargo containment systems, gas carrier, gas/dangerous zone, gas- safe space, hold space, inter barrier space, MARVS, primary and secondary barrier, tank dome* - *Various types of ships (Fully pressurized, Semi pressurized, Fully refrigerated and Semi refrigerated)* - *Various types of tanks (integral, membrane, semi-membrane, independent and internally insulated tank)* - *Certificate of fitness* - *Detection of cargo leakage through primary barrier* *Sketch and describe* - *Deepwell pump* - *Re-liquefaction plant* *List* - *Contents of pre-cargo checklist*	*4*		
14.3 Methods and Safeguards when Fumigating Holds:	*2*		

Explain - *Reasons for the control of pest,* - *International health regulations,* - *Precautions when the vessel is fumigated.* - *How contact insecticides are used for dealing with local infestation* - *Procedures to make man entry in the space after fumigation* *State* - *Vulnerable areas on ships requiring particular attention* - *Permission to be obtained from Port State administration prior fumigation.* *List* - *Fumigation information which should be supplied to the Master*			
14.4 Cargo Calculations:			
14.4.1 Draft Survey and related Calculations. *Calculate* - *Quantity of cargo loaded/ to load, discharge/ to discharge by draft survey (Ship Stability Booklet)*	*2*	*6*	
14.4.2 Cargo Calculations: *Calculate* - *Quantity of cargo using ASTM tables, given density at 15 degrees Centigrade in vacuum, dimensions of the cargo space and ullage at observed temperature. (given angle of list, trim of the vessel and position of ullage port)* - *Using WRF, weight of cargo in tank* - *Quantity of cargo/ water by using wedge formula.* *(No calculations based on mixture/blend of cargoes)*	*2*	*7*	
14.5 Use of stability and trim diagrams and stress-calculating equipments, including automatic data-based (ADB) equipment, and knowledge of loading cargoes and ballasting in order to keep hull stress within acceptable limits.	*1*		
TOTAL	*74*	*16*	

COURSE: *CHIEF MATE (F.G) - PHASE – I*

DETAILED TEACHING SYLLABUS

SUBJECT: *SHIP STABILITY*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence 15: Control trim, stability and stress ***15.2.1: Ship Stability***			
Approximate calculation of areas and volumes: *State* - *Simpson's Rules 1,2 and 3* *Calculate* - *Areas, Volumes using Simpsons's rule* - *Geometric centres of areas and volumes. (Horizontal or Vertical ordinates/ semi ordinates at equal intervals or half intervals)* - *TPC , FWA using Simpson's Rules*	*2*	*5*	
Effects of density: TPC, FWA, DWA calculations *Explain* - *Effect of change of density of water on TPC* *Calculate* - *Draft of the vessel fore and aft due to change in density*	*1*	*2*	
Calculation of Free Surface Effect *Explain* - *The formula FSC = i/Vol* - *$i = lb^3/12$ for rectangular areas* - *FSC= FSM/ Δ* *Calculate* - *Free Surface correction using formula and ship stability booklet* - *Moment of inertia (i) of a tank using Simpson's rules*	*1*	*1*	
Simplified stability data *Explain* - *Maximum dead weight moment, Minimum permissible GM, Maximum permissible KG (diagrams/ tables)* - *Use of diagrams of dead weight moment.*	*1*		
Trim and list *Trim* *Explain* - *LCG, LCB* - *Effect of loading, discharging and shift of weights on LCG* - *Effect of change in underwater volume on LCB* - *Trimming moment* - *Moments required to change trim by 1 cm (MCTC)* - *MCTC =(Δ X GM_l)/(100 X LBP)* - *Why BM_l is used instead of GM_l to determine MCTC*	*3*	*10*	

- *Effect of change in density on MCTC* - *Trim = Trimming Moments/ MCTC* - *Change in trim(T_c)= Change in draft forward + Change in draft aft* - *Use of trim tables* *State* - *Centre of Floatation is centroid of water plane area.* - *LCF is the tipping centre or the pivoting point about which the vessels changes her trim* - *Change in draft aft* *$T_a = (T_c X LCF)/ LBP$* - *Change in draft fwd* *$T_f = [T_c X (LBP- LCF)]/ LBP$* *Calculate* - *Quantity of cargo to be loaded/ discharged/ shifted to produce a required trim* - *Final Forward and Aft drafts* - *Quantity of cargo to be loaded/ discharged to keep the forward/ aft draught constant,* - *Quantity of cargo to be loaded/ discharged to reach desired forward/ aft draft,* - *Final trim, fore and aft drafts using ship stability booklet* *List* *Explain* - *Cross curves of Stability and KN curves* - *How to determine GZ from Cross/ KN curves* - *Effect on GZ values due to shift of weights (Vertical and horizontal curves)* - *Range of Stability* *Describe* - *Effect of increased length, breadth and freeboard on the curve of statical stability* *Calculate* - *Angle of list resulting from transverse and vertical movement of weight using GZ curve* - *Area under the GZ curve using Simpson's Rules*			
Dynamical stability *State* - *Statical stability requirements as per SOLAS* - *Dynamical Stability at stated angle of heel represents potential energy of the ship.* - *Potential Energy is used in overcoming resistance to rolling and in producing rotational energy.* - *Dynamical Stability = Δ X Area under GZ curve*	*2*		
Intact stability requirements for carriage of the grain *Explain* - *Intact stability requirements for carriage of the grain* - *Volumetric heeling moments (VHM) caused due to shift of grain in partly filled / full compartments.* - *Use of Maximum Permissible VHM curves*	*2*	*5*	

Calculate - *Heeling Arm λ_0 = VHM/ (SF X Δ)* - *Heeling Arm λ_{40} = 0.8 X λ_0* *Draw* - *Heeling arm curve on Righting arm curve for given ship's condition (from stability booklet) and determine angle of heel* *Compare* - *Results from calculations above with the criteria set in Reg 4 of Grain Code.*			
Dry-docking and grounding *Dry-docking* *State* - *Part of the weight is taken by the blocks as soon as the ship touches the blocks and reduces buoyancy force by same amount.* *Define* - *Critical instant, Critical period, Declivity of docks* *Explain* - *Upthrust (P) causes a virtual loss of GM* - *Upthrust P = (MCTC X T_c) /Distance from Centre of Floatation* - *Why GM must remain positive until critical instant.* *Calculate* - *Minimum GM to ensure ship remains stable at the point of taking blocks overall.* - *Maximum trim to ensure ship remains stable at the point of taking blocks overall.* - *Virtual loss of GM and drafts of ships after water level has fallen by stated amount.* - *Drafts on taking the blocks overall.* - *Loss in GM for fall in water level after sitting over-all* *(Vessel takes to blocks first at any point on the entire length of the vessel)* *Grounding* *Explain* - *How the stability of a ship aground at one point on centre line is reduced the same way as in dry dock.* - *How increase in upthrust with fall in tide, increases the heeling moment and reduces the stability.* *Calculate* - *Virtual loss of GM and drafts of ship after tide has fallen by a stated amount.* - *Point of grounding, given initial drafts and drafts after grounding.* *(Calculations on dry-docking and grounding would be based on constant data as well as hydrostatic tables)*	*2* *1*	*7* *5*	
TOTAL	*15*	*35*	

COURSE: *CHIEF MATE (F.G) - PHASE – I*

DETAILED TEACHING SYLLABUS

SUBJECT: *SHIP CONSTRUCTION*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence 15: Control trim, stability and stress ***15.1.1: Ship Construction***			
Welding: *Describe* - *Manual electric arc welding* - *Automatic welding processes, electro-slag, electro-gas, TIG, MIG, SAW, Resistance welding* - *Butt, lap and fillet welds* - *Preparation of plate edge for welding* - *Use of tack welding* - *Weld faults: lack of fusion, penetration, re-inforcement, root penetration; slag inclusion, porosity, overlap and under cut* - *Gas cutting of metals* - *Various tests for welds* *Explain* - *Purpose of flux* - *Single pass, multi- pass and back run* - *Full penetration fillet weld* - *Distortion due to welding and measures to minimise them* *State* - *Classification Societies require tests on weld materials and electrodes before approval*	*4*		
Bulkheads: *State* - *Regulation regarding minimum number of bulkheads and their location.* *Define* - *Watertight, Non watertight, Weather tight, Oil tight, and Corrugated bulk heads* *Sketch and describe* - *Construction of W/T bulkheads and its attachments to sides and tank top* - *How water tightness is maintained when bulkheads are pierced by longitudinal, beams or pipes* *Explain* - *Purpose of wash bulkheads* - *Use of cross ties in tankers* - *Procedures for testing of bulkheads* - *Racking stresses and transverse bulkheads* *Compare*	*4*		

- *Cofferdam, flat plate and corrugated*			
Watertight and weather-tight doors: *State* - *W/T doors, mechanisms, indicators and all associated valves must be inspected once a week* - *All W/T doors in main transverse bulkhead must be operated daily.* - *Drills for operating W/T doors, Side scuttles, valves and closing mechanisms must be held weekly.* - *Records of drills and inspections to be entered in the log book with record of any defects.* *Explain* - *Categories of watertight doors (Class 1, Class 2, Class 3)* - *Rules regarding number of openings in passenger ships and W/T doors* - *Difference between Water tight and weather tight doors* *Sketch and describe* - *Arrangement of power operated sliding W/T door* - *Hinged W/T door and means of securing them* - *Ramp doors of Ro-Ro ships* - *Ship side doors*	*4*		
Corrosion and its prevention: *Explain* - *Corrosion, Erosion, Corrosion Triangle* - *Formation of corrosion cell* - *Galvanic series of metals* - *Stress concentrations leading to corrosion cell formation* - *Differences in surface condition leading to formation of corrosion cells* - *Cathodic protection using sacrificial anodes* *Describe* - *Impressed Current System* - *Measures to minimise corrosion* - *Treatment of steel in shipyard* *Explain* - *Structure of paint and purpose of each constituent.* - *Purpose of Material Safety Data Sheets (MSDS)* *List* - *Common paint vehicles: Drying oils, oleo-resins, alkyd resins, polymerizing chemicals and bitumen and state suitability of each for various applications.* *Describe* - *Typical paint schemes for: underwater areas, boot topping, top sides, weather decks, superstructures and tank interiors.* - *Surface preparation for painting* - *Safety precautions when using paints*	*4*		

- *How anti-fouling paint acts.* - *How anti-corrosive paint acts.* *State* - *Wetted Surface area* *$S = 2.58 X \sqrt{(\Delta X \text{ Length of ships})}$*			
Surveys, certification & dry-docking: *Define* - *Statutory and Mandatory surveys.* *Explain* - *Initial Survey, Intermediate Survey, Annual Survey and Renewal Survey* - *Harmonised System of Ship Surveys* - *Enhanced Surveys* - *Conditions Assessment Scheme (CAS)* - *Condition Assessment Programme (CAP)*	*4*		
TOTAL	*20*		

COURSE: *CHIEF MATE (F.G) - PHASE – I*

DETAILED TEACHING SYLLABUS

SUBJECT: *SHIP SAFETY, DAMAGE CONTROL & MAINTENANCE*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competency No. 17: Maintain safety and security of the ship's crew and passengers and the operational condition of life-saving, fire fighting and other safety systems			
17.1 A thorough knowledge of life saving appliance regulations (International Convention for the safety of Life at Sea) – LSA Code *Explain* - *Purpose and Objectives of LSA Code* - *LSA requirements as per SOLAS*	*2*		
17.2 Organisation of fire and abandon ship drills *Explain* - *How to draw a muster list and emergency instructions for a given crew and type of vessel* - *How to assign duties* - *Division of crew into command, emergency and backup teams* - *How drills and practices should be organized keeping fatigue factor in consideration.* - *Importance of debriefings after a drill* - *Importance of steps to be taken to follow up conclusions of any drill*	*2*		
17.3 Maintenance of operational condition of life saving, fire fighting and other safety systems. *17.4 Actions to be taken to protect and safeguard all persons on board in emergencies* *18.1.3 Explains methods and aids for fire prevention and detection and extinction: Fire prevention procedures, different types of fires and fire fighting equipments to be used, fighting fire on different types of ship.* *18.1.4 Understands functions and use of life saving appliances: Different types of emergencies, actions taken, life saving appliances and instructions to use it.* *Describe* - *How to draw plans for maintenance and inspection of life saving, fire fighting and other safety systems (Remote controlled W/T doors, Bilge alarms* - *Procedures for maintenance of LSA (Lifeboat ,Launching appliances, Lifeboat equipment including radio life-saving appliances, satellite EPIRBs, SARTs, immersion suits and thermal protective aids; Life jackets; Pyrotechnics ; Line Throwing Apparatus)* - *Procedures for maintenance of FFA(Portable fire*	*5*		

extinguishers; Fire hydrants; Fire hoses, Fire nozzles International Shore Connection; Fireman's outfit, Self Contained Breathing Apparatus (SCBA); Fire wallet; Fire dampers, Fire flaps and ventilators; EEBD) - *Actions to be taken in event of fire on own ship (accommodation, engine rooms, cargo spaces and galley)* *Explain* - *How to draw plans to deal with: Fire and Explosion.*			
17.5 Actions to limit damage and salve the ship following a fire, explosion, collision or grounding *List* - *Contents of Emergency Checklists for fire, explosion, collision, grounding*	*3*		
17. 6 Safety and Security of the ship's crew and passengers *Explain* - *Role of Safety committee* - *Purpose and Objectives of Code of safe working practices,* - *Dock safety regulation.* - *Procedures for Reporting of accidents* - *Security Levels and Duties and responsibilities of every individual at various levels as per ISPS Code* - *Actions to be taken in case of piracy or armed robbery*	*3*		
17.7 Ship maintenance and repairs *Describe* - *Planned maintenance system (PMS)* - *Care and maintenance of ropes, wires, accommodation ladders, pilot hoist and pilot ladders, W/T doors, mooring equipment, hatch covers and cargo handling equipment.*	*3*		
Competency No. 18: Develop emergency & damage control plans & handle emergency situations			
18.1 Emergency situation			
18.1.1 Demonstrate the knowledge of preparations of contingency plans for response to emergencies: Drawing plans to deal with emergencies, legal aspects and seamanship practise *18.1.2 Understands ship construction with regards to damage control* *Explain* - *How to draw plans to deal with: Leakages and spills in dangerous cargoes, rescue of victims from enclosed spaces, heavy weather damage, rescue of survivors from another ship or sea, & abandon ship.* - *Constructional features with regards to damage control*	*3*		

Competence No. 19: Use of leadership and managerial skills			
19.1 Knowledge of shipboard personnel management and training *Principles of Controlling Subordinates and maintaining good relationships* *State that the principles include:* - *being calm and even in temperament when giving orders and dealing with offenders* - *being honest and fair in all matters, and being firm when necessary* - *treating all staff on the same basis,* - *avoiding causing disappointment to staff* - *avoiding making promises,* - *having a proper attitude towards spokesmen or representatives of trade unions* - *making allowances for differences in nationality, language, religion and other cultural matters affecting behaviour and attitude* - *ensuring that all staff feel that their services on board are appreciated* *Staff Attitudes* *States the reasons why people work:* - *need to earn money* - *need to be a useful member of society* - *need for security of their standard of living* - *need to use their manual and mental skills and to derive satisfaction from them, and need to achieve their ambitions and improve their status* *Exercise of Authority* *States* - *the appointment of a person to a higher rank gives authority* - *the real authority is achieved when the person concerned demonstrates that he knows the work, is decisive, decisions are generally correct, orders are clear and are quickly carried out without argument, seeks advice when necessary and helps others, accept orders from superiors and carry them out and accepted by those with whom he works.* *Training Methods* *State* - *training should be based on attitude, skill and knowledge* *Explain* - *the purpose of on-board training* - *why training should be relevant to the trainees' work and duties aboard ship* - *how to conduct a training session (Purpose, Objective, Contents, Mode of training, Briefing and Debriefing)* - *Importance of group activity, demonstration and hands-on experience*	*3*		

19.2 A knowledge of related international maritime conventions and recommendations, and national legislation *Explain* - *Principles underlying the ISM Code* - *Content and application of the ISM Code* - *Principles underlying the STCW Convention* - *Content and application of the STCW Convention* - *Hours of rest for watchkeepers as per STCW and MLC* *19.3 Ability to apply task and workload management, including planning and co-ordination, personnel assignment, time and resource constraints and prioritization* *Planning and co-ordination* *Explain* - *Signs of fatigue* - *Causes of fatigue* - *The results, if fatigue is overlooked and / or allowed to develop* - *Need to maintain work/ rest hour records.* - *Importance of meetings on board for planning* - *Importance of safety committee* *Personnel Assignment* *State* - *Personnel assignment depends upon knowledge, skill, experience, competence, attitude, ship design, manning arrangements, external environmental conditions, reliability of equipment and machinery, and operational conditions.* *Time and resource constraints* *State* - *The work be planned, allocated, delegated, keeping in mind the time and resource constraints* - *The importance of using all the available resources, with proper planning to obtain optimum results* *Prioritization* *State* - *Importance of prioritizing the work, in different day to- day scenarios*	*3*		
19.4 Knowledge and ability to apply effective resource management : Allocation, assignment, and prioritization of resources, Effective communication on board and ashore, Decisions reflect consideration of team experiences, assertiveness and leadership, including motivation, Obtaining and maintaining situation awareness *Allocation, assignment and prioritization of resources* *State* - *The importance of allocating, assignment and prioritization of resources.* *Effective communication on board and ashore*	*4*		

Explain - *Interactive and closed loop communication* - *Importance of effective communication, briefings and debriefings.* *Decisions reflect consideration of team experiences* *Explain* - *Factors to be taken into consideration to allocate and delegate the tasks.* - *Effective resource management taking into account the experience of the team* - *Error chains and explains how they can be avoided* *Assertiveness and leadership, including motivation* *Define* - *Authority and Assertiveness* - *Motivation* *Explain* - *Need for a balance between authority and assertiveness* - *Methods of motivation and the importance of motivating the crew to obtain the optimum result* *Obtaining and maintaining situational awareness* *Explain* - *The importance of obtaining and maintaining situational awareness*			
19.5 Knowledge and ability to apply decision-making techniques: Situation and risk assessment, Identify and generate options, Selecting course of action, Evaluation of outcome effectiveness *Situation and risk assessment* *Explain* - *Method to carry out situation and risk assessment* *Identify and Generate Options* *Explain* - *Need to identify and generate all possible options.* *Selecting Course of Action* *Explain* - *Method of selecting effective course of action* *Evaluation of outcome effectiveness* *Explain* - *Need to evaluate the outcome effectiveness*	*6*		
19.6 Development, implementation, and oversight of standard operating procedures *Explain* - *How to develop standard operating procedures (SOP's)* - *Methods to implement the SOP's* - *Reasons of over sighting of SOP's and the dangers associated with over sight.*	*3*		
TOTAL	*40*		

COURSE: *CHIEF MATE (F.G) - PHASE – II*

DETAILED TEACHING SYLLABUS

SUBJECT: *BRIDGE WATCHKEEPING, SHIP HANDLING & EMERGENCIES*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence No. 5: Establish watch keeping arrangement and procedures			
5.1 Watch keeping Arrangements and Procedures			
5.1.1 The content, application and intent of COLREG 1972.	*8*	*3*	*2*
5.1.2Navigational watch *Explain:* - *Factors deciding the composition of the watch on the bridge* - *Communication between chief engineer and master in deciding the composition of engine room watch*	*2*		
5.1.3 Master – Pilot Exchange of information	*1*		
5.1.4 Ensuring the adequacy of an engineering watch: *Explain:* - *Communication between chief engineer and master* - *Factors deciding the composition of watch*	*1*		
5.1.5 VTS/VTMS *10.10 Manoeuvring in and near vessel traffic service(VTS) areas* *Explain:* - *IMO ship routeing guide* - *Manoeuvring in and near vessel traffic service(VTS) areas*	*2*		
Competence No. 4: Co-ordinate search and rescue operations ***Competence No.9: Respond to navigational emergencies***			
9.1 Contingency Plans for Response to Emergencies: *Describe:* - *Muster list* - *Assignment of duties to personnel* - *Composition of emergency team* - *Drawing of plans to deal with heavy weather damage* - *Excessive list, bilging, & flooding* - *Fire in E-room, Paint locker, Cargo spaces, wheel house and galley* - *Stranding* - *Abandoning ship*	*8*		

- *Spillage of noxious substances* - *Piracy and armed robbery* - *Collision.*			
9.2 Measures which should be taken in emergencies for the protection and safety of the ship, passengers and crew *9.2.1 Beaching a vessel* *Describe:* - *Circumstances in which the vessel is to be beached* - *Precautions to be taken prior to and after beaching* - *Log book entries*	*2*		
9.2.2 Stranding *Explain:* - *Actions to be taken if stranding is imminent and after stranding* - *Discharging or transferring of weights on board to facilitate refloating* - *Control of discharge of harmful substances* - *Assessment of damage and control* - *Refloating of stranded ship with & without assistance* - *Log book entries*	*2*		
9.2.3 Collision *Explain:* - *Duties of Master following a collision or impairment of the water tight integrity of the hull as per SOLAS* - *Log book entries*	*2*		
9.2.4 Precautions for the protection and safety of passengers in emergency situations: *Explain:* - *Duties of crew members to assist and muster passengers* - *Precautions for the protection and the safety of passengers in emergency situations.*	*2*		
9.2.5 Fire or explosion *Describe* - *Boundary cooling* - *Effect on stability of the vessel caused by use of water to mitigate fire* - *Procedure for man entry* - *Procedures for using fixed fire extinguishing system* - *Procedure for rescue of person/s from the space*	*2*		
9.2.6 Abandoning ship *Explain:* - *Situations under which to abandon ship* - *Procedures for abandoning a ship*	*3*		

-*Preparation on ship prior abandoning a ship* -*Duty of crew and passengers* - *Distress call transmission until acknowledgement* -*Mustering of crew and passengers* -*Importance of mustering and carrying extra rations, EPIRB, SART and other resources such as blankets etc* - *Use of distress signal to attract attention* -*Launching of boats and liferafts in heavy weather* -*Steps for avoidance of false distress calls* -*Cancellation of false distress alert calls* -*Log book entries*			
9.2.7 Emergency steering gear *Explain:* - *Change over bridge control to local control in the steering gear compartment* -*Standard emergency steering procedures* -*Need for proper communication*	*1*		
9.2.8 Towing *Explain:* - *The contents of emergency towing booklet* - *Emergency towing arrangements,* - *Procedure and tools for towing,* - *Procedure for towing in good and rough weather conditions,* - *Calculation of bollard pull and towing speed prior towage*	*4*		
4.1 Co-ordinate search and rescue operations *9.2.9 IAMSAR* *9.2.10 Man overboard procedures* *10.12 Precautions in manoeuvring the ship to be able to launch rescue boats in bad weather* *Explain:* -*Contents of IAMSAR Manual Vol 3* -*Various search patterns* -*Role and duties of MRCC, RCC, OSC* -*Man-overboard procedures* - *Recovering a person from the sea in heavy weather* -*Action to take when a person is reported missing at sea.* -*Precautions in manoeuvring the ship to be able to launch rescue boats in bad weather* -*Logbook entries*	*18.5*		
9.2.11 Emergencies in Port *Explain:*	*0.5*		

-Actions to take when emergencies arise in port (at berth or at anchor) –Fire, Pollution, Approaching Storm, Tsunami, Casualties, Personnel related accidents.			
9.2.12 Piracy or armed robbery. *Explain:* *- Best management practices (BMP)* *- Guidelines provided by Indian authorities* *- IMB PRC (Piracy Reporting Centre), UKMTO (UK Maritime Trade Organisation), MSCHOA(Maritime Security Centre Horn of Africa)*	*2*		
Competence No. 10: Manoeuvre and handle a ship in all conditions			
10.1 Manoeuvres *Explain:* *- Manoeuvres required when approaching a pilot vessel or station with , Tide and current,* *- Head reach, stopping Distance and rudder cycling*	*1*		
10.2 Rivers, Estuaries and Restricted Water *Define:* *- Shallow water* *- Squat* *Explain:* *- How Squat is dependent on speed of the vessel, block coefficient and the width of the channel* *- Reduction in under keel clearance resulting from rolling and pitching and heel or list* *- How to round bends in a channel with a current in either direction, taking account of the effect of wind* *- Use of an anchor to assist in rounding a bend* *- How to turn short round in a narrow channel, with or without a wind, and current.* *Calculate:* *- The approximate sinkage due to squat* *ROTI* *Describe:* *- Use of constant rate of rate and constant radius turn in restricted waters*	*5*		
10.3 Berthing and Unberthing *Describe:* *- the effects of right- and left-handed propellers on manoeuvring* *- the use of twin screws for manoeuvring* *- the advantages and disadvantages of controllable-pitch propellers with regard to ship handling*	*6*		

- *the use of lateral thrusters (bow & stern)* - *how an anchor or anchors may be used to assist in manoeuvring* - *the different ways in which tugs may be made fast and used*			
Ship and tug interaction *Explain:* - *Pivot point and girding of tugs*	*1*		
Interaction *Describe:* - *The interaction between a ship and nearby banks (bank cushion and bank suction)* - *The interaction between ships when meeting end-on* - *The interaction between ships in an overtaking situation* - *The particular dangers of interaction when working close by other craft such as tugs*	*3*		
10.4 Anchoring *Explain:* - *The procedures for anchoring with one or two anchors* - *Factors for deciding the scope of the cable* - *Swinging circle* - *Procedures and precautions taken for anchoring in deep waters* - *Running moor* - *Standing moor* - *Open moor* - *Mediterranean moor* *Dragging anchor* *Describe:* - *Actions taken when vessel starts dragging its anchor(s)* - *How to slip anchor(s)* - *Foul hawse and methods to clear it*	*4* *1*		
10.5 Lighterage at Sea: *Describe:* - *Contents of Ship to ship transfer guide,* - *Lighterage preparations for both vessels,* - *Method of separating on completion of transfer operations.*	*1*		
10.6 Dry-docking	*1*		

Describe - *Preparation of repairs list* - *Hull cleaning, inspection, blasting, painting* - *Precautions before flooding the dock* - *Measurement of rudder and propeller drop* - *Ship's plans* - *Steel renewals and thickness measurements* - *Floating Dry Dock, critical period*			
10.7 Heavy Weather *Describe:* - *Pooping* - *Broaching to* - *Synchronous rolling* - *Parametric rolling* - *Actions to take to minimise the effect of all mentioned above* *Explain* - *Rolling period in sec= $2\pi K/(g \times GM)^{1/2}$* *where* *K= Radius of Gyration* *g= Acceleration due to gravity*	*2*		
10.8 Manoeuvring diagrams *Define:* - *Advance* - *Transfer* - *Tactical diameter* - *Track reach* - *Stopping distance* - *Turning circles at various draughts and speeds* *Explain* - *The effects of displacement, draught, trim, speed and under-keel clearance on turning circles and stopping distances* - *Effect of transverse thrust on turning circle of the ship with right/ left handed propeller.*	*1*		
10.9 Ice Navigation *Define* - *Solid, Soft, Drift and Pack Ice; Growler; Ice berg* *Explain:* - *Procedure and precautions to be taken prior entering ice*	*2*		

- *Contents of the Polar code* - *Master's obligation to report dangerous ice* - *Cold weather precautions* - *Freezing sprays and steps required to minimise same.*			
10.11 Bow wave and stern wave *Explain:* - *Damage to shore facilities due to excessive bow waves and stern waves* - *The effects of passing ships on ships moored alongside* - *The precautions that should be taken by ships alongside to minimize the effect of passing traffic*	*1*		
TOTAL	*90*	*3*	*2*

COURSE: *CHIEF MATE (F.G) - PHASE – II*

DETAILED TEACHING SYLLABUS

SUBJECT: *NAVIGATIONAL AIDS*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence 2: Determine position and the accuracy of resultant position fix by any means			
2.2 Electronic Systems of Position Fixing			
2.2.1 Terrestrial electronic position fixing system *- Principle, operation and Errors of E-Loran* ***(To be taught when E- Loran becomes functional)***	*2*		
2.2.2 Satellite electronic position of fixing system:			
GNSS *Global Positioning System:* *Explain:* - *Working principle* - *System configuration and frequencies used* *Describe* - *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* - *Dangers of over reliance on satellite derived positions* - *IMO Performance Standards* *Brief outline of GLONASS and GALILEO*	*3*		
2.2.3 Other navigational aids: AIS,VDR,SVDR, LRIT, BNWAS *AIS* *Explain:* - *Purpose of AIS* - *Limitations of AIS* - *Precautions during use of AIS for collision avoidance* - *Pseudo AIS* *Describe* - *The Principle* - *Frequencies used* - *Types of messages and time interval* - *Information displayed on AIS screen* - *IMO Performance Standards*	*3*		

VDR/SVDR *Explain:* - *Purpose of VDR* - *Duration of data stored* - *Modules of VDR* - *Saving and retrieval of data in case if incident and training purpose* - *IMO Performance Standards* *List* - *Data recorded on VDR* - *Data recorded on S-VDR.* *LRIT* *Explain:* - *Purpose of LRIT* - *Data transmitted by LRIT* - *Authorised receivers of data* *Describe* - *Difference between LRIT and AIS* *BNWAS* *Explain* - *Performance standards for BNWAS*			
2.2.4 Radial steering, (ROTI) parallel indexing, and radar plotting *Rate of Turn Indicator (ROTI):* *Describe:* - *Procedure to execute a constant radius turns with or without current.* *Explain:* - *The need to monitor the turn.* - *Methods of monitoring the turn* - *IMO Performance Standards* *Radar Plotting Exercises with three targets and current and taking action to avoid collision as per Collision Regulations*	*1*	*6*	
2.2.5 Echo sounders, speed logs: Sources of errors *Echo Sounder:* *Explain:* - *Basic principle,* - *Effect of density, temperature and pressure on velocity of sound and the limits in which the true value may lie.* *Describe* - *Ranging and Phasing* - *Inaccuracies of equipment, scale error and measures to eliminate them.* - *False echoes* - *Errors due to Trim, List & positioning* - *Various alarms and settings.* - *IMO Performance Standards* *Speed log:*	*4*		

Explain - *The difference between ground reference and water reference speed.* - *IMO Performance Standards* *<u>Doppler speed log:</u>* *Describe:* - *Principle* - *Janus configuration* - *Dual axis configuration and its uses during docking operations.* - *Calibration of the log* - *The Limitations* - *The errors of Doppler log* ***<u>(Derivation of formulae for explaining Doppler effect not required)</u>***			
2.2.6 Course recorder and auto pilot operation and precautions. *<u>Course Recorder</u>* *Explain* - *Setting of Course Recorder* - *Information to be recorded on the course recorder by the operator* - *Alarms of course recorder* *<u>Auto- Pilot</u>* *Explain:* - *The principle* - *Various settings of the auto-pilot for optimal performance* - *The procedures and factors to take into account for change over* - *Adaptive automatic pilot systems and its functions* - *Various alarms* - *The need for regular checking and test of auto pilot* - *The regulation regarding the use of auto pilot.*	*1*		
Competence 3: Determine and allow for compass errors			
3.1 Magnetic Compass Error and Correction:			
Explain: - *Earth as a magnet* - *Ship's permanent magnetic field components P, Q, and R.* - *Induced Magnetism* - *Principle of Magnetic Compass* - *Method of compensating effect of P, Q and R (Placement of Permanent correctors)* - *Method of compensating effect of induced magnetism (Placement of Induced magnetism correctors)* - *Why a deviation curve made in one hemisphere and position cannot be used in the other*	*5*		

hemisphere *Describe* - *Method of obtaining table of deviation/ deviation curve*			
3.2 Gyro-compass Errors and Corrections			
Calculate - *Error on Gyro Compass given latitude, speed, course steered and ratio between control and damping precess (Settling error and Steaming error)* *List* - *The equipment getting heading inputs from gyro compass.* *Outline the performance standards of Gyro Compass.*	*4*	*1*	
Total duration (hours):	*23*	*7*	

COURSE: *CHIEF MATE (F.G) - PHASE – II*

DETAILED TEACHING SYLLABUS

SUBJECT: *GENERAL ENGINEERING KNOWLEDGE*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence No. 11: Operate remote controls of propulsion plant and engineering systems and services			
11.1 Marine Engineering Terms and Fuel Consumption			
11.1 Marine engineering terms: *Define:* - *Mass, Force, Work, Power,* - *Energy, Stress, Strain, heat,* - *Efficiency of a machine* - *Indicated power, shaft power,* - *Propeller power and thrust*	*0.5*		
11.1.2 Fuel consumption: *Define* - *Admiralty coefficient, Fuel coefficient, Thermal Efficiency, Specific Fuel Consumption* *Explain* - *Effect of condition of hull, tips of propeller on fuel coefficient, fuel consumption, and propeller efficiency.* *Describe* - *Indicator diagrams and the information obtained* *Calculate* - *Power output from indicator diagrams* - *Daily consumption at service speed* - *Bunker fuel required for the voyage* - *Speed for a given daily consumption* - *Speed required to complete a voyage with given consumption.*	*2*	*4*	
11.2 Auxiliaries :			
11.2.1 Auxiliary boilers: *Describe* - *Water tube boiler* - *Fire tube boilers* - *Exhaust gas boiler* - *Importance of maintaining correct water level and function of safety valve* *Distinguish* - *Between water tube and fire tube boiler* *Describe* - *The procedure of flashing the boiler from cold.* - *Effects of salts in boiler feed water and procedure for treatment of feed water.*	*4*		

11.2.2 Distillation and fresh-water systems: *Explain with sketch as necessary* - *Principle of operation of a low pressure Fresh Water Generator* - *Principle of Reverse osmosis* - *Hydrophore system for domestic water supply.* - *Drinking Water Treatment*	*2*		
11.2.3 Pumps and pumping systems: *Describe with sketch the principle of working of* - *Reciprocating pump/Gear pump/Screw pump* - *Centrifugal pump [including Hydraulic Aggregate pump (Hydraulically driven submerged pump – trade name Framo), Submersible, and Deepwell pumps]* - *Fire pumps* - *Emergency Fire pump and its pumping arrangement* *Describe* - *Typical bilge system of a ship.* - *Typical ballast system of a ship.*	*4*		
11.2.4 Steering gears: *Describe with sketch* - *Ram type hydraulic steering gear* - *Rotary vane steering gear* - *Electrical steering gear* - *Telemotor system* - *Fail safe arrangement* *State* - *IMO requirements for auxiliary steering gears* - *IMO requirement for testing steering gears* - *Requirements for Emergency Control*	*4*		
11.2.5 Generators, alternators and electrical distribution: *Explain* - *Operation of an alternator* - *Electrical distribution systems* - *Use of circuit breaker & fuses.* - *Procedure for maintenance of batteries* - *Operation of Emergency Compressor* - *Purpose and operation of purifiers* *Describe with sketch* - *Navigation light circuit with indicators/ alarms and alternative power supply* *List* - *Services to be supplied from Emergency Generator* *Describe* - *Procedure for starting emergency generator manually.*	*2.5*		
11.2.6 Refrigeration, air-conditioning and ventilation: *State* - *Properties of a refrigerant* *Describe with sketch*	*2*		

- *Simple refrigeration cycle for domestic refrigeration and cargo spaces* - *Working principle of air conditioning plant*			
11.2.7 Stabilisers: *Describe* - *Construction and operation of fin stabiliser*	*0.5*		
11.2.8 Sewage treatment plants: *Describe with sketch* - *Operation of chemical sewage treatment plant* - *Operation of biological sewage treatment plant*	*1*		
11.2.9 Oily-water Separators and oil filtering equipment: *Describe with sketch* - *Construction and operation of Oily Water Separator* - *Construction and operation of ODMCS.* *11.2.10 Incinerators:* *Draw* - *Block diagram for the operation of a waste incinerator.*	*1.5*		
11.2.11 Deck machinery: *Explain* - *Advantages and disadvantages of steam, electric and hydraulic drive for winches* *Describe* - *Routine maintenance including lubrication of deck machinery (windlass, mooring winch, cranes, cargo winches)* *Describe with sketch* - *Windlass drive system* *11.2.12 Hydraulic systems:* *Describe* - *Hydraulic accumulator* - *Ram and rotary vane actuators* - *Common failures of system and remedial measures* *State* - *Necessity for cooling/ heating of hydraulic oil*	*2*		
11.3 Marine Power plants:			
11.3.1 Diesel engines: *Describe* - *Working principle of two stroke and four stroke internal combustion engines* - *Compare and contrast* - *Two stroke and Four stroke internal combustion engines* - *Explain* - *Causes of Scavenge fires and remedial actions* - *Causes of Crankcase explosions* - *Super charging (constant pressure and pulse type)* *Describe* - *Preparation of Diesel Engine for Standby mode* - *Procedure for starting and reversing*	*5*		

State - *Number of starts is limited by capacity of starting air reservoir* *Draw a block diagram of* - *Fuel oil system from bunker tank to injection* - *Lubricating oil system* - *Cooling water system*			
11.3.2 Steam turbine systems *Explain* - *Working principle of* - *Impulse turbine* - *Reaction turbine* *Describe* - *Steam turbine and its bearing* - *Procedure for warming through a steam turbine for manoeuvring* - *Procedure for manoeuvring using a steam turbine (forward and astern)*	*2*		
11.3.3 Propeller and propeller shaft: *Define* - *Pitch, slip and efficiency of a propeller* *Calculate* - *Percentage apparent slip, real slip* - *Ship's speed given rpm, mean pitch and percentage slip* - *Indicated power, shaft power, delivered power and effective power* *Explain* - *How propeller thrust is transmitted to the hull* - *How propeller shaft is supported* - *How propeller (keyless) is secured to tail shaft* *Describe* - *Operation of a controllable pitch propeller*	*2*	*1*	
11.3.4 Bridge control: *Describe with block diagram* - *Control systems for Main Engine (including control from bridge, ECR and local)* - *Bridge control of controllable pitch propeller,* *List* - *Indicators and alarms provided with bridge control* - *Indicators for lateral thrusters.* *Explain* - *Arrangements and operation of lateral thrusters* - *Main Engine starting arrangement* - *Purpose of turbocharger and need to control rpm whilst carrying out turbocharger washing.*	*3*		
11.4 Engine room watchkeeping			
11.4.1 - *Describe arrangements necessary for appropriate and effective engineering watches to be maintained*	*2*		

for the purpose of safety under normal circumstances and UMS operations. *11.4.2* - *Describe arrangements necessary to ensure a safe engineering watch is maintained when carrying dangerous cargo*			
	40	*5*	

COURSE: *CHIEF MATE (F.G) - PHASE – II*

DETAILED TEACHING SYLLABUS

SUBJECT: *MARITIME LEGISLATION*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence no. 16: Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment			
16.1 Introduction to Maritime Law	*1*		
16.2 Law of the Sea (UNCLOS): *Define (as per THE TERRITORIAL WATERS, CONTINENTAL SHELF, EXCLUSIVE ECONOMIC ZONE AND OTHER MARITIME ZONES ACT, 1976 as amended)* - *Territorial sea and the contiguous zone,* - *Exclusive economic zone and continental shelf,* *Define (as per UNCLOS)* - *International straits,* - *High seas*	*2*		
16.3 Safety: Outline knowledge of the following safety conventions:			
16.3.1 International Convention on Load Lines, 1966 (LL 1966), as amended *Describe* - *Requirements for initial and periodical surveys* - *Requirements for periodical inspections* *List* - *Fittings and appliances to be inspected* - *Circumstances in which LLC would be cancelled* - *Contents of Record of Conditions of Assignment of freeboard*	*3*		
16.3.2 International Convention for the Safety of Life at Sea, 1974 as amended (SOLAS) *Describe:* - *Procedures for testing of ship's steering gear* - *Change over procedures for remote steering gear* - *Requirements for emergency steering drills* - *General requirements for carriage of navigational equipment* *List* - *The chapters of SOLAS and brief outline of the contents as covered therein.* - *Log book Entries to be made regarding steering gear and emergency drills* - *The amendments to SOLAS (within last three years)*	*4*		
16.3.3 International Convention on Standards of Training, and Watchkeeping for Seafarers, 1978 (STCW) as amended	*2*		

Explain - *Manila Amendments to STCW 78*			
16.3.4 Convention for the suppression of unlawful act against the Safety of Maritime Navigation 1988 as amended *Explain* - *Aims, objectives and general provisions of the convention*	*1*		
16.3.5 ITU Radio Regulations *Explain* - *Aim and objectives of the regulation*	*1*		
16.4 Pollution: Outline knowledge of the following pollution conventions and their amendments: *16.4.1 International Convention for the Prevention of Pollution from Ships, 1973.* *Explain* - *MARPOL : Contents and Purpose* - *OPA – 90 : Contents and Purpose* - *National Pollutant Discharge Elimination system (NPDES) of the U.S. Clean Water Act: Contents and Purpose.* *Explain:* - *Particularly sea sensitive areas* - *Discharge provisions for oil and oily waste from machinery spaces outside special areas and within special areas,* *Describe* - *Contents of SOPEP* - *Contents of Vessel Response Plan (VRP)* - *Notification procedures as per SOPEP and VRP* - *Entries to be made in Oil Record Book (Part I, Machinery Space Operations) and Part II (Cargo and ballast operations)* - *Need to maintain records* - *Contents and validity of IOPP certificate and annexures* *Explain:* - *Contents of MARPOL Annex II* - *Chemical discharge criteria in special and other areas.* - *Need to maintain records* - *Entries to be made in Cargo Record Book for Chemical Cargoes* - *SMPEP*	*5.5*		
16.4.1 International Convention for the Prevention of Pollution from Ships, 1973.... contd *State* - *Notification procedures for loading/ unloading harmful substances as per MARPOL Annex III* *Explain:*			

- *Discharge criteria for Sewage (Annex IV)* - *Holding tanks,* - *Nearest land* - *Contents and validity of ISPP certificate and annexures* *Explain (with regards to Annex V):* - *Special areas* - *Discharge criteria* - *Garbage management plan* - *Entries in Garbage record book* - *Need for maintaining records* *Explain (with regards to Ballast Water Management):* - *Ballast water management plan* - *Need for maintaining records* - *Ballast Water Management Convention* *Describe (with regards to Annex VI):* - *SECA(Sulphur Emission Control areas* - *Volatile Organic Compounds(VOC) management plan* - *Contents and validity of IAPP certificate and annexures*			
16.4.2 London Dumping Convention (LDC) *Define* - *Dumping* - *Waste or other matters* - *Special permit* - *General permit* *Explain* - *Aims of the convention*	*0.5*		
16.4.3 Intervention convention. *Define* - *Maritime Casualty* - *Related Interests* *Describe* - *The rights of parties to intervene on high seas*	*0.5*		
16.4.4 Civil Liability convention (CLC) and Fund Convention. *Define* - *Pollution damage* - *Incident* *State* - *Exceptions to liability* - *Limitations of liability*	*0.5*		
16.4.5 Oil Pollution Preparedness, Response & Co-operation Convention (OPRC) as amended (OPRC-HNS Protocol) *Explain* - *Aims, objectives and general provisions of the convention*	*0.5*		
16.4.6 Reporting of incidents:	*0.5*		

Explain - *Need for prompt reporting,* - *Probability of discharge.*			
16.5 Passengers *Explain:* *16.5.1 Special Trade Passenger Ships Agreement.* *16.5.2 Protocol and Rules on Space Requirements for Special Trade Passenger Ships, 1973* *16.5.3 General provisions of Athens Convention relating to the Carriage of Passengers and their Luggage by Sea*	*2*		
16.6 Tonnage *16.6.1 International Convention On Tonnage Measurement of Ships, 1969 as amended* *Define* - *Gross Tonnage* - *Net Tonnage* - *Excluded spaces* *List* - *The information available in International Tonnage Certificate*	*1*		
16.7 ILO Maritime Labour Convention (MLC)-2006 *a) Minimum requirements for seafarers to work on ships: minimum age, medical certificates, training and qualification, recruitment and placement.* *b) Conditions of Employment: Seafarers Employment Agreements, Wages, Hours of Work and Hours of Rest, Entitlement to Leave, Repatriation, Seafarer compensation for the ship's Loss or Foundering, Manning Levels, Career and Skill Development and Opportunities for Seafarers' Employment* *c) Accommodation, Recreational Facilities, Food and Catering* *d) Health Protection, Medical Care, Welfare & Social Security Protection: Medical Care on-board ship and Ashore, Ship-owners' Liability, Health & Safety Protection and Accident Prevention, Access to Shore-based Welfare Facilities, Social Security* *e) Compliance and Enforcement* *i) Flag State Responsibilities: General Principles, Authorization of Recognised Organizations, Maritime Labour Certificate and Declaration of Maritime Labour Compliance, Inspection and Enforcement, On-board Complaint Procedures, Marine Casualties* *ii) Port State Responsibilities: Inspections in Port, Detailed Inspection, Detentions, On-shore Seafarer Complaint Handling Procedures* iii) *Labour-supplying Responsibilities: Recruitment and Placement services, Social security provisions*	*6*		

16.8 Arrival Documents and Procedures as amended: *16.8.1 International Health Regulations (IHR)* *Define* - *Arrival of Ship* - *Baggage* - *Container* - *Crew* - *Epidemic* - *Free pratique* - *In quarantine* - *International voyage* *Describe* - *Requirements of Ship Sanitation/ Ship Sanitation Exemption Certificate* - *Master's obligation concerning maritime declaration of health*	*2*		
16.8.2 Convention on Facilitation of International Maritime Traffic, (FAL 1965) *State* - *The purpose of the convention* - *IMO Standard forms for general declaration, cargo declaration, ship's and crew effect declaration, crew list and passenger list* *List* - *The documents for arrival or departure of ships* *Explain* - *Standard and Recommended practices regarding documentation under FAL convention*	*1.5*		
16.8.3 Noting protests *Explain* - *Note of Protest* - *Conditions in which Note of Protest is to be filed* - *Extended Note of Protest*	*0.5*		
16.9 Collision *16.9.1 International Convention for the unification of Certain Rules of Law with respect to Collision between Vessels, and Relating to Penal Jurisdiction in Matters of Collision or other Incidents of Navigation* *Describe* - *Duties of Master after collision* *Explain* - *Apportionment of Liability* *State* - *Convention applies where even no collision has taken place.*	*2*		
16.10 Assistance and Salvage			
16.10.1 International Salvage Convention *Define* - *Salvage*	*2*		

- *Vessel* - *Property* *Describe* - *No cure- No Pay principle* - *Application of convention* - *Duties of Salvor, Owner, and Master* - *Rights of Salvor* *Explain* - *Criteria for assessing reward* - *Criteria for assessing special compensation (SCOPIC Clause)* - *Apportionment of the remuneration* *16.10.2 Lloyd's Standard Form of Salvage Agreement (LOF)* *Explain* - *The contents and clauses of LOF.*			
16.11 Convention on Limitation of Liability for Maritime Claims *State* - *Scope of application of convention* *List* - *Persons entitled to limit liability* - *Claims subject to limitation of liability* - *Claims exempted from limitation* - *Circumstances in which limitation would be barred.* *Describe* - *Constitution of a limitation fund*	*1*		
16.12Classification Societies *1612.1 Overview of all classification society rules* *State* - *The Role of IACS* - *Repairs/ Alterations must be carried out under survey and to satisfaction of class.* *Explain* - *Reasons for having ship's classed.* - *Special survey requirements* - *Role of Classification Society* *State* - *That periodical surveys are annual survey, dry-docking, intermediate and special surveys.*	*1*		
16.13 Cargo *16.13.1 International Convention for the Unification of Certain Rules of Law relating to Bills of Lading (Hague-Visby Rules)* *Define* - *Carrier* - *Contract of Carriage* - *Goods* - *Ship* - *Carriage of goods*	*4*		

List - *Duties of Carrier* - *Information to be shown on Bill of Lading* - *Exceptions to carrier's responsibility for loss or damage* *Explain* - *Bill of Lading as evidence of contract* - *Shipper's responsibility for loss or damage* - *Limitations of liability* *Describe* - *Scope of application of convention* - *System of documentary credit* *State* - *Right to deviate* - *Burden of proving due diligence is on the carrier.* *16.13.2 Charter-parties* *State* - *Charter party is a contract* - *Charter Party drawn using standard forms* *Explain* - *Voyage Charter party* - *Time Charter party* - *Demise or Bare boat charter party* - *Tonnage contract or Contract of Affreightment* *Explain (with regards to Hamburg Rules)* - *Effect of charges for goods carried under Hamburg rules*			
16.14 General Average and Marine Insurance *16.14.1 The York-Antwerp Rules* *Define* - *General Average Act* - *General Average Sacrifice* *Explain* - *Duties of Master in GA* - *Rights to contribution in GA* *16.14.2 Marine insurance* *Explain* - *Purpose of Marine Insurance* - *Insurable interest* - *Utmost good faith* - *Misrepresentation or non- disclosure* - *Warranty* - *Deviation* - *Institute clauses* - *Particular average* - *Subrogation* - *Partial loss* - *Total loss* - *Constructive total loss* - *Functions of P and I clubs*	*3*		

- *Risks, liabilities and expenses covered by P and I clubs* *Describe* - *Voyage policy* - *Time policy* - *Floating policy* - *Perils covered in insurance*			
16.15 Certificates and Documents required to be Carried by International Conventions and Agreements *List* - *Certificates carried on board ships by international conventions and their periods of validity* - *Documents to be carried on board*	*1*		
16.16 National Maritime Legislation *16.16.1 General provisions of Merchant Shipping Act and brief outline of Rules made there under*	*1*		
TOTAL	*50*		

COURSE: *CHIEF MATE (F.G) - PHASE – II*

DETAILED TEACHING SYLLABUS

SUBJECT: *SHIP CONSTRUCTION*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence 15: Control trim, stability and stress ***15.1.2: Ship Construction***			
Ship building materials *Define* - *Tensile Strength* - *Ductility* - *Hardness* - *Toughness* - *Yield Point* - *Ultimate tensile stress* - *Modulus of Elasticity* - *Stress/Brittle/Fatigue fracture* - *Mild steel* - *Strain* *Explain with sketch* - *Stress/ Strain curve* *Explain* - *Advantages of use of aluminium alloys* - *Use of higher tensile steel and hazards associated with same.* - *How aluminium superstructure strength is preserved* *List* - *Examples where castings or forgings are used.* *State* - *Shipbuilding steel is tested, graded and stamped with approval marks.* *Describe* - *Precautions against corrosion where aluminium is connected to steel work.*	*4*		
Ship yard practice *Block diagram* - *General layout of a ship yard and co-operation between departments* *Describe and sketch* - *Sheer plan* - *Half breadth plan* - *Body plan* *Describe* - *Various tests for ship building steel*	*2*		
Brief outline of Loadline convention *Explain* - *Conditions of Assignment of freeboard*	*3*		

Define - *Margin Line* - *Forward and Aft Perpendicular* - *LBP* - *Sub divisional load lines* - *Minimum bow height* - *Factor of sub- division* - *Garboard and Sheer strake* *Explain* - *Multiple load lines* - *Type A and Type B ships* *List* - *Items to be inspected during annual, periodical and renewal surveys*			
Brief outline of Tonnage convention *Explain* - *Gross tonnage* - *Net tonnage* - *Excluded spaces* - *Enclosed spaces* *Calculate* - *Gross tonnage* - *Net tonnage*	*1*	*2*	
Brief outline of passenger ship subdivision *Explain* - *Floodable length* - *Permissible length* - *Sub-division load line*	*1*		
Brief outline Fire integrity of ships *Explain* - *Types of bulkheads* - *Standard Fire test*	*1*		
Midship section of ships *Sketch and label midship section of following ships:* - *General Cargo Ships* - *Cellular Container Ship* - *Hatch cover less cellular container vessel* - *Bulk Carrier* - *Double hull oil tanker* - *Chemical tanker* - *LPG carrier* - *LNG carrier* - *OBO vessel* - *Ro-Ro vessel*		*6*	
TOTAL	*12*	*8*	

COURSE: *CHIEF MATE (F.G) - PHASE – II*

DETAILED TEACHING SYLLABUS

SUBJECT: *SHIP STABILITY*

TOPICS	Teaching method/hours		
	Lectures	*Exercise*	*Practicals*
Competence 15: Control trim, stability and stress ***15.2.2: Ship Stability***			
Moments of inertia calculations *Explain* - *Theorem of parallel axis* *Calculate* - *Moments of Inertia of rectangular and curvi-linear surface (using vertical or horizontal ordinates) about a stated axis* - *BM_L and BM_T of a ship given ordinates of water plane area.* - *KM of a vessel in a floating dry-dock after taking to the blocks.*	*0.5*	*1*	
Thrust due to liquid pressure. *Define* - *Centre of pressure* - *Thrust* *Calculate* - *Centre of pressure and thrust of rectangular and curvi-linear surface (using vertical or horizontal ordinates) at a stated liquid level*	*0.5*	*1*	
Stability at moderate and large angles of heel *State* - *$GZ = GM \sin \theta$ for angles of heel up to 10°* - *$GZ = (GM + ½ BM \tan^2 \theta) \sin \theta$ for angles of heel greater than 10°* - *$BM = i/V$* - *$KM = KB + BM$* *Define* - *Rolling period* *Explain* - *Procedure to determine Ship Stability by means of rolling period test* - *Limitations of the Rolling period test* *Calculate* - *Approximate GM by means of rolling period tests.*	*1.5*	*0.5*	
Inclining test: Procedure of carrying out inclining test and calculation of KG. *Describe* - *Procedure to determine Initial KG of the ship by Inclining Test* - *Precautions to be taken while carrying out Inclining*	*1*	*0.5*	

Test *Calculate* - *Initial KG given Inclining Test data*			
Recommendation on intact stability for passenger and cargo ships (IMO Intact Stability Code 2008): *Explain* - *Precautions against capsizing,* - *Intact and damage stability criteria for passenger and cargo ships* - *Stability information available in hydrostatic tables* *Describe* - *IMO severe wind and weather heeling criteria* - *Heel while turning*	*2*		
Rolling of ships: *Explain* - *Effect of GM on rolling,* - *Effect of draught and displacement on rolling,* - *Function of bilge keels, anti-rolling tanks and stabiliser fins to reduce the amplitude of rolling* - *Conditions under which Parametric or Synchronous rolling occurs* - *Parametric Rolling and actions to be taken to mitigate* - *Synchronous Rolling and actions to be taken to mitigate*	*2*		
Shear force, bending moment and for torsional stress *Explain* - *Shear force, bending moment Load (Difference between buoyancy and weight)* - *How wave profile effects Shear force and bending moment* - *Wave and cargo induced Torsional stresses* - *Maximum Permissible Torsional moments* *Calculate* - *Shear force and bending moments, at stated stations* - *(simply supported uniform beam with added weights or box shaped vessel with a given distribution of weight and on even keel)* *Draw* - *Shear forces and bending moment curves for above calculations*	*1*	*6.5*	
Effect of flooding on transverse stability *Define* - *Margin line* - *Permeability of a space and cargo* *Explain* - *Loss of buoyancy of a bilged compartment = Volume regained* - *How Area of intact water plane is reduced* - *Effect of flooding on transverse stability* *Calculate*	*1*	*5*	

- *Stability of the ship after bilging of a mid ship compartment (with or without permeability)* - *List of the ship after bilging of a mid ship side compartment (with or without permeability)* *(All calculations to be based on box shaped vessels)*			
Effect of flooding on trim: *Explain* - *Effect of flooding on trim* *Calculate* - *Final Fore and Aft drafts after bilging of end/ intermediate compartments (with or without permeability)* - *Stability of the ship after bilging of end compartments (with or without permeability)* *(All calculations to be based on box shaped vessels)*	*1*	*5*	
TOTAL	*10.5*	*19.5*	