

DIRECTORATE GENERAL OF SHIPPING		
Authorized by: C.S.	EAC Branch File No. ENG/EXAM- 17(37)/2001	EACQMP Chap V
	Instructions to Examiners	Circular No. 125
	Issue No. 00	Dated: 19 <sup>th</sup> August, 2014
Extra First Class Engineer Certification - reg		
<p><b>1. <u>General:</u></b></p> <ol style="list-style-type: none"> <li>1. The Directorate General of Shipping (DGS) has always been keen to facilitate higher academic platforms to the mariners, which will enhance their professional skills to deal with the contemporary technologies and futuristic practices in the highly dynamic and challenging maritime field.</li> <li>2. The “<b>Extra First Class Engineer</b>” Certificate of Competency, under rule.24 of Merchant Shipping (Standards of Training, Certification and Watchkeeping) Rules 2010, provided as an <b>optional certificate</b>, therefore, extends to a candidate aspiring for higher professional assignments in the maritime field, an evidence of having attained a higher level of professional excellence in the field, over and above the Certificate of Competency as Marine Engineer Officer- Class-I stipulated under Regulation III/2 of STCW 1978, as amended.</li> <li>3. To keep pace with the evolving technological, managerial and regulatory requirements of the industry, the DGS constituted a Committee of experts (Dr. B.K. Saxena Committee) to formulate a new course curriculum for the Extra First Class Engineer CoC, after careful study of the best practices in the maritime industry and the pattern and syllabi of the related courses conducted by the World Maritime University, IIT, Kharagpur and other renowned institutes.</li> <li>4. This Circular is being issued to prescribe a guideline for the syllabus, conduct of course and pattern of examinations leading to the award of Extra First Class Engineer certificate of competency, under rule.24 of Merchant Shipping (Standards of Training, Certification and Watch keeping) Rules 2010.</li> </ol>		

## **2. Course Curriculum:**

1. The Examination and Assessment for the Extra First Class CoC will cover 12 subjects divided equally in Part A and Part B. The subjects are as given below:

### **Part A**

- A. 1. Law of the Sea & Maritime Law
- A. 2. Risk Management & Marine Insurance
- A. 3. Shipping, Economics & Finance
- A. 4. Marine Materials & Corrosion of Marine Structures
- A. 5. Advanced Electrical, Electronic and Control Engineering Knowledge
- A. 6. Environment Protection & Energy Management in the Maritime industry.

### **Part B**

- B. 1. Maritime Regulations
- B. 2. Management Techniques & Applications
- B. 3. Naval Architecture
- B. 4. Vibration Engineering
- B. 5. Advanced Marine Engineering Knowledge
- B. 6. Human Element

2. The detailed syllabi is attached as [Appendix-I](#) to this circular.
3. Candidate can select any five subjects out of the six from each Part and therefore shall satisfactorily complete the course and assessment of a total of ten subjects to consider for the award of the Extra First Class CoC.

## **3. Conduct of Course:**

1. The conduct and coordination of course will be undertaken by an institute designated for the purpose by the Directorate General of Shipping, and will spread over two semesters, Semester-I (January-June) covering Part A and Semester-II (July-December) covering Part B.
2. The candidates are required to apply directly to the designated institute in order to enroll for the course and the conduct of course will be in correspondence mode with the provision for contact classes by the institute on demand from the candidates and if the institute so decides.

#### 4. Assessment:

1. The assessment of the subject will be based on combination mode of **assignment and examination**. The weightage for the two may be different for different subject, as decided by the institute conducting the course. However, at no time the weightage for examination shall be less than 60%.
2. Institute conducting the course should ensure that the assignments are so designed that the analytic ability of the candidate is explored and evaluated, and the assignments in each subject should help in assessing the knowledge, comprehension, application and analytical capabilities of the candidates for different modules. The institute is required to prepare the guidelines for the written assignment and it should be a dynamic document to be updated from time to time with the consent of the Chief Examiner of Engineers.
3. The Examination for all subjects is expected to be conducted by the Directorate General of Shipping, twice in a year i.e., in **June and December** every year. However, the candidates applying for the examination have to satisfactorily complete the course for the respective subjects, including the assignments, if any, as per the schedule prescribed by the institute, but in any case before 31<sup>st</sup> May and 30<sup>th</sup> November, respectively.
4. The assignments will have to be evaluated by the institute conducting the course. The records of the evaluated assignments are to be kept in electronic format for future verification.
5. The designated institute conducting the course shall issue a certificate of completion of course to the candidate, mentioning the subjects he has satisfactorily completed along with the marks scored for the assignment part, if any, and also forward the details to that effect to the Mercantile Marine Departments, conducting the examinations by 5<sup>th</sup> June and 5<sup>th</sup> December, respectively.

6. The duly filled-up applications from the candidates for the Examination shall reach the respective Mercantile Marine Department by 15<sup>th</sup> June and 15<sup>th</sup> December for the examination in June and December, respectively.
7. Pass marks for each subject would be 50%. Candidates who fail to pass a subject would need to reappear for the written examination. They however, would be exempted to submit assignments again if they have secured 50% or more marks in such assignments.
8. The course and examination need to be successfully completed within a maximum of five years from the date of first enrollment for the course, failing which, the candidate has to undergo the complete course and examination all over again.

**5. Exemptions:**

1. Candidates who have partly completed the Extra-First Class examination on the basis of existing syllabus have the option to migrate to the new syllabus, with due credits for the subjects he has successfully completed under the existing syllabus. However, in-case of candidates who are only left with dissertation under the existing extra first class syllabus will be required to complete the same by 31<sup>st</sup> December 2016, failing which he has to take examination of subjects of Part A and Part B under the new syllabus for which he was not examined under the old syllabus of Part A and Part B.
2. The candidates who have successfully completed M.Sc degree in Maritime Affairs covering all aspects of "Administration of Maritime Safety and Environmental Protection from the World Maritime University, Malmo, Sweden or PGDMOM from IIT, Kharagpur shall be exempted from the following subjects and can therefore take credit for the same:-

**Part A**

- A1. Law of the Sea & Maritime Law
- A2. Shipping, Economics & Finance
- A3. Marine Materials & Corrosion of Marine Structures

A4. Advanced Electrical, Electronic and Control Engineering Knowledge

**Part B**

B1. Maritime Regulations

B2. Management Techniques & Applications

B3. Naval Architecture

B4. Vibration Engineering

3. Candidates falling under the category mentioned at sub-para 5.2 above, would therefore have to clear two subjects, one each from Part A and Part B, out of the remaining four subjects (ie.A2, A6, B5 and B6).
4. Candidates who have successfully completed Post Graduate course from World Maritime University, Malmo, Sweden in Maritime Affairs in streams other than those mentioned at sub-para.5.2 above are required to clear four subjects, two each from Part A and Part B out of six subjects (i.e. A4, A5, A6 and B3, B4 and B5).

**6. Fees:**

1. The fees for Course shall be paid by the candidates directly to the institute conducting the course, at the time of their enrollment.
2. The fees for the Examination & Certification shall be paid to the Mercantile Marine Department, conducting such examinations as provided under Merchant Shipping (Standards of Training, Certification and Watch keeping) Rules 2010.

This circular is issued with the approval of the competent authority and comes into effect from the date of issuance.

Sd/

(Ajithkumar Sukumaran)

Dy. Chief Surveyor-cum-

Sr. Dy. Director General (Tech)

Enclosure:

[Appendix-I](#)- Detailed Syllabus.

To,

1. Principal Officer, Mercantile Marine Department, Mumbai/Kolkata/  
Chennai/ Kandla/Cochin.
2. Surveyor-in-Charge, Mercantile Marine Department, Goa/ Jamnagar/  
Port Blair/ Visakhapatnam / Tuticorin / Delhi / Haldia/ Paradip /  
Mangalore.
3. All Recognized Organizations.
4. Indian National Shipowner's Association (INSA), Mumbai.
5. Sr. PS to DG/CS/NA/CSS/Jt. DG for information.
6. Hindi Cell, DGS, for Hindi translation.
7. Guard file, DGS, Gol.
8. Computer Cell, DGS, for uploading on website.

<p style="text-align: center;"><u>Appendix-I</u></p> <p style="text-align: center;"><u>DETAILED SYLLABI-EXTRA FIRST CLASS</u></p>		
Sr. No.	Subject	
<u>PART A</u>		
A1.	Law of the Sea & Maritime Law	
<p>Law of Contract - general principles, essential features of a contract, types of contracts, breaches and their remedies; Bailment and its features; INCOTERMS 2010, Special Contracts - Indemnity and Guarantee;</p> <p>Law of Agency - general principles, types of agencies, legal relationship between the parties involved, breach of warranty of authority and termination of agency; Tort - negligence in shipping and defences against tortious liabilities; Freight &amp; types of freights; Fundamental of ship chartering – Voyage Charter, Time Charter, Bareboat Charter.</p> <p>UN Convention of the Law of the Sea &amp; Maritime Zones of India Act, 1976; Arrest of Ships- International Convention on the arrest of ships.</p> <p>Maritime Arbitration -- methods of dispute resolution; arbitration: The Arbitration and Conciliation Act, 1996 (Indian); Convention on Facilitation of International Maritime Traffic, 1965 (FAL Convention of IMO).</p> <p>Bill of Lading and the Indian Bills of Lading Act, 1856, ; Law of Carriage: the Indian Carriage of Goods by Sea Act, 1925, as amended; Hague-Visby Rules and Hamburg Rules; Rotterdam Rules: MMTG Act 1993, as amended.</p> <p>Collision law -- Related Convention and apportionment of blame; Salvage and Towage and Related contracts; Lloyds Open Form; International Convention on Salvage, 1989; Limitation of Liability of Carrier -- Related conventions and method of Calculations; Admiralty Jurisdiction -- Methods of enforcement of marine liens and arrest of vessels; Maritime and possessory liens -- claims accepted as maritime lien; order of priorities; subjects of maritime liens; arrest and jurisdiction; International Conventions related to Pollution Claims -- Civil Liability Protocol, 1992 and Fund Protocol, 1992 as amended; OPA 1990; The Customs Act, 1962; Marine Frauds -- Preventive measures and role of International Maritime Bureau.</p>		

A2	Risk management & Marine Insurance	
	<p>Risk management : concept, process and practice; Fundamental precepts of safety and risk, including risk assessment, safety and Formal Safety Assessment (FSA); Relationship between risk assessment and maritime casualty investigation; Emergency preparedness measures and contingency planning as part of the overall risk management process;</p> <p>Origin and history of insurance; Principles of insurance and their applications to marine insurance – insurable interest, utmost good faith, indemnity, subrogation, contribution and proximate cause;</p> <p>Types of losses; Partial Loss or Particular Average, Total Loss – Actual Total Loss (ATL) &amp; Constructive Total Loss (CTL); General Average; salvage and sue &amp; labor expenses Marine insurance markets in India and abroad -GIC and its subsidiaries; Lloyd's of London; Hull and machinery insurance - relevance of statutory and classification certificates, basis of underwriting/rating; Relevant Clauses of time policy;</p> <p>Liability and insurance of liabilities; concept of mutual insurance and Protection &amp; Indemnity clubs; international pool of P &amp; I clubs; liabilities related international conventions.</p> <p>Insurance claims, surveys, documentation and procedure; standard, non-standard and ex- gratia claims; Legal aspects of insurer's recovery claims against shipowner; General Average - principles and practice; York Antwerp Rules 1994; general average adjustment; Protection and Indemnity Clubs -- risks covered and practice; Insurance implication of Piracy- Kidnap &amp;Ransom (KR) Insurance.</p>	
A3	Shipping, Economics & Finance	
	<p>Fundamentals of economics, basic concerns and special features of transport and maritime transport; To apply economic principles to maritime transport; effect of supply and demand on shipping markets; Cost structure in shipping; direct &amp; indirect operating expenses; Importance of IOE per day;</p>	

Basic knowledge in shipping and port management; Sale and purchase of ships - process; role of brokers; inspection and valuation; memorandum of agreement; standard forms including SALEFORM; necessary documentation; standard contracts for new building and demolition;

Commercial operations – liner trade and chartering; voyage and time charters; clauses of charter party that are related to technical operations; performance evaluation.

Shipping Economics- Investment appraisal in shipping; payback, NPV and IRR methods; Economics of scrapping and laying up of ships; Budget and cost control in shipping; Financing of ship acquisition; investment in shipping; sources of finance; payments for purchase and/or construction of ships from abroad;

Foreign exchange - impact of exchange rates on shipping; Relevant sections of legislation e.g., Foreign Exchange Management Act, 1999 (including all amendments and revisions) regarding *remittances* for - (a) Collection of freight, (b) Acquisition of ships (c) Other related matters; Role of banks in shipping and banking procedures regarding documentary credit/UCP 600;

Ports and Harbor-infrastructure and their role in marine transportation, inter-modal transportation; Uncertainties in economic variables and their effect on economic evaluation; information Technology Applications, Ship Production Process.

**A4**

**Marine Materials & Corrosion of Marine Structures**

Classification society requirements and other national and international material standards- selection of materials for marine construction. Steel: Shipbuilding quality steels-mild steels, HY steels, HSLA steels, Iron-carbon diagram, cooling processes and their effects on mechanical properties, Stress-strain characteristics. Composite material in marine applications.

Requirements for welded construction of ships. Weld induced distortions, distortion mitigation techniques. Welding flaws reason for same. Concept of welder's qualification.

Material Failure tests and evaluations: Metal behavior under different environments,

Experimental methods of testing rate of atmospheric oxidation and thermal oxidation by Marker test, Thermo gravimetric test, salt spray test etc. Identification of surface, subsurface and deep seated discontinuities in metals by suitable NDT techniques. Introduction to fracture mechanics to evaluate the tolerance limit of surface flaws for useful usage

Corrosion Principles: Factor influencing corrosion-types of corrosion- electrochemical aspects-environmental effects-metallurgical effects- mechanism of corrosion-galvanic or two metal corrosion - crevice corrosion--corrosion atmospheric corrosion-pitting-inter granular corrosion-selective leaching -erosion corrosion-stress corrosion-hydrogen damage- fatigue corrosion - corrosion due to biofouling- microbial corrosion-corrosion rate expressions - corrosion rate measurements.

Corrosion Control and Prevention: Materials selection-alteration of environments - design for cathodic and anodic protection -- comparison of cathodic and anodic protection- protective coating - metallic coating and other inorganic coat inorganic coating- coating system selection-paint system-protection by means of paints-antifouling paints-corrosion protection system of hull structure-corrosion control by GRP- biofouling control- corrosion inhibitors-anodic inhibitor-marine coating -corrosion resistant materials for propellers, pumps, system, heat exchangers, hulls, wire ropes.

**A5**

**Advanced Electrical, Electronic and Control Engineering  
Knowledge**

Cable & Insulation: Cables and layout, International Protection ratings, fittings in hazardous areas, classification of insulation.

Protective relaying: Primary and back up protection, principle of working and characteristics of Induction type relays, static and digital relays, protection of alternators, motors, transformer and busbar.

High Voltage system: Requirements of classification societies, mandatory rules with/without earthing, interference with control system, safe practice while watch keeping and maintenance, switching and isolation procedure, various circuit breakers, lay out of system, rating of switch gear.

Propulsion Systems: Comparisons between Electric, Steam and Diesel driven propulsion systems, DC Propulsion motors: Constant Voltage Propulsion system, Induction propulsion motors, High Temperature Super-conducting motors, Harmonics.

Microcontroller: Number formats and operations, Fixed point 8 bit numbers representations of signed integers and fraction, Floating Point Numbers. Generation of PWM signals, sinusoidal pulse width modulation, ADC and DAC interface, Assemblers and assembly language programming.

Review of Power Devices: Power MOSFET, IGBT, Thyristor (SCR), GTO, IGCT, gate trigger circuits, commutation circuits and class, natural & forced commutation, comparison of power devices.

Speed Control: AC-DC converters: 3-phase half wave converters, single-phase dual converters. DC-DC converters : Step-down chopper, step-up chopper, 2-quadrant & 4-quadrant chopper, DC-AC converters: 1-phase half bridge and full bridge, 3-phase inverter 180° and 120° conduction, Synchroconverter, Servo converter, Soft start technique. AC- AC converters: Application of cycloconverter in electric propulsion onboard.

Instrumentation and Control: Review of control systems; process control loop, PID control, modern control systems; PLC, PAC, SCADA, Field Bus, Introduction to motion control systems. Review of sensors; Temperature, Pressure, Flow, Level, Humidity, Viscosity etc, Smart sensors, introduction to wireless sensor networks.

<b>A6</b>	<b>Environment Protection &amp; Energy Management in the Maritime Industry</b>	
<p>Pollution:- the science, mechanisms and technologies for pollution monitoring and control, and the institutions within the United Nations system; To consider integrated management principles and approaches such as ecosystem-based management and integrated coastal and ocean management, in place for the achievement of healthy, resilient and sustainable marine ecosystems;</p> <p>Marine pollution problems related to shipping and port development such as ballast</p>		

water, dredging and spills from ships, and other significant global drivers including population migration to coasts, increasing urbanization and industrialization, land based pollution and climate change, and their impact on habitats and biodiversity, economic development and human well-being; Trends and trajectories of these pressures and impacts and the international, national and local responses that are being employed to address them; UNFCCC & Kyoto Protocol and its impact in shipping; Concerns and challenges of developing countries, particularly from maritime sector.

The International Convention for the prevention of pollution from ships (MARPOL) Annex VI, inter-alia: Ship Energy Efficiency Management Plan (SEEMP); Energy Efficiency Operational Indicator (EEOI); Energy Efficiency Design Index (EEDI); Compliance timeframes and issues; Market based measures (MBMs) for GHG reduction.

Design and construction of more efficient vessels; Maintenance, Measurement and Management strategies towards sustainable development; Innovations including usage of sustainable marine renewable energy resources to tap into the power of the wind, solar and tidal energy; Reduction of Carbon dioxide –Regulation vs Responsibility (CSR aspects of emission); Energy efficiency calculations for a complete power generation plant; Fuel management and energy efficiency technologies and operational practices.

Ballast Water Convention 2004; Antifouling Convention 2001; Recycling of Ships: Hong Kong Convention;

## PART B

**B1**

### **Maritime Regulations**

IMO Conventions, IMO Codes, IMO Guidelines; Knowledge of National Legislation, Knowledge of International Legislation & Regulations; Merchant Shipping Act, Merchant Shipping Rules; relevant sections from IV Act 1917, Indian Port Act 1908, and Indian Port Trust Act 1948.

Role of Govt. in policy formulation & administration of maritime affairs; To provide an overview of the various international institutions involved in shipping and maritime

affairs, including UN agencies and inter-governmental and non-governmental organizations and their interrelationship.

Structure & functions of various maritime bodies, (MMDs, Maritime boards etc) and their jurisdiction; Registration of ships; Statutory survey & Certification; Flag State implementation and Port State Control; different MOUs, benefits and usefulness of information; Marine Accidents: Reporting/Investigation.

Role of Recognized Organizations; role of Classification Societies and their structure; IACS & Common Structural Rules; IMO RO Code.

Flag of convenience/open registry countries, their effect on shipping, ITF, Second International ship Registers; IMO Member State Audit Scheme.

Latest Conventions and impacts: Bunker Convention; Nairobi Convention; HNS Convention etc.

**B2**

**Management Techniques & Applications**

Principles of Management; Strategic Management; Quality Control and TOM; Materials and Maintenance Management.

Project management: Definition of Project and Project Management; Stages of a Project: Project Management processes such as Initiation, Planning, Execution, and Closure; Feasibility studies and Project Report; Techniques for project planning and scheduling, PERT, CPM, network, models, time-cost trade off concepts, resource allocation and Project monitoring and control; Project Integration Management; Computer applications for better Project Management.

Optimization: Schematic View of Optimization process, Optimization Methods in management science, and applications of optimization; Optimization methodologies including linear programming, network optimization, integer programming, and decision trees. Applications to logistics, manufacturing, transportation, marketing, project management, and finance.

Failure analysis tools: Fault Tree Analysis, Failure Mode and Effects Analysis, Root Cause Analysis, and Ishikawa Diagram.

**B3**

**Naval Architecture**

Development of ship types: Internal arrangement based on cargo type; Structural arrangements of various ship types-longitudinal and transverse framing systems, continuity and connectivity of structural members. Ship hull form and its definitions; Sectional areas and moments; hydrostatics calculations; Floatation and trim.

Stability: Stability at small angles; Free surface effects; Effects of lifting and movement of large masses on stability, Stability at large angles; Cross-curves of stability; Curves of statical stability; Dynamical stability; Effect of asymmetrical flooding on trim and heel; Floodable length; Stability in damaged conditions-lost buoyancy and added weight methods.

Structural strength: Static force on ship in still waters, static longitudinal strength calculations, characteristics of shearing force and bending moment curves, response of the structure, shear stress in ship's structure, calculation of deflection, dynamic longitudinal strength, long term probability distribution, resistance of ship's structure's to buckling, strength of transverse structure, structural failure.

Powering & propulsion: Resistance of ships to forward motion-components of resistance, Viscous and wave resistance; Air resistance; Resistance due to roughness and fouling; Hump and hollow speeds; Laminar and turbulent boundary layer, Froude number and Reynolds number; Model experiment, ITTC friction formulation and extrapolation procedure. Screw propeller geometry and definitions; Propeller theories momentum, blade element and lifting line; Propeller characteristics and open water efficiency, Hull propeller interaction, Wake, thrust deduction fraction, relative-rotative efficiency and quasi-propulsive coefficient; Propeller design using standard series data; Powering performance calculations; Ship trials and trial data analysis.

Seakeeping: Sea-waves-theory of regular waves; Energy celerity dispersion and other characteristics of water waves; ship in regular waves; Encounter frequency; Ship motions- uncoupled heave, pitch and roll, Response amplitude operator, irregular and

realistic sea- waves; statistical description and wave-energy spectrum; Sea-states and theoretical energy-spectra motion of ships in irregular waves. Slamming, deck-wetness, sea-sickness and other derived responses

Ship maneuverability; Definitions of directional stability, steering ability and controllability, Hydrodynamic derivatives for motions in horizontal plane; Directional stability criteria; Turning-circle, zig-zag and other maneuvering trials; Rudder and its hydrodynamic characteristics; model experiments to stability maneuvering characteristics.

**B4**

### **Vibration Engineering**

Introduction to Mechanical vibration; Hull girder vibration; Calculation of natural frequencies of hull girder and hull resonance diagram; Propeller induced vibration, Vibration control and Mount design.

Review of Basic Dynamics, Kinematics of Rigid Bodies, Vibration of Single DOF damped systems, Vibration of Multi- DOF Marine Structures, Free and Forced Response, Vibration isolation of Marine Engines, Tuned Absorbers, Rudiments of Rotor Dynamics, Critical Review of Basic Dynamics, Kinematics of Rigid Bodies, Vibration of Single DOF damped systems, Vibration of Multi- DOF Marine Structures, Free and Forced Response, Barred range, Vibration isolation of Marine Engines, Tuned Absorbers, Rudiments of Rotor Dynamics.

Single degree of freedom systems, two degree of freedom systems: Spring coupled, mass coupled, vibration absorbers, and vibration isolation. Multi degree of freedom systems: Lagrange's equation, close couples and far coupled systems, Dunker ley's approximation method, Rayleigh method, matrix method, matrix iteration, orthogonality principle, orthogonality, expansion theorem and modal analysis, Flexural and torsional vibration, single/two/three/multi rotor systems, torsionally equivalent shafts, effect of inertia of shafts; Stodola method, Holzer method, Galerkin method, Rayleigh- Ritz method, Myklested – Prohl method for far coupled systems, transfer matrix method.

Experimental methods in vibration analysis: Vibration instruments, vibration exciters, transducers and measurement devices, analyzers, vibration tests: free and forced

vibration tests.

**B5**

**Advanced Marine Engineering Knowledge**

Latest developments of Marine Diesel engines, auxiliaries like boilers, purifiers, pumps & pumping system, evaporators, purification systems, oily water separators, incinerators, sewage treatment plants, refrigeration & air conditioning systems, coolers, heat exchangers & their controls, compressed air systems, cooling systems, hydraulics, steering gear systems, propeller shafting systems, automation & control systems etc.

Latest developments in Marine Gas Engines (Operated by LNG). Suitability of LNG as marine fuel for upcoming MARPOL regulations and economy.

Comparative analysis of the advantages and disadvantages of latest technology - Electronic Engines vs Traditional Engines. Alternative fuel /energy sources, Fuel Cell Technology- possibility in shipping.

Technology to improve SFOC, Engine De-rating, retrofitting for today's slow steaming. Application of emerging technology for powering merchant ships.

Appreciation of combustion processes; Insight into steam based power plants and cogeneration plants; Advancements in Shipboard Instrumentation & Control; Introduction to dual fuel system and boil off system of LNG carriers; Appreciation of Gas turbine and combined cycle; Advancements related to improvement in design and materials of marine equipment.

**B6**

**Human Element**

Broad overview of the relevant IMO, ILO, MLC and other regimes relating to the Human Element, in the maritime industry such as maritime labor and welfare, and in particular the rights and expectations of seafarers in relation to occupational safety.

Familiarization with the work that has been undertaken by IMO and ILO with respect to human element issues and measures and recommendations introduced to minimize or

mitigate the effects of human error aboard ships.

Human Factor and ISM Code: implementation of the ISM Code; shipboard and shore-based safety management, the approach by a classification society; Development of shipboard and shore-based safety management, the approach by a shipping company; Flag and Port State applications of the ISM Code

Knowledge and understanding of mandates assigned to maritime administrations with particular reference to crew supply, manning and certification of seafarers.

Organizational behavior: Perception, Values, Attitudes, Beliefs, Learning, Motivation, Leadership, Communication; occupational behavioral related safety practices; cross/multi-cultural issues; women in shipping.

Understanding the structure of the STCW 95 Convention and the STCW Code and the MLC.