Republic of the Philippines
OFFICE OF THE PRESIDENT
COMMISSION ON HIGHER EDUCATION

CHED MEMORANDUM ORDER
No. 14
Series of 2018

SUBJECT : ADDENDUM TO CHED MEMORANDUM ORDER NO. 67, SERIES 2017 ENTITLED "REVISED POLICIES, STANDARDS AND GUIDELINES FOR THE BACHELOR OF SCIENCE IN MARINE TRANSPORTATION (BSMT) AND BACHELOR OF SCIENCE IN MARINE ENGINEERING (BSMarE) PROGRAMS"

Pursuant to the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the "Higher Education Act of 1994", and by virtue of Commission en Banc (CEB) Resolution No. 251-2018 dated May 29, 2018, the following Annexes of CMO No. 67, s. 2017 entitled "Revised Policies, Standards and Guidelines for the Bachelor of Science in Marine Transportation (BSMT) and Bachelor of Science in Marine Engineering (BSMarE) Programs", are hereby adopted and promulgated by the Commission for the guidance of all concerned:

Annex A - Curriculum Mapping

Annex C - Course Specifications

Annex D - Minimum Required Equipment

This CMO shall take effect immediately 15 days after its publication in the Official Gazette or in a newspaper of general circulation.

Issued this 26th of June 2018 Quezon City, Philippines.

For the Commission:

J. PROSPERO E. DE VERA III, DPA
Officer-In-Charge
Commission on Higher Education

	Bachelor of Science in Marine Transportation **CURRICULUM MAPPING**	Annex A of CMO No. 67, s. 2017 Revision No: 00 Revision Date: 00

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
A-II/1	***Function 1 Navigation at the operational level***									
C1	Plan and conduct a passage and determine position	KUP1	*Celestial navigation*				X			
		.1	Ability to use celestial bodies to determine the ship's position				x			
		KUP2	*Terrestrial and coastal navigation*			X				
		.1	Ability to determine the ship's position by use of landmarks			x				
		.2	Ability to determine the ship's position by use of aids to navigation, including lighthouses, beacons and buoys			x				
		.3	Ability to determine the ship's position by use of dead reckoning, taking into account winds, tides, currents and estimated speed			x				
		KUP3	*Thorough knowledge of and ability to use nautical charts, and publications, such as sailing directions, tide tables, notices to mariners, radio navigational warnings and ships' routeing information*		X					
		KUP4	*Electronic systems of position fixing and navigation*	X						
		.1	Ability to determine the ship's position by use of electronic navigational aids	x						
		KUP5	*Echo-sounders*	X						
		.1	Ability to operate the equipment and apply the information correctly	x						
		KUP6	*Compass – magnetic and gyro*							
		.1	Knowledge of the principles of magnetic and gyro-compasses	X						
		KUP7	*Steering and control systems*							
		.1	Knowledge of steering control systems, operational procedures and change-over from manual to automatic control and vice versa. Adjustment of controls for optimum performance							
		KUP8	*Meteorology*							
		.1	Ability to use and interpret information obtained from shipborne meteorological instruments							
		.2	Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems							
		.3	Ability to apply the meteorological information available							
C2	Maintain a safe navigational watch	KUP1	*Watchkeeping*							
		.1	Thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended							

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
		.2	Thorough knowledge of the Principles to be observed in keeping a navigational watch							
		.3	The use of routeing in accordance with the General Provisions on Ships' Routeing							X
		.4	The use of information from navigational equipment for maintaining a safe navigational watch							
		.5	Knowledge of blind pilotage techniques							
		.6	The use of reporting in accordance with the General Principles for Ship Reporting Systems and with VTS procedures							
		KUP2	*Bridge resource management*							
C3	Use of RADAR and ARPA to maintain safety of navigation	KUP1	*Radar navigation*					X		
		.1	Knowledge of the fundamentals of radar and automatic radar plotting aids (ARPA)					x		
		.2	Ability to operate and to interpret and analyse information obtained from radar, including the following:					x		
		.2a	Performance, including:					x		
		.2a.1	factors affecting performance and accuracy					x		
		.2a.2	setting up and maintaining displays					x		
		.2a.3	detection of misrepresentation of information, false echoes, sea return, etc., racons and SARTs					x		
		.2b	Use, including:					x		
		.2b.1	range and bearing; course and speed of other ships; time and distance of closest approach of crossing, meeting overtaking ships					x		
		.2b.2	identification of critical echoes; detecting course and speed changes of other ships; effect of changes in own ship's course or speed or both					x		
		.2b.3	application of the International Regulations for Preventing Collisions at Sea, 1972, as amended					x		
		.2b.4	plotting techniques and relative and true-motion concepts					x		
		.2b.5	parallel indexing					x		
		KUP2	*Principal types of ARPA, their display characteristics, performance standards and the dangers of over-reliance on ARPA*					X		
C4	Use of ECDIS to	KUP1	*Navigation using ECDIS*						X	

	Bachelor of Science in Marine Transportation **CURRICULUM MAPPING**	Annex A of CMO No. 67, s. 2017 Revision No: 00 Revision Date: 00

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
	maintain the safety of navigation	.1	Knowledge of the capability and limitations of ECDIS operations, including:						x	
		.1.1	a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats						x	
		.1.2	the dangers of over-reliance						x	
		.1.3	familiarity with the functions of ECDIS required by performance standards in force						x	
		.2	Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including:						x	
		.2.1	use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings						x	
		.2.2	safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced)						x	
		.2.3	confirmation of vessel position by alternative means						x	
		.2.4	efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements						x	
		.2.5	adjustment of settings and values to suit the present conditions						x	
		.2.6	situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors						x	
C5	Respond to emergenc	KUP1	*Emergency procedures*							
		.1	Precautions for the protection and safety of passengers in emergency situations							
		.2	Initial action to be taken following a collision or a grounding; initial damage assessment and control							
		.3	Appreciation of the procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port							
C8	Transmit and receive	KUP1	*Visual signalling*							

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
	information by visual signalling	.1	Ability to use the International Code of Signals							
		.2	Ability to transmit and receive, by Morse light, distress signal SOS as specified in Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and appendix 1 of the International Code of Signals, and visual signalling of single-letter signals as also specified in the International Code of Signals							
C9	Manoeuver the ship	KUP1	*Ship manoeuvering and handling*							
		.1	Knowledge of:							
		.1.1	the effects of wind anthe effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distancesd current on ship handling							
		.1.2	the effects of wind and current on ship handling							
		.1.3	manoeuvres and procedures for the rescue of person overboard							
		.1.4	squat, shallow-water and similar effects							
		.1.5	proper procedures for anchoring and mooring							

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
A-II/2	***Function 1 Navigation at the management level***									
C1	Plan a voyage and conduct navigation	KUP1	*Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks*							x
		.1	restricted waters							x
		.2	meteorological conditions							x
		.3	Ice							x
		.4	restricted visibility							x
		.5	traffic separation schemes							x
		.6	vessel traffic service (VTS) areas							x
		.7	areas of extensive tidal effects							x
C2	Determine position and the accuracy of resultant position fix by any means	KUP1	*Position determining in all conditions*							
		.1	Celestial observations							
		.2	Terrestrial observations, including the ability to use appropriate charts, notices to mariners and other publications to assess the accuracy of the resulting fix							x
		.3	Modern electronic navigational aids with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing							x
C8	Forecast weather and oceanographic conditions	KUP1	*Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax*							
		KUP2	*Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants*							
		KUP3	*Knowledge of ocean current systems*							
		KUP4	*Ability to calculate tidal conditions*							
		KUP5	*Use all appropriate nautical publications on tides and currents*							
C11	Operate remote controls of propulsion plant and engineering systems and services	KUP1	*Operating principles of marine power plants*							
		KUP2	*Ships' auxiliary machinery*							
		KUP3	*General knowledge of marine engineering terms*							
	Contribute to berthing, anchoring and other mooring operations	KUP1	*Working knowledge of the mooring system and related procedures*							
		1.1	the function of mooring and tug lines and how each line functions as part of an overall system							

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
		1.2	the capacities, safe working loads, and breaking strengths of mooring equipment, including mooring wires, synthetic and fibre lines, winches, anchor windlasses, capstans, bitts, chocks and bollards							
		1.3	the procedures and order of events for making fast and letting go mooring and tug lines and wires, including towing lines							
		1.4	the procedures and order of events for the use of anchors in various operations							
		KUP2	*Working knowledge of the procedures and order of events associated with mooring to a buoy or buoys*							
A-II/1	***Function 2 Cargo handling and stowage at the operational level***									
C1	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes	KUP1	*Cargo handling, stowage and securing*							
		.1	Knowledge of the effect of cargo, including heavy lifts, on the seaworthiness and stability of the ship							
		.2	Knowledge of safe handling, stowage and securing of cargoes, including dangerous, hazardous and harmful cargoes, and their effect on the safety of life and of the ship							
		.3	Ability to establish and maintain effective communications during loading and unloading							
C2	Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks	KUP1	*Knowledge and ability to explain where to look for damage and defects most commonly encountered due to:*							
		.1	loading and unloading operations							
		.2	corrosion							
		.3	severe weather conditions							

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
		KUP2	*Ability to state which parts of the ship shall be inspected each time in order to cover all parts within a given period of time*							
		KUP3	*Identify those elements of the ship structure which are critical to the safety of the ship*							
		KUP4	*State the causes of corrosion in cargo spaces and ballast tanks and how corrosion can be identified and prevented*							
		KUP5	*Knowledge of procedures on how the inspections shall be carried out*							
		KUP6	*Ability to explain how to ensure reliable detection of defects and damages*							
		KUP7	*Understanding of the purpose of the "enhanced survey programme"*							
A-II/2	***Function 2 Navigation at the operational level***									
C1	Plan and ensure safe loading, stowage, securing, care during the voyage and unloading cargoes	KUP1	*Knowledge of and ability to apply relevant international regulations, codes and standards concerning the safe handling, stowage, securing and transport of cargoes*							
		KUP2	*Knowledge of the effect on trim and stability of cargoes and cargo operations*							
		KUP3	*Use of stability and trim diagrams and stress-calculating equipment, including automatic data-based (ADB) equipment, and knowledge of loading cargoes and ballasting in order to keep hull stress within acceptable limits*							
		KUP4	*Stowage and securing of cargoes on board ships, including cargo-handling gear and securing and lashing equipment*							
		KUP5	*Loading and unloading operations, with special regard to the transport of cargoes identified in the Code of Safe Practice for Cargo Stowage and Securing*							
		KUP6	*General knowledge of tankers and tanker operations*							
		KUP7	*Knowledge of the operational and design limitations of bulk carriers*							
		KUP8	*Ability to use all available shipboard data related to loading, care and unloading of bulk cargoes*							
		KUP9	*Ability to establish procedures for safe cargo handling in accordance with the provisions of the relevant instruments etc*							
		KUP10	*Ability to explain the basic principles for establishing effective communications and improving working relationship between ship and terminal personnel*							

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
C3	Carriage of dangerous goods	KUP1	*International regulations, standards, codes and recommendations on carriage of dangerous goods*							
		KUP2	*Carriage of dangerous, hazardous and harmful cargoes, precautions during loading and unloading and care during the voyage*							
A-II/1	***Function 3 Controlling the operation of the ship and care for persons on board at the operational level***									
C1	Ensure compliance with pollution prevention requirements	KUP1	*Prevention of pollution of the marine environment and anti-pollution procedures*							
		.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment							
		.2	Anti-pollution procedures and all associated equipment							
		.3	Importance of proactive measures to protect the marine environment							
C2	Maintain seaworthiness of the ship	KUP1	*Ship stability*							
		.1	Working knowledge and application of stability, trim and stress tables, diagrams and stresscalculating equipment							
		.2	Understanding of the fundamentals of watertight integrity							
		.3	Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy							
		KUP2	*Ship construction*							
		.1	General knowledge of the principal structural members of a ship and the proper names for the various parts							
C6	Monitor compliance with legislative requirements	KUP1	*Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment*							
C7	Application of leadership and teamworking skills	KUP1	*Working knowledge of shipboard personnel management and training*							
		KUP2	*A knowledge of related international maritime conventions and recommendations, and national legislation*							
		KUP3	*Ability to apply task and workload management*							
		.1	planning and co-ordination							
		.2	personnel assignment							
		.3	time and resource constraints							
		.4	prioritization							

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
		KUP4	*Knowledge and ability to apply effective resource management*							
		.1	allocation, assignment, and prioritization of resources							
		.2	effective communication onboard and ashore							
		.3	decisions reflect consideration of team experiences							
		.4	assertiveness and leadership, including motivation							
		.5	obtaining and maintaining situational awareness							
		KUP5	*Knowledge and ability to apply decision-making techniques*							
A-II/2	***Function 1 Navigation at the operational level***									
C1	Control trim, stability and stress	KUP1	*Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability*							
		KUP2	*Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken*							
		KUP3	*Knowledge of IMO recommendations concerning ship stability*							
C2	Monitor and control compliance with legislative measures to ensure safety of life at sea and protection of the marine environment	KUP1	*Knowledge of relevant international maritme law embodied in international agreements and conventions. Regard shall be paid to responsibilities under the International Convention for the Prevention of Pollution from Ships as amended.*							
		KUP2	*Regard shall be paid especially to the following subjects:*							
		.1	certificates and other documents required to be carried on board ships by International conventions, how they may be obtained and their period of valldity							
		.2	responsibilities under the relevant requirements of the International Convention on Load Lines, 1966, as amended							
		.3	responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea							
		.4	responsibilities under the International Convention for the Prevention of Pollution from Ships							

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
		.5	maritime declarations of health and the requirements of the International Health Regulations							
		.6	responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo							
		.7	methods and aids to prevent pollution of the marine environment by ships							
		.8	national legislation for implementing international agreements and conventions							
A-II/5	***Function 3 Controlling the Operation of the ship and care for persons on board at the support level***									
C1	Contribute to the safe operation of deck equipment and machinery	KUP1	*Knowledge of deck equipment*							
		KUP2	*Knowledge of the following procedures and ability to:*							
		.1	Rig and unrig bosun's chairs and staging							
		.2	Rig and unrig pilot ladders, hoists, rat-guards and gangways							
		.3	Use marlin spike seamanship skills, including the proper use of knots, splices and stoppers							
A-II/5	***Function 4 Maintenance and repair at the support level***									
C1	Contribute to shipboard maintenance and repair	KUP1	*Ability to use painting, lubrication and cleaning materials and equipment*							
		KUP2	*Ability to understand and execute routine maintenance and repair procedures*							
		KUP3	*Knowledge of surface preperation techniques*							
		KUP4	*Understanding manufacturer's safety guidelines and shipboard instructions*							
		KUP5	*Knowledge of safe disposal of waste materials*							
		KUP6	*Knowledge of the application, maintenance and use of hand and power tools*							
A-III/6	***Function 1 Electrical, electronic and control engineering at the operational level***									
C5	Operate computers and computer networks on ships	KUP1	Understanding of:							

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Nav 1	Nav 2	Nav 3	Nav 4	Nav 5	Nav 6	Nav 7
		KUP2	*Theoretical knowledge*							
		1.2	main features of data processing							
		1.3	construction and use of computer networks on ships							
		1.4	bridge-based, engine-room based and commercial computer use							
	GMDSS									
C1	Transmit and receive information using GMDSS subsystems and equipment and fulfilling the functional requirements of GMDSS (Table A-IV/2)	KUP1	*In addition to the requirements of the Radio Regulations, a knowledge of:*							
		.1	search and rescue radiocommunications, including procedures in the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual							
		.2	the means to prevent the transmission of false distress alerts and the procedures to mitigate the effects of such alerts							
		.3	ship reporting systems							
		.4	radio medical services							
		.5	use of the International Code of Signals and the IMO Standard Marine Communication Phrases							
		.6	the English language, both written and spoken, for the communication of information relevant to safety of life at sea							
C2	Provide radio services in emergencies (Table A-IV/2)	KUP1	*The provision of radio services in emergencies such as*							
		0.1	abandon ship							
		0.2	fire on board ship							
		0.3	partial or full breakdown of radio installations							
		KUP2	*Preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical and non-ionizing radiation hazards*							
			total indicative class hours	0	0	0	0	0	0	0

	Competences from Table A-II/1 OIC Navigational Watch
	Competences from Table A-II/2 Management Level Deck
	Competences from Table A-II/5 Able Seafarer Deck
	Competence from Table A-IV/2 GMDSS Radio Operators

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
A-II/1	***Function 1 Navigation at the operational level***								
C1	Plan and conduct a passage and determine position	KUP1	*Celestial navigation*						
		.1	Ability to use celestial bodies to determine the ship's position						
		KUP2	*Terrestrial and coastal navigation*						
		.1	Ability to determine the ship's position by use of landmarks						
		.2	Ability to determine the ship's position by use of aids to navigation, including lighthouses, beacons and buoys						
		.3	Ability to determine the ship's position by use of dead reckoning, taking into account winds, tides, currents and estimated speed						
		KUP3	*Thorough knowledge of and ability to use nautical charts, and publications, such as sailing directions, tide tables, notices to mariners, radio navigational warnings and ships' routeing information*						
		KUP4	*Electronic systems of position fixing and navigation*						
		.1	Ability to determine the ship's position by use of electronic navigational aids						
		KUP5	*Echo-sounders*						
		.1	Ability to operate the equipment and apply the information correctly						
		KUP6	*Compass – magnetic and gyro*						
		.1	Knowledge of the principles of magnetic and gyro-compasses						
		KUP7	*Steering and control systems*						
		.1	Knowledge of steering control systems, operational procedures and change-over from manual to automatic control and vice versa. Adjustment of controls for optimum performance						
		KUP8	*Meteorology*						
		.1	Ability to use and interpret information obtained from shipborne meteorological instruments						
		.2	Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems						
		.3	Ability to apply the meteorological information available						
C2	Maintain a safe navigational watch	KUP1	*Watchkeeping*						
		.1	Thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended						

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
		.2	Thorough knowledge of the Principles to be observed in keeping a navigational watch						
		.3	The use of routeing in accordance with the General Provisions on Ships' Routeing						
		.4	The use of information from navigational equipment for maintaining a safe navigational watch						
		.5	Knowledge of blind pilotage techniques						
		.6	The use of reporting in accordance with the General Principles for Ship Reporting Systems and with VTS procedures						
		KUP2	*Bridge resource management*						
C3	Use of RADAR and ARPA to maintain safety of navigation	KUP1	*Radar navigation*						
		.1	Knowledge of the fundamentals of radar and automatic radar plotting aids (ARPA)						
		.2	Ability to operate and to interpret and analyse information obtained from radar, including the following:						
		.2a	Performance, including:						
		.2a.1	factors affecting performance and accuracy						
		.2a.2	setting up and maintaining displays						
		.2a.3	detection of misrepresentation of information, false echoes, sea return, etc., racons and SARTs						
		.2b	Use, including:						
		.2b.1	range and bearing; course and speed of other ships; time and distance of closest approach of crossing, meeting overtaking ships						
		.2b.2	identification of critical echoes; detecting course and speed changes of other ships; effect of changes in own ship's course or speed or both						
		.2b.3	application of the International Regulations for Preventing Collisions at Sea, 1972, as amended						
		.2b.4	plotting techniques and relative and true-motion concepts						
		.2b.5	parallel indexing						
		KUP2	*Principal types of ARPA, their display characteristics, performance standards and the dangers of over-reliance on ARPA*						
C4	Use of ECDIS to	KUP1	*Navigation using ECDIS*						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
	maintain the safety of navigation	.1	Knowledge of the capability and limitations of ECDIS operations, including:						
		.1.1	a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats						
		.1.2	the dangers of over-reliance						
		.1.3	familiarity with the functions of ECDIS required by performance standards in force						
		.2	Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including:						
		.2.1	use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings						
		.2.2	safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced)						
		.2.3	confirmation of vessel position by alternative means						
		.2.4	efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements						
		.2.5	adjustment of settings and values to suit the present conditions						
		.2.6	situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors						
C5	Respond to emergen	KUP1	*Emergency procedures*					X	
		.1	Precautions for the protection and safety of passengers in emergency situations					x	
		.2	Initial action to be taken following a collision or a grounding; initial damage assessment and control					x	
		.3	Appreciation of the procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port					x	
C8	Transmit and receive	KUP1	*Visual signalling*						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
	Information by visual signalling	.1	Ability to use the International Code of Signals						
		.2	Ability to transmit and receive, by Morse light, distress signal SOS as specified in Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and appendix 1 of the International Code of Signals, and visual signalling of single-letter signals as also specified in the International Code of Signals						
C9	Manoeuver the ship	KUP1	*Ship manoeuvering and handling*					X	
		.1	Knowledge of:					x	
		.1.1	the effects of wind anthe effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distancesd current on ship handling					x	
		.1.2	the effects of wind and current on ship handling					x	
		.1.3	manoeuvres and procedures for the rescue of person overboard					x	
		.1.4	squat, shallow-water and similar effects					x	
		.1.5	proper procedures for anchoring and mooring					x	

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6
A-II/2	*Function 1 Navigation at the management level*								
C1	Plan a voyage and conduct navigation	KUP1	*Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks*						
		.1	restricted waters						
		.2	meteorological conditions						
		.3	ice						
		.4	restricted visibility						
		.5	traffic separation schemes						
		.6	vessel traffic service (VTS) areas						
		.7	areas of extensive tidal effects						
C2	Determine position and the accuracy of resultant position fix by any means	KUP1	*Position determining in all conditions*						
		.1	Celestial observations						
		.2	Terrestrial observations, including the ability to use appropriate charts, notices to mariners and other publications to assess the accuracy of the resulting fix						
		.3	Modern electronic navigational aids with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing						
C8	Forecast weather and oceanographic conditions	KUP1	*Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax*						
		KUP2	*Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants*						
		KUP3	*Knowledge of ocean current systems*						
		KUP4	*Ability to calculate tidal conditions*						
		KUP5	*Use all appropriate nautical publications on tides and currents*						
C11	Operate remote controls of propulsion plant and engineering systems and services	KUP1	*Operating principles of marine power plants*						
		KUP2	*Ships' auxiliary machinery*						
		KUP3	*General knowledge of marine engineering terms*						
	Contribute to berthing, anchoring and other mooring operations	KUP1	*Working knowledge of the mooring system and related procedures*	X					
		1.1	the function of mooring and tug lines and how each line functions as part of an overall system	x					

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
		1.2	the capacities, safe working loads, and breaking strengths of mooring equipment, including mooring wires, synthetic and fibre lines, winches, anchor windlasses, capstans, bitts, chocks and bollards	x					
		1.3	the procedures and order of events for making fast and letting go mooring and tug lines and wires, including towing lines	x					
		1.4	the procedures and order of events for the use of anchors in various operations	x					
		KUP2	*Working knowledge of the procedures and order of events associated with mooring to a buoy or buoys*	X					
A-II/1	***Function 2 Cargo handling and stowage at the operational level***								
C1	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes	KUP1	*Cargo handling, stowage and securing*		X	X	X		
		.1	Knowledge of the effect of cargo, including heavy lifts, on the seaworthiness and stability of the ship		x	x			
		.2	Knowledge of safe handling, stowage and securing of cargoes, including dangerous, hazardous and harmful cargoes, and their effect on the safety of life and of the ship				x		
		.3	Ability to establish and maintain effective communications during loading and unloading			x	x		
C2	Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks	KUP1	*Knowledge and ability to explain where to look for damage and defects most commonly encountered due to:*			X			
		.1	loading and unloading operations			x			
		.2	corrosion			x			
		.3	severe weather conditions			x			

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
		KUP2	*Ability to state which parts of the ship shall be inspected each time in order to cover all parts within a given period of time*			X			
		KUP3	*Identify those elements of the ship structure which are critical to the safety of the ship*			X			
		KUP4	*State the causes of corrosion in cargo spaces and ballast tanks and how corrosion can be identified and prevented*			X			
		KUP5	*Knowledge of procedures on how the inspections shall be carried out*			X			
		KUP6	*Ability to explain how to ensure reliable detection of defects and damages*			X			
		KUP7	*Understanding of the purpose of the "enhanced survey programme"*			X	X		
A-II/2	***Function 2 Navigation at the operational level***								
C1	Plan and ensure safe loading, stowage, securing, care during the voyage and unloading cargoes	KUP1	*Knowledge of and ability to apply relevant international regulations, codes and standards concerning the safe handling, stowage, securing and transport of cargoes*						
		KUP2	*Knowledge of the effect on trim and stability of cargoes and cargo operations*						
		KUP3	*Use of stability and trim diagrams and stress-calculating equipment, including automatic data-based (ADB) equipment, and knowledge of loading cargoes and ballasting in order to keep hull stress within accaptable limits*						
		KUP4	*Stowage and securing of cargoes on board ships, including cargo-handling gear and securing and lashing equipment*						
		KUP5	*Loading and unloading operations, with special regard to the transport of cargoes identified in the Code of Safe Practice for Cargo Stowage and Securing*						
		KUP6	*General knowledge of tankers and tanker operations*				X		
		KUP7	*Knowledge of the operational and design limitations of bulk carriers*						
		KUP8	*Ability to use all available shipboard data related to loading, care and unloading of bulk cargoes*						
		KUP9	*Ability to establish procedures for safe cargo handling in accordance with the provisions of the relevant instruments etc*						
		KUP10	*Ability to explain the basic principles for establishing effective communications and improving working relationship between ship and terminal personnel*						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
C3	Carriage of dangerous goods	KUP1	*International regulations, standards, codes and recommendations on carriage of dangerous goods*				X		
		KUP2	*Carriage of dangerous, hazardous and harmful cargoes, precautions during loading and unloading and care during the voyage*				X		
A-II/1	***Function 3 Controlling the operation of the ship and care for persons on board at the operational***								
C1	Ensure compliance with pollution prevention requirements	KUP1	*Prevention of pollution of the marine environment and anti-pollution procedures*						
		.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment						
		.2	Anti-pollution procedures and all associated equipment						
		.3	Importance of proactive measures to protect the marine environment						
C2	Maintain seaworthiness of the ship	KUP1	*Ship stability*		X				
		.1	Working knowledge and application of stability, trim and stress tables, diagrams and stresscalculating equipment		x				
		.2	Understanding of the fundamentals of watertight integrity		x				
		.3	Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy		x				
		KUP2	*Ship construction*	X					
		.1	General knowledge of the principal structural members of a ship and the proper names for the various parts	x					
C6	Monitor compliance with legislative requirements	KUP1	*Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment*						
C7	Application of leadership and teamworking skills	KUP1	*Working knowledge of shipboard personnel management and training*	X					
		KUP2	*A knowledge of related international maritime conventions and recommendations, and national legislation*						
		KUP3	*Ability to apply task and workload management*						
		.1	planning and co-ordination						
		.2	personnel assignment						
		.3	time and resource constraints						
		.4	prioritization						

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
		KUP4	*Knowledge and ability to apply effective resource management*						
		.1	allocation, assignment, and prioritization of resources						
		.2	effective communication onboard and ashore						
		.3	decisions reflect consideration of team experiences						
		.4	assertiveness and leadership, including motivation						
		.5	obtaining and maintaining situational awareness						
		KUP5	*Knowledge and ability to apply decision-making techniques*						
A-II/2	***Function 1 Navigation at the operational level***								
C1	Control trim, stability and stress	KUP1	*Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability*						X
		KUP2	*Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken*						X
		KUP3	*Knowledge of IMO recommendations concerning ship stability*						X
C2	Monitor and control compliance with legislative measures to ensure safety of life at sea and protection of the marine environment	KUP1	*Knowledge of relevant international maritime law embodied in international agreements and conventions. Regard shall be paid to responsibilities under the International Convention for the Prevention of Pollution from Ships as amended.*						
		KUP2	*Regard shall be paid especially to the following subjects:*						
		.1	certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity						
		.2	responsibilities under the relevant requirements of the International Convention on Load Lines, 1966, as amended						
		.3	responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea						
		.4	responsibilities under the International Convention for the Prevention of Pollution from Ships						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
		.5	maritime declarations of health and the requirements of the International Health Regulations						
		.6	responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo						
		.7	methods and aids to prevent pollution of the marine environment by ships						
		.8	national legislation for implementing international agreements and conventions						
A-II/5	***Function 3 Controlling the Operation of the ship and care for persons on board at the support lev***								
C1	Contribute to the safe operation of deck equipment and machinery	KUP1	*Knowledge of deck equipment*	X					
		KUP2	*Knowledge of the following procedures and ability to:*	X					
		.1	Rig and unrig bosun's chairs and staging	x					
		.2	Rig and unrig pilot ladders, hoists, rat-guards and gangways	x					
		.3	Use marlin spike seamanship skills, including the proper use of knots, splices and stoppers	x					
A-II/5	***Function 4 Maintenance and repair at the support level***								
C1	Contribute to shipboard maintenance and repair	KUP1	*Ability to use painting, lubrication and cleaning materials and equipment*	X					
		KUP2	*Ability to understand and execute routine maintenance and repair procedures*	X					
		KUP3	*Knowledge of surface preparation techniques*	X					
		KUP4	*Understanding manufacturer's safety guidelines and shipboard instructions*	X					
		KUP5	*Knowledge of safe disposal of waste materials*	X					
		KUP6	*Knowledge of the application, maintenance and use of hand and power tools*	X					
A-III/6	***Function 1 Electrical, electronic and control engineering at the operational level***								
C5	Operate computers and computer networks on ships	KUP1	Understanding of:						

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				Seam 1	Seam 2	Seam 3	Seam 4	Seam 5	Seam 6
		KUP2	*Theoretical knowledge*						
		1.2	main features of data processing						
		1.3	construction and use of computer networks on ships						
		1.4	bridge-based, engine-room based and commercial computer use						
	GMDSS								
C1	Transmit and receive information using GMDSS subsystems and equipment and fulfilling the functional requirements of GMDSS (Table A-IV/2)	KUP1	*In addition to the requirements of the Radio Regulations, a knowledge of:*						
		.1	search and rescue radiocommunications, including procedures in the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual						
		.2	the means to prevent the transmission of false distress alerts and the procedures to mitigate the effects of such alerts						
		.3	ship reporting systems						
		.4	radio medical services						
		.5	use of the International Code of Signals and the IMO Standard Marine Communication Phrases						
		.6	the English language, both written and spoken, for the communication of information relevant to safety of life at sea						
C2	Provide radio services in emergencies (Table A-IV/2)	KUP1	*The provision of radio services in emergencies such as*						
		0.1	abandon ship						
		0.2	fire on board ship						
		0.3	partial or full breakdown of radio installations						
		KUP2	*Preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical and non-ionizing radiation hazards*						
			total Indicative class hours	0	0	0	0	0	

	Competences from Table A-II/1 OIC Navigational Watch
	Competences from Table A-II/2 Management Level Deck
	Competences from Table A-II/5 Able Seafarer Deck
	Competence from Table A-IV/2 GMDSS Radio Operators

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
A-II/1	*Function 1 Navigation at the operational level*								
C1	Plan and conduct a passage and determine position	KUP1	*Celestial navigation*						
		.1	Ability to use celestial bodies to determine the ship's position						
		KUP2	*Terrestrial and coastal navigation*						
		.1	Ability to determine the ship's position by use of landmarks						
		.2	Ability to determine the ship's position by use of aids to navigation, including lighthouses, beacons and buoys						
		.3	Ability to determine the ship's position by use of dead reckoning, taking into account winds, tides, currents and estimated speed						
		KUP3	*Thorough knowledge of and ability to use nautical charts, and publications, such as sailing directions, tide tables, notices to mariners, radio navigational warnings and ships' routeing information*						
		KUP4	*Electronic systems of position fixing and navigation*						
		.1	Ability to determine the ship's position by use of electronic navigational aids						
		KUP5	*Echo-sounders*						
		.1	Ability to operate the equipment and apply the information correctly						
		KUP6	*Compass – magnetic and gyro*						
		.1	Knowledge of the principles of magnetic and gyro-compasses						
		KUP7	*Steering and control systems*		X				
		.1	Knowledge of steering control systems, operational procedures and change-over from manual to automatic control and vice versa. Adjustment of controls for optimum performance		x				
		KUP8	*Meteorology*			X			
		.1	Ability to use and interpret information obtained from shipborne meteorological instruments			x			
		.2	Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems			x			
		.3	Ability to apply the meteorological information available			x			
C2	Maintain a safe navigational watch	KUP1	*Watchkeeping*	X					
		.1	Thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended	x					

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COMPETENCE INDEX	COMPETENCE	KUP / INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
A-II/1	***Function 1 Navigation at the operational level***								
		.2	Thorough knowledge of the Principles to be observed in keeping a navigational watch		x				
		.3	The use of routeing in accordance with the General Provisions on Ships' Routeing		x				
		.4	The use of information from navigational equipment for maintaining a safe navigational watch		x				
		.5	Knowledge of blind pilotage techniques		x				
		.6	The use of reporting in accordance with the General Principles for Ship Reporting Systems and with VTS procedures		x				
		KUP2	*Bridge resource management*		x				
C3	Use of RADAR and ARPA to maintain safety of navigation	KUP1	*Radar navigation*						
		.1	Knowledge of the fundamentals of radar and automatic radar plotting aids (ARPA)						
		.2	Ability to operate and to interpret and analyse information obtained from radar, including the following:						
		.2a	Performance, including:						
		.2a.1	factors affecting performance and accuracy						
		.2a.2	setting up and maintaining displays						
		.2a.3	detection of misrepresentation of information, false echoes, sea return, etc., racons and SARTs						
		.2b	Use, including:						
		.2b.1	range and bearing; course and speed of other ships; time and distance of closest approach of crossing, meeting overtaking ships						
		.2b.2	identification of critical echoes; detecting course and speed changes of other ships; effect of changes in own ship's course or speed or both						
		.2b.3	application of the International Regulations for Preventing Collisions at Sea, 1972, as amended						
		.2b.4	plotting techniques and relative and true-motion concepts						
		.2b.5	parallel indexing						
		KUP2	*Principal types of ARPA, their display characteristics, performance standards and the dangers of over-reliance on ARPA*						
C4	Use of ECDIS to maintain the	KUP1	*Navigation using ECDIS*						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
	maintain the safety of navigation	.1	Knowledge of the capability and limitations of ECDIS operations, including:						
		.1.1	a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats						
		.1.2	the dangers of over-reliance						
		.1.3	familiarity with the functions of ECDIS required by performance standards in force						
		.2	Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including:						
		.2.1	use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings						
		.2.2	safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced)						
		.2.3	confirmation of vessel position by alternative means						
		.2.4	efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements						
		.2.5	adjustment of settings and values to suit the present conditions						
		.2.6	situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors						
C5	Respond to emergend	KUP1	*Emergency procedures*						
		.1	Precautions for the protection and safety of passengers in emergency situations						
		.2	Initial action to be taken following a collision or a grounding; initial damage assessment and control						
		.3	Appreciation of the procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port						
C8	Transmit and receive	KUP1	*Visual signalling*						X

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
	Information by visual signalling	.1	Ability to use the International Code of Signals						x
		.2	Ability to transmit and receive, by Morse light, distress signal SOS as specified in Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and appendix 1 of the International Code of Signals, and visual signalling of single-letter signals as also specified in the International Code of Signals						x
C9	Manoeuver the ship	KUP1	*Ship manoeuvering and handling*						
		.1	Knowledge of:						
		.1.1	the effects of wind anthe effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distancesd current on ship handling						
		.1.2	the effects of wind and current on ship handling						
		.1.3	manoeuvres and procedures for the rescue of person overboard						
		.1.4	squat, shallow-water and similar effects						
		.1.5	proper procedures for anchoring and mooring						

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
A-II/2	*Function 1 Navigation at the management level*								
C1	Plan a voyage and conduct navigation	KUP1	*Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks*						
		.1	restricted waters						
		.2	meteorological conditions						
		.3	ice						
		.4	restricted visibility						
		.5	traffic separation schemes						
		.6	vessel traffic service (VTS) areas						
		.7	areas of extensive tidal effects						
C2	Determine position and the accuracy of resultant position fix by any means	KUP1	*Position determining in all conditions*						
		.1	Celestial observations						
		.2	Terrestrial observations, including the ability to use appropriate charts, notices to mariners and other publications to assess the accuracy of the resulting fix						
		.3	Modern electronic navigational aids with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing						
C8	Forecast weather and oceanographic conditions	KUP1	*Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax*				X		
		KUP2	*Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants*				X		
		KUP3	*Knowledge of ocean current systems*				X		
		KUP4	*Ability to calculate tidal conditions*				X		
		KUP5	*Use all appropriate nautical publications on tides and currents*				X		
C11	Operate remote controls of propulsion plant and engineering systems and services	KUP1	*Operating principles of marine power plants*					X	
		KUP2	*Ships' auxiliary machinery*					X	
		KUP3	*General knowledge of marine engineering terms*					X	
	Contribute to berthing, anchoring and other mooring operations	KUP1	*Working knowledge of the mooring system and related procedures*						
		1.1	the function of mooring and tug lines and how each line functions as part of an overall system						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
		1.2	the capacities, safe working loads, and breaking strengths of mooring equipment, including mooring wires, synthetic and fibre lines, winches, anchor windlasses, capstans, bitts, chocks and bollards						
		1.3	the procedures and order of events for making fast and letting go mooring and tug lines and wires, including towing lines						
		1.4	the procedures and order of events for the use of anchors in various operations						
		KUP2	*Working knowledge of the procedures and order of events associated with mooring to a buoy or buoys*						
A-II/1	***Function 2 Cargo handling and stowage at the operational level***								
C1	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes	KUP1	*Cargo handling, stowage and securing*						
		.1	Knowledge of the effect of cargo, including heavy lifts, on the seaworthiness and stability of the ship						
		.2	Knowledge of safe handling, stowage and securing of cargoes, including dangerous, hazardous and harmful cargoes, and their effect on the safety of life and of the ship						
		.3	Ability to establish and maintain effective communications during loading and unloading						
C2	Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks	KUP1	*Knowledge and ability to explain where to look for damage and defects most commonly encountered due to:*						
		.1	loading and unloading operations						
		.2	corrosion						
		.3	severe weather conditions						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
		KUP2	*Ability to state which parts of the ship shall be inspected each time in order to cover all parts within a given period of time*						
		KUP3	*Identify those elements of the ship structure which are critical to the safety of the ship*						
		KUP4	*State the causes of corrosion in cargo spaces and ballast tanks and how corrosion can be identified and prevented*						
		KUP5	*Knowledge of procedures on how the inspections shall be carried out*						
		KUP6	*Ability to explain how to ensure reliable detection of defects and damages*						
		KUP7	*Understanding of the purpose of the "enhanced survey programme"*						
A-II/2	***Function 2 Navigation at the operational level***								
C1	Plan and ensure safe loading, stowage, securing, care during the voyage and unloading cargoes	KUP1	*Knowledge of and ability to apply relevant international regulations, codes and standards concerning the safe handling, stowage, securing and transport of cargoes*						
		KUP2	*Knowledge of the effect on trim and stability of cargoes and cargo operations*						
		KUP3	*Use of stability and trim diagrams and stress-calculating equipment, including automatic data-based (ADB) equipment, and knowledge of loading cargoes and ballasting in order to keep hull stress within accaptable limits*						
		KUP4	*Stowage and securing of cargoes on board ships, including cargo-handling gear and securing and lashing equipment*						
		KUP5	*Loading and unloading operations, with special regard to the transport of cargoes identified in the Code of Safe Practice for Cargo Stowage and Securing*						
		KUP6	*General knowledge of tankers and tanker operations*						
		KUP7	*Knowledge of the operational and design limitations of bulk carriers*						
		KUP8	*Ability to use all available shipboard data related to loading, care and unloading of bulk cargoes*						
		KUP9	*Ability to establish procedures for safe cargo handling in accordance with the provisions of the relevant instruments etc*						
		KUP10	*Ability to explain the basic principles for establishing effective communications and improving working relationship between ship and terminal personnel*						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
C3	Carriage of dangerous goods	KUP1	*International regulations, standards, codes and recommendations on carriage of dangerous goods*						
		KUP2	*Carriage of dangerous, hazardous and harmful cargoes, precautions during loading and unloading and care during the voyage*						
A-II/1	***Function 3 Controlling the operation of the ship and care for persons on board at the operational l***								
C1	Ensure compliance with pollution prevention requirements	KUP1	*Prevention of pollution of the marine environment and anti-pollution procedures*						
		.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment						
		.2	Anti-pollution procedures and all associated equipment						
		.3	Importance of proactive measures to protect the marine environment						
C2	Maintain seaworthiness of the ship	KUP1	*Ship stability*						
		.1	Working knowledge and application of stability, trim and stress tables, diagrams and stresscalculating equipment						
		.2	Understanding of the fundamentals of watertight integrity						
		.3	Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy						
		KUP2	*Ship construction*						
		.1	General knowledge of the principal structural members of a ship and the proper names for the various parts						
C6	Monitor compliance with legislative requirements	KUP1	*Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment*						
C7	Application of leadership and teamworking skills	KUP1	*Working knowledge of shipboard personnel management and training*						
		KUP2	*A knowledge of related international maritime conventions and recommendations, and national legislation*						
		KUP3	*Ability to apply task and workload management*						
		.1	planning and co-ordination						
		.2	personnel assignment						
		.3	time and resource constraints						
		.4	prioritization						

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
		KUP4	*Knowledge and ability to apply effective resource management*						
		.1	allocation, assignment, and prioritization of resources						
		.2	effective communication onboard and ashore						
		.3	decisions reflect consideration of team experiences						
		.4	assertiveness and leadership, including motivation						
		.5	obtaining and maintaining situational awareness						
		KUP5	*Knowledge and ability to apply decision-making techniques*						
A-II/2	***Function 1 Navigation at the operational level***								
C1	Control trim, stability and stress	KUP1	*Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability*						
		KUP2	*Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken*						
		KUP3	*Knowledge of IMO recommendations concerning ship stability*						
C2	Monitor and control compliance with legislative measures to ensure safety of life at sea and protection of the marine environment	KUP1	*Knowledge of relevant international maritme law embodied in international agreements and conventions. Regard shall be paid to responsibilities under the International Convention for the Prevention of Pollution from Ships as amended.*						
		KUP2	*Regard shall be paid especially to the following subjects:*						
		.1	certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity						
		.2	responsibilities under the relevant requirements of the International Convention on Load Lines, 1966, as amended						
		.3	responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea						
		.4	responsibilities under the International Convention for the Prevention of Pollution from Ships						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
		.5	maritime declarations of health and the requirements of the International Health Regulations						
		.6	responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo						
		.7	methods and aids to prevent pollution of the marine environment by ships						
		.8	national legislation for implementing international agreements and conventions						
A-II/5	***Function 3 Controlling the Operation of the ship and care for persons on board at the support leve***								
C1	Contribute to the safe operation of deck equipment and machinery	KUP1	*Knowledge of deck equipment*						
		KUP2	*Knowledge of the following procedures and ability to:*						
		.1	Rig and unrig bosun's chairs and staging						
		.2	Rig and unrig pilot ladders, hoists, rat-guards and gangways						
		.3	Use marlin spike seamanship skills, including the proper use of knots, splices and stoppers						
A-II/5	***Function 4 Maintenance and repair at the support level***								
C1	Contribute to shipboard maintenance and repair	KUP1	*Ability to use painting, lubrication and cleaning materials and equipment*						
		KUP2	*Ability to understand and execute routine maintenance and repair procedures*						
		KUP3	*Knowledge of surface preparation techniques*						
		KUP4	*Understanding manufacturer's safety guidelines and shipboard instructions*						
		KUP5	*Knowledge of safe disposal of waste materials*						
		KUP6	*Knowledge of the application, maintenance and use of hand and power tools*						
A-III/6	***Function 1 Electrical, electronic and control engineering at the operational level***								
C5	Operate computers and computer networks on ships	KUP1	Understanding of:						

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses					
				D-Watch 1	D-Watch 2	Met-O 1	Met-O 2	Mar Pow	Marcom
		KUP2	*Theoretical knowledge*						
		1.2	main features of data processing						
		1.3	construction and use of computer networks on ships						
		1.4	bridge-based, engine-room based and commercial computer use						
	GMDSS								
C1	Transmit and receive information using GMDSS subsystems and equipment and fulfilling the functional requirements of GMDSS (Table A-IV/2)	KUP1	*In addition to the requirements of the Radio Regulations, a knowledge of:*						X
		.1	search and rescue radiocommunications, including procedures in the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual						x
		.2	the means to prevent the transmission of false distress alerts and the procedures to mitigate the effects of such alerts						x
		.3	ship reporting systems						x
		.4	radio medical services						x
		.5	use of the International Code of Signals and the IMO Standard Marine Communication Phrases						x
		.6	the English language, both written and spoken, for the communication of information relevant to safety of life at sea						x
C2	Provide radio services in emergencies (Table A-IV/2)	KUP1	*The provision of radio services in emergencies such as*						X
		0.1	abandon ship						x
		0.2	fire on board ship						x
		0.3	partial or full breakdown of radio installations						x
		KUP2	*Preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical and non-ionizing radiation hazards*						X
			total indicative class hours	0	0	0	0	0	0

	Competences from Table A-II/1 OIC Navigational Watch
	Competences from Table A-II/2 Management Level Deck
	Competences from Table A-II/5 Able Seafarer Deck
	Competence from Table A-IV/2 GMDSS Radio Operators

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				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
A-II/1	*Function 1 Navigation at the operational level*							
C1	Plan and conduct a passage and determine position	KUP1	*Celestial navigation*					
		.1	Ability to use celestial bodies to determine the ship's position					
		KUP2	*Terrestrial and coastal navigation*					
		.1	Ability to determine the ship's position by use of landmarks					
		.2	Ability to determine the ship's position by use of aids to navigation, including lighthouses, beacons and buoys					
		.3	Ability to determine the ship's position by use of dead reckoning, taking into account winds, tides, currents and estimated speed					
		KUP3	*Thorough knowledge of and ability to use nautical charts, and publications, such as sailing directions, tide tables, notices to mariners, radio navigational warnings and ships' routeing information*					
		KUP4	*Electronic systems of position fixing and navigation*					
		.1	Ability to determine the ship's position by use of electronic navigational aids					
		KUP5	*Echo-sounders*					
		.1	Ability to operate the equipment and apply the information correctly					
		KUP6	*Compass – magnetic and gyro*					
		.1	Knowledge of the principles of magnetic and gyro-compasses					
		KUP7	*Steering and control systems*					
		.1	Knowledge of steering control systems, operational procedures and change-over from manual to automatic control and vice versa. Adjustment of controls for optimum performance					
		KUP8	*Meteorology*					
		.1	Ability to use and interpret information obtained from shipborne meteorological instruments					
		.2	Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems					
		.3	Ability to apply the meteorological information available					
C2	Maintain a safe navigational watch	KUP1	*Watchkeeping*					
		.1	Thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended					

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				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
		.2	Thorough knowledge of the Principles to be observed in keeping a navigational watch					
		.3	The use of routeing in accordance with the General Provisions on Ships' Routeing					
		.4	The use of information from navigational equipment for maintaining a safe navigational watch					
		.5	Knowledge of blind pilotage techniques					
		.6	The use of reporting in accordance with the General Principles for Ship Reporting Systems and with VTS procedures					
		KUP2	*Bridge resource management*					
C3	Use of RADAR and ARPA to maintain safety of navigation	KUP1	*Radar navigation*					
		.1	Knowledge of the fundamentals of radar and automatic radar plotting aids (ARPA)					
		.2	Ability to operate and to interpret and analyse information obtained from radar, including the following:					
		.2a	Performance, including:					
		.2a.1	factors affecting performance and accuracy					
		.2a.2	setting up and maintaining displays					
		.2a.3	detection of misrepresentation of information, false echoes, sea return, etc., racons and SARTs					
		.2b	Use, including:					
		.2b.1	range and bearing; course and speed of other ships; time and distance of closest approach of crossing, meeting overtaking ships					
		.2b.2	identification of critical echoes; detecting course and speed changes of other ships; effect of changes in own ship's course or speed or both					
		.2b.3	application of the International Regulations for Preventing Collisions at Sea, 1972, as amended					
		.2b.4	plotting techniques and relative and true-motion concepts					
		.2b.5	parallel indexing					
		KUP2	*Principal types of ARPA, their display characteristics, performance standards and the dangers of over-reliance on ARPA*					
C4	Use of ECDIS to	KUP1	*Navigation using ECDIS*					

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses				
				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
	maintain the safety of navigation	.1	Knowledge of the capability and limitations of ECDIS operations, including:					
		.1.1	a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats					
		.1.2	the dangers of over-reliance					
		.1.3	familiarity with the functions of ECDIS required by performance standards in force					
		.2	Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including:					
		.2.1	use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings					
		.2.2	safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced)					
		.2.3	confirmation of vessel position by alternative means					
		.2.4	efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements					
		.2.5	adjustment of settings and values to suit the present conditions					
		.2.6	situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors					
C5	Respond to emergen	KUP1	*Emergency procedures*					
		.1	Precautions for the protection and safety of passengers in emergency situations					
		.2	Initial action to be taken following a collision or a grounding; initial damage assessment and control					
		.3	Appreciation of the procedures to be followed for rescuing persons from the sea, assisting a ship in distress, responding to emergencies which arise in port					
C6	Transmit and receive	KUP1	*Visual signalling*					

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses						
				Mar Pow	Marcom	MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
	information by visual signalling	.1	Ability to use the International Code of Signals							
		.2	Ability to transmit and receive, by Morse light, distress signal SOS as specified in Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and appendix 1 of the International Code of Signals, and visual signalling of single-letter signals as also specified in the International Code of Signals							
C9	Manoeuver the ship	KUP1	*Ship manoeuvering and handling*							
		.1	Knowledge of:							
		.1.1	the effects of wind anthe effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distancesd current on ship handling							
		.1.2	the effects of wind and current on ship handling							
		.1.3	manoeuvres and procedures for the rescue of person overboard							
		.1.4	squat, shallow-water and similar effects							
		.1.5	proper procedures for anchoring and mooring							

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				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
A-II/2	***Function 1 Navigation at the management level***							
C1	Plan a voyage and conduct navigation	KUP1	*Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks*					
		.1	restricted waters					
		.2	meteorological conditions					
		.3	ice					
		.4	restricted visibility					
		.5	traffic separation schemes					
		.6	vessel traffic service (VTS) areas					
		.7	areas of extensive tidal effects					
C2	Determine position and the accuracy of resultant position fix by any means	KUP1	*Position determining in all conditions*					
		.1	Celestial observations					
		.2	Terrestrial observations, including the ability to use appropriate charts, notices to mariners and other publications to assess the accuracy of the resulting fix					
		.3	Modern electronic navigational aids with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing					
C8	Forecast weather and oceanographic conditions	KUP1	*Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax*					
		KUP2	*Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants*					
		KUP3	*Knowledge of ocean current systems*					
		KUP4	*Ability to calculate tidal conditions*					
		KUP5	*Use all appropriate nautical publications on tides and currents*					
C11	Operate remote controls of propulsion plant and engineering systems and services	KUP1	*Operating principles of marine power plants*					
		KUP2	*Ships' auxiliary machinery*					
		KUP3	*General knowledge of marine engineering terms*					
	Contribute to berthing, anchoring and other mooring operations	KUP1	*Working knowledge of the mooring system and related procedures*					
		1.1	the function of mooring and tug lines and how each line functions as part of an overall system					

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses				
				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
		1.2	the capacities, safe working loads, and breaking strengths of mooring equipment, including mooring wires, synthetic and fibre lines, winches, anchor windlasses, capstans, bitts, chocks and bollards					
		1.3	the procedures and order of events for making fast and letting go mooring and tug lines and wires, including towing lines					
		1.4	the procedures and order of events for the use of anchors in various operations					
		KUP2	*Working knowledge of the procedures and order of events associated with mooring to a buoy or buoys*					
A-II/1	***Function 2 Cargo handling and stowage at the operational level***							
C1	Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes	KUP1	*Cargo handling, stowage and securing*					
		.1	Knowledge of the effect of cargo, including heavy lifts, on the seaworthiness and stability of the ship					
		.2	Knowledge of safe handling, stowage and securing of cargoes, including dangerous, hazardous and harmful cargoes, and their effect on the safety of life and of the ship					
		.3	Ability to establish and maintain effective communications during loading and unloading					
C2	Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks	KUP1	*Knowledge and ability to explain where to look for damage and defects most commonly encountered due to:*					
		.1	loading and unloading operations					
		.2	corrosion					
		.3	severe weather conditions					

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses				
				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
		KUP2	*Ability to state which parts of the ship shall be inspected each time in order to cover all parts within a given period of time*					
		KUP3	*Identify those elements of the ship structure which are critical to the safety of the ship*					
		KUP4	*State the causes of corrosion in cargo spaces and ballast tanks and how corrosion can be identified and prevented*					
		KUP5	*Knowledge of procedures on how the inspections shall be carried out*					
		KUP6	*Ability to explain how to ensure reliable detection of defects and damages*					
		KUP7	*Understanding of the purpose of the "enhanced survey programme"*					
A-II/2	***Function 2 Navigation at the operational level***							
C1	Plan and ensure safe loading, stowage, securing, care during the voyage and unloading cargoes	KUP1	*Knowledge of and ability to apply relevant international regulations, codes and standards concerning the safe handling, stowage, securing and transport of cargoes*					
		KUP2	*Knowledge of the effect on trim and stability of cargoes and cargo operations*					
		KUP3	*Use of stability and trim diagrams and stress-calculating equipment, including automatic data-based (ADB) equipment, and knowledge of loading cargoes and ballasting in order to keep hull stress within acceptable limits*					
		KUP4	*Stowage and securing of cargoes on board ships, including cargo-handling gear and securing and lashing equipment*					
		KUP5	*Loading and unloading operations, with special regard to the transport of cargoes identified in the Code of Safe Practice for Cargo Stowage and Securing*					
		KUP6	*General knowledge of tankers and tanker operations*					
		KUP7	*Knowledge of the operational and design limitations of bulk carriers*					
		KUP8	*Ability to use all available shipboard data related to loading, care and unloading of bulk cargoes*					
		KUP9	*Ability to establish procedures for safe cargo handling in accordance with the provisions of the relevant instruments etc*					
		KUP10	*Ability to explain the basic principles for establishing effective communications and improving working relationship between ship and terminal personnel*					

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COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses				
				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
C3	Carriage of dangerous goods	KUP1	*International regulations, standards, codes and recommendations on carriage of dangerous goods*					
		KUP2	*Carriage of dangerous, hazardous and harmful cargoes, precautions during loading and unloading and care during the voyage*					
A-II/1	***Function 3 Controlling the operation of the ship and care for persons on board at the operational***							
C1	Ensure compliance with pollution prevention requirements	KUP1	*Prevention of pollution of the marine environment and anti-pollution procedures*	X				
		.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment	x				
		.2	Anti-pollution procedures and all associated equipment	x				
		.3	Importance of proactive measures to protect the marine environment	x				
C2	Maintain seaworthiness of the ship	KUP1	*Ship stability*		X			
		.1	Working knowledge and application of stability, trim and stress tables, diagrams and stresscalculating equipment		x			
		.2	Understanding of the fundamentals of watertight integrity		x			
		.3	Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy					
		KUP2	*Ship construction*					
		.1	General knowledge of the principal structural members of a ship and the proper names for the various parts					
C6	Monitor compliance with legislative requirements	KUP1	*Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment*		X		X	
C7	Application of leadership and teamworking skills	KUP1	*Working knowledge of shipboard personnel management and training*			X		
		KUP2	*A knowledge of related international maritime conventions and recommendations, and national legislation*					
		KUP3	*Ability to apply task and workload management*			X		
		.1	planning and co-ordination			x		
		.2	personnel assignment			x		
		.3	time and resource constraints			x		
		.4	prioritization			x		

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				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
		KUP4	*Knowledge and ability to apply effective resource management*			X		
		.1	allocation, assignment, and prioritization of resources			x		
		.2	effective communication onboard and ashore			x		
		.3	decisions reflect consideration of team experiences			x		
		.4	assertiveness and leadership, including motivation			x		
		.5	obtaining and maintaining situational awareness			x		
		KUP5	*Knowledge and ability to apply decision-making techniques*			X		
A-II/2	***Function 1 Navigation at the operational level***							
C1	Control trim, stability and stress	KUP1	*Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability*					
		KUP2	*Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken*					
		KUP3	*Knowledge of IMO recommendations concerning ship stability*					
C2	Monitor and control compliance with legislative measures to ensure safety of life at sea and protection of the marine environment	KUP1	*Knowledge of relevant international maritme law embodied in international agreements and conventions. Regard shall be paid to responsibilities under the International Convention for the Prevention of Pollution from Ships as amended.*		X			
		KUP2	*Regard shall be paid especially to the following subjects:*		X			
		.1	certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity		x			
		.2	responsibilities under the relevant requirements of the International Convention on Load Lines, 1966, as amended		x			
		.3	responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea		x			
		.4	responsibilities under the International Convention for the Prevention of Pollution from Ships	x				

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				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
		.5	maritime declarations of health and the requirements of the International Health Regulations		x			
		.6	responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo		x			
		.7	methods and aids to prevent pollution of the marine environment by ships	x				
		.8	national legislation for implementing international agreements and conventions		x			
A-II/5	***Function 3 Controlling the Operation of the ship and care for persons on board at the support leve***							
C1	Contribute to the safe operation of deck equipment and machinery	KUP1	*Knowledge of deck equipment*					
		KUP2	*Knowledge of the following procedures and ability to:*					
		.1	Rig and unrig bosun's chairs and staging					
		.2	Rig and unrig pilot ladders, hoists, rat-guards and gangways					
		.3	Use marlin spike seamanship skills, including the proper use of knots, splices and stoppers					
A-II/5	***Function 4 Maintenance and repair at the support level***							
C1	Contribute to shipboard maintenance and repair	KUP1	*Ability to use painting, lubrication and cleaning materials and equipment*					
		KUP2	*Ability to understand and execute routine maintenance and repair procedures*					
		KUP3	*Knowledge of surface preparation techniques*					
		KUP4	*Understanding manufacturer's safety guidelines and shipboard instructions*					
		KUP5	*Knowledge of safe disposal of waste materials*					
		KUP6	*Knowledge of the application, maintenance and use of hand and power tools*					
A-III/6	***Function 1 Electrical, electronic and control engineering at the operational level***							
C5	Operate computers and computer networks on ships	KUP1	Understanding of:					X

	Bachelor of Science in Marine Transportation **CURRICULUM MAPPING**	Annex A of CMO No. 67, s. 2017 Revision No: 00 Revision Date: 00

COMPETENCE INDEX	COMPETENCE	KUP INDEX	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Professional Courses				
				MarEnv	Mar Law	Mgmt 1	Mgmt 2	ICT
		KUP2	*Theoretical knowledge*					X
		1.2	main features of data processing					x
		1.3	construction and use of computer networks on ships					X
		1.4	bridge-based, engine-room based and commercial computer use					x
	GMDSS							
C1	Transmit and receive information using GMDSS subsystems and equipment and fulfilling the functional requirements of GMDSS (Table A-IV/2)	KUP1	*In addition to the requirements of the Radio Regulations, a knowledge of:*					
		.1	search and rescue radiocommunications, including procedures in the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual					
		.2	the means to prevent the transmission of false distress alerts and the procedures to mitigate the effects of such alerts					
		.3	ship reporting systems					
		.4	radio medical services					
		.5	use of the International Code of Signals and the IMO Standard Marine Communication Phrases					
		.6	the English language, both written and spoken, for the communication of information relevant to safety of life at sea					
C2	Provide radio services in emergencies (Table A-IV/2)	KUP1	*The provision of radio services in emergencies such as*					
		0.1	abandon ship					
		0.2	fire on board ship					
		0.3	partial or full breakdown of radio installations					
		KUP2	*Preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical and non-ionizing radiation hazards*					
			total indicative class hours	0	0	0		

	Competences from Table A-II/1 OIC Navigational Watch
	Competences from Table A-II/2 Management Level Deck
	Competences from Table A-II/5 Able Seafarer Deck
	Competence from Table A-IV/2 GMDSS Radio Operators

	Bachelor of Science in Marine Transportation **COURSE SPECIFICATIONS** **COLLISION REGULATIONS**	Annex C of CMO No. 67, S. 2017 Revision No : 00 Revision Date: 00

Course Code	:	D-Watch 1						
Course Descriptive Title	:	Collision Regulations				**Prerequisite**	:	None
Course Credits	:	4 units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F1.C2: Maintain a safe navigational watch						
KUP	:	A-II/1 F1.C2.KUP1.1: *Watchkeeping* - Thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended						
Course Outcome	:	CO1: Demonstrate thorough knowledge and understanding of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended.						
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation **COURSE SPECIFICATIONS** **DECK WATCHKEEPING WITH BRIDGE RESOURCE MANAGEMENT**	Annex C of CMO No. 67, S. 2017 Revision No : 00 Revision Date: 00

Course Code	:	D-Watch 2						
Course Descriptive Title	:	Deck Watchkeeping with Bridge Resource Management				**Prerequisite**	:	D-Watch 1 Nav 6 Mgmt 1
Course Credit	:	3 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F1.C1: Plan and conduct a passage and determine position A-II/1 F1.C2: Maintain a safe navigational watch						
KUP/s	:	A-II/1 F1.C1.KUP7: Steering control system .1 Knowledge of steering control systems, operational procedures and change-over from manual to automatic control and vice versa. Adjustment of controls for optimum performance A-II/1 F1.C2.KUP1.2: Thorough knowledge of the Principles to be observed in keeping a navigational watch A-II/1 F1.C2.KUP1.3: The use of routeing in accordance with the General Provisions on Ships' Routeing A-II/1 F1.C2.KUP1.4: The use of information from navigational equipment for maintaining a safe navigational watch A-II/1 F1.C2.KUP1.5: Knowledge of blind pilotage techniques A-II/1 F1.C2.KUP1.6: The use of reporting in accordance with the General Principles for Ship Reporting Systems and with VTS procedures A-II/1 F1.C2.KUP2: Bridge resource management						

	Bachelor of Science in Marine Transportation **COURSE SPECIFICATIONS** **DECK WATCHKEEPING WITH BRIDGE RESOURCE MANAGEMENT**	Annex C of CMO No. 67, S. 2017 Revision No : 00 Revision Date: 00

Course Outcome/s	:	CO1: Explain the operational procedures of steering control systems and the selection of the mode of steering suitable for the prevailing weather, sea and traffic conditions and intended maneuvers CO2: Perform assigned watchkeeping duties as part of the bridge team, in different weather, sea and traffic conditions, utilizing all bridge equipment in ensuring the safety of navigation.
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **SOFTWARE APPLICATION AND NETWORK SYSTEM USED IN SEAGOING SHIPS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	ICT						
Course Descriptive Title	:	Software Application and Network System Used in Seagoing Ships				**Prerequisite**	:	None
Course Credit	:	2 Units	**Lecture Contact Hours per Week**	:	1 hour	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-III/6.F1.C5: Operate computers and computer networks on ships						
KUP	:	A-III/6.F1.C5.KUP1: Understanding of: .1 Main features of data processing .2 construction and use of computer networks on ships .3 bridge-based, engine room-based and computer use						
Course Outcome/s	:	1. Effectively use computer applications for documents used onboard ship. 2. Manage computer networks used onboard ships. 3. Troubleshoot computer as per manufacturer's instructions.						
Reference/s	:	1. STCW 1978, as amended – Table A-III/6 - Specification of minimum standard of competence for electro-technical officers 2. Instrument Engineers Handbook: Process Software and Digital Network, Bela G. Liptak 3. Marine Shipmanager Technical Software (any brand)						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **MARITIME COMMUNICATIONS** **(GMDSS FOR GOC)**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mar Com						
Course Descriptive Title	:	Maritime Communications (GMDSS for GOC)				**Prerequisite**	:	None
Course Credits	:	5 units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	6 hours
Competence/s	:	A-II/1 F1.C8: Transmit and receive information by visual signalling A-IV/2 C1: Transmit and receive information using GMDSS subsystems and equipment and fulfilling the functional requirements of GMDSS A-IV/2 C2: Provide radio services in emergencies						
KUP/s	:	A-II/1 F1.C8.KUP1: *Visual signaling* .1 Ability to use the International Code of Signals .2 Ability to transmit and receive, by Morse light, distress signal SOS as specified in Annex IV of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and appendix 1 of the International Code of Signals, and visual signaling of single-letter signals as also specified in the International Code of *Signals* A-IV/2 C1.KUP1: In addition to the requirements of the Radio Regulations, a knowledge of: .1 search and rescue radio communications, including procedures in the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual .2 the means to prevent the transmission of false distress alerts and the procedures to mitigate the effects of such alerts						

		.3 ship reporting systems .4 radio medical services .5 use of the International Code of Signals and the IMO Standard Marine Communication Phrases .6 the English language, both written and spoken, for the communication of information relevant to safety of life at sea A-IV/2 C2.KUP1: The provision of radio services in emergencies such as: .1 abandon ship .2 fire on board ship .3 partial or full breakdown of radio installations A-IV/2 C2.KUP2: Preventive measures for the safety of ship and personnel in connection with hazards related to radio equipment, including electrical and non-ionizing radiation hazards
Course Outcome/s	:	CO 1: Transmit and receive messages by Morse light, distress signal SOS in accordance with Annex IV of International Regulations for Preventing Collisions at Sea (COLREGS) 1972 as amended and International Code of Signals (ICS). CO2: Transmit and receive "Distress, Urgency, Safety, and Routine" communication using GMDSS sub-systems and equipment. CO3: Explain how to test, maintain, and activate SART and EPIRB.
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. Table A-IV/2 Function: Radio Communications at the operational level 3. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation **COURSE SPECIFICATIONS** **PROTECTION OF THE MARINE ENVIRONMENT**	Annex C of CMO No. 67, S. 2017 Revision No : 00 Revision Date: 00

Course Code	:	Mar Env						
Course Descriptive Title	:	Protection of the Marine Environment				**Prerequisite**	:	None
Course Credit	:	3 Units	**Lecture Contact Hours per Week**	:	3 Hours	**Laboratory Contact Hours per Week**	:	0 Hours
Competence/s	:	A-II/1.F3.C1 Ensure compliance with pollution-prevention requirements A-II/2.F3.C2 Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea, security and protection of marine environment						
KUP/s	:	A-II/1.F3.C1.KUP1.1 Knowledge of the precaution to prevent pollution to marine environment A-II/1.F3.C1.KUP1.2 Anti-pollution procedures in all associated equipment A-II/1.F3.C1.KUP1.3 Importance of proactive measures to protect the marine environment A-II/2.F3.C2.KUP2.4 Knowledge of relevant international maritime law embodied in international agreements and conventions, regard shall be paid to responsibilities under the International Convention for the Prevention of Pollution from Ships. A-II/2.F3.C2.KUP 2.8 Methods and aids to prevent pollution of the marine environment by ships.						
Course Outcome/s	:	CO1: Evaluate the impact of shipping operations to the environment in case of marine pollution. CO2: Relate the balance between the 3P's (people, planet and profit) in order to attain sustainable shipping CO3: Apply MARPOL Annexes 1-6 legislation to a specific situation by recommending corrective actions						
Reference/s	:	1. Table A-II/1 Function 3: Controlling the Operation of the Ship and care for persons on board at the Operational Level 2. Table A-II/2.Function 3: Controlling the Operation of the Ship and Care for Persons on board at the Management level 3. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation **COURSE SPECIFICATIONS** **MARITIME LAW**	Annex C of CMO No. 67, S. 2017 Revision No : 00 Revision Date: 00

Course Code	:	Mar Law						
Course Descriptive Title	:	Maritime Law				**Prerequisite**	:	None
Course Credit	:	4 units	**Lecture Contact Hours per Week**	:	4 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence/s	:	A-II/1 F3.C6: Monitor compliance with legislative requirements A-II/2 F3.C2: Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea, security and the protection of the marine environment						
KUP/s	:	A-II/1 F3.C6.KUP1: Basic working knowledge of the relevant IMO conventions concerning safety of life at sea. A-II/2 F3.C2.KUP1: Knowledge of international maritime law embodied in international agreements and conventions A-II/2 F3.C2.KUP2: Regard shall be paid especially to the following subjects: .1 certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity .2 responsibilities under the relevant requirements of the International Convention on Load Lines .3 responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea .5 maritime declarations of health and the requirements of the International Health Regulations .6 responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo .8 national legislation for implementing international agreements and conventions						

	Bachelor of Science in Marine Transportation **COURSE SPECIFICATIONS** **MARITIME LAW**	Annex C of CMO No. 67, S. 2017 Revision No : 00 Revision Date: 00

Course Outcome/s	:	CO 1: Discuss the significant provisions of the SOLAS Convention, Maritime Labor Convention (MLC 2006), Load Line Convention, United Nations Convention on the Law of the Sea (UNCLOS) and other international agreements and national legislations, applicable in the practice of the marine profession. CO 2: Demonstrate a knowledge and understanding of International Maritime Law in International Agreements and Conventions with particular regard to certificates and documents to be carried on board
Reference/s	:	1. Table A-II/1 Function 3: Controlling the operation of the ship and care for persons on board at the operational level 2. Table A-II/2 Function 3: Controlling the operation of the ship and care for persons on board at the management level 3. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **BASIC MARINE ENGINEERING**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mar Power						
Course Descriptive Title	:	Basic Marine Engineering				Prerequisite	:	None
Course Credit	:	**4 Units**	**Lecture Contact Hours per Week**	:	4 Hours	**Laboratory Contact Hours per Week**	:	0 Hours
Competence	:	AII/2.F1.C11: Operate remote control of propulsion plant and engineering system and services						
KUP/s	:	AII/2.F1.C11.KUP1: Operating principles of marine power plants AII/2.F.1.C11.KUP2: Ship auxiliary machinery AII/2.F.1.C11.KUP3: General knowledge of marine engineering terms						
Course Outcome/s	:	CO1: Differentiate the principles of operation for various marine propulsion plants CO2: Determine the impact of deck operations relating to generator and electrical distribution system CO3: Determine the effective use of pumps and pumping system to various deck operations CO4: Explain the operating principles of hydraulic winches, windlass and steering gear as used in deck operations CO5: Sketch a general arrangement plan of the engine room showing the basic elements, machinery and equipment needed for efficient operation.						
Reference/s	:	1. Table II/2 Function 1: Navigation at the Management level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **METEOROLOGY AND OCEANOGRAPHY 1**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Met – O 1						
Course Descriptive Title	:	Meteorology and Oceanography 1				**Prerequisite**	:	None
Course Credits	:	5 units	**Lecture Contact Hours per Week**	:	5 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence	:	A-II/1 F1.C1: Plan and conduct a passage and determine position						
KUP/s	:	A-II/1 F1.C1.KUP8.1: Ability to use and interpret information obtained from shipborne meteorological instruments A-II/1 F1.C1.KUP8.2: Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems A-II/1 F1.C1.KUP8.3: Ability to apply the meteorological information available						
Course Outcome/s	:	CO1: Interpret information obtained from ship borne meteorological instruments while vessel is underway. CO2: Discuss various weather systems, reporting procedures, and recording systems over the oceans. CO3: Use appropriate meteorological information and observations in determining expected weather conditions						
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the Operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **METEOROLOGY AND OCEANOGRAPHY 2**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Met – O 2						
Course Descriptive Title	:	Meteorology and Oceanography 2				**Prerequisite**	:	Met – O 1
Course Credits	:	4 units	**Lecture Contact Hours per Week**	:	4 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence	:	A-II/2 F1.C8: Forecast weather and oceanographic conditions						
KUP/s	:	A-II/2 F1.C8.KUP1: Ability to understand and interpret a synoptic chart and to forecast area weather, taking into account local weather conditions and information received by weather fax A-II/2 F1.C8.KUP2: Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants A-II/2 F1.C8.KUP3: Knowledge of ocean current systems A-II/2 F1.C8.KUP4: Ability to calculate tidal conditions A-II/2 F1.C8.KUP5: Use all appropriate nautical publications on tides and currents						
Course Outcome/s	:	CO1: Interpret area weather using a synoptic chart, taking into account local weather conditions and information received by weather fax. CO2: Explain tropical revolving storms and how to avoid and/or escape storm centers and dangerous quadrants in the northern and southern hemisphere. CO3: Interpret ocean current system and principal adjoining seas using various charts and nautical publications. CO4: Calculate the tidal conditions based on nautical publications on board and electronically obtained information.						
Reference/s	:	1. Table A-II/2 Function 1: Navigation at the Management level 2. CMO No.67 series of 2017 : Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation **COURSE SPECIFICATIONS** **LEADERSHIP AND TEAMWORK**	Annex C of CMO No. 67, S. 2017 Revision No : 00 Revision Date: 00

Course Code	:	Mgmt 1						
Course Descriptive Title	:	Leadership and Teamwork				**Prerequisite**	:	None
Course Credit	:	3 units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence/s	:	A-II/1 F3.C7: Application of leadership and teamworking skills						
KUP/s	:	A-II/1 F3.C7.KUP1: Working knowledge of shipboard personnel management and training A-II/1 F3.C7.KUP3: Ability to apply task and workload management .1 planning and coordination .2 personnel assignment .3 time and resource constraints .4 prioritization A-II/1 F3.C7.KUP4: Knowledge and ability to apply effective resource management .1 allocation, assignment, and pricritization of resources .2 effective communications on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership, including motivation .5 obtaining and maintaining situation awareness A-II/1 F3.C7.KUP5: Knowledge and ability to apply decision-making techniques .1 situation and risk assessment .2 identify and generate options .3 selecting course of action .4 evaluation of outcome effectiveness						
Course Outcome/s	:	CO1: Appraise the content and application of ISM Code, STCW '78 as amended and MLC 2006 pertaining to the Personnel Management CO2: Organize and manage a safe and efficient operation of ship at a given scenario thru						

		role play or other forms of simulation.
Reference/s	:	1. Table A-II/1 Function 3: Controlling the operation of the ship and care for persons on board at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **INTEGRATED MANAGEMENT SYSTEM**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mgmt 2						
Course Descriptive Title	:	Integrated Management System				**Prerequisite**	:	None
Course Credit	:	2 Units	**Lecture Contact Hours per Week**	:	2 Hours	**Laboratory Contact Hours per Week**	:	0 Hours
Competence/s	:	A-II/1.F3.C6: Monitor compliance with legislative requirements						
KUP/s	:	A-II/1.F3.C6: KUP1: Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment						
Course Outcome/s	:	CO1: Relate the provisions of ISM Code to various ship operations CO2: Differentiate the training requirements for seafarers with and without security duties, as required by the provisions of STCW 78, as amended to the ISPS Code CO3: Analyze the provisions of the ISO 9001:2015 in relation to the ISM code in terms to their peculiarities CO4: Explain the importance of the STCW 78, as amended in the attainment of the goal-based ships operations through the deployment of competent seafarers CO5: Analyze the provisions of the ISO 14001:2015 that can help ship operators improve their environmental performance through a more efficient use of resources and reduction of waste CO6: Determine compliance of a given SMS procedure to OHSAS 18001, Occupational Health and Safety Standard provisions to demonstrate due diligence, good governance, low risk and competent management that is committed to health and safety in the workplace CO7: Conduct an impact assessment on a particular ship operation on the safety, security, health, environment and quality (SSHEQ) in relation to the attainment of the IMO mission statement.						
Reference/s	:	1. Table A-II/1 Function 3: Controlling the Operation of the Ship and care for persons on board at the Operational Level 2. Table A-III/1 Function 4: Controlling the Operation of the Ship and care for persons on board at the Operational Level 3. Table A-II/2 Function 3 Controlling the Operation of the Ship and care for persons on board at the						

		Management Level 4. Table A-III/2 Function 1 Marine Engineering at the Management Level 5. Annex A of CMO No. 67, S. 2017: Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **NAVIGATIONAL INSTRUMENTS WITH COMPASSES**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav 1					
Course Descriptive Title	:	Navigational Instruments with Compasses			**Prerequisite**	:	None
Course Credits	:	4 units	**Lecture Contact Hours per Week**	: 3 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F1.C1.Plan and conduct a passage and determine position					
KUP	:	A-II/1 F1.C1.KUP4: Ability to determine the ship's position by use of electronic navigational aids A-II/1 F1.C1.KUP5: Ability to operate the echo-sounder and apply the information correctly A-II/1 F1.C1.KUP6: Compass – magnetic and gyro .1: Knowledge of the principles of magnetic and gyro-compasses					
Course Outcome	:	CO1: Operate electronic navigational equipment such as GPS, AIS, echo-sounder, gyro and magnetic compass CO2: Determine errors of magnetic and gyro compass CO3: Determine the errors of magnetic and gyro-compasses and apply corrections in obtaining true course and bearing					
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the Operational Level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs					

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **TERRESTRIAL AND COASTAL NAVIGATION 1**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav 2						
Course Descriptive Title	:	Terrestrial and Coastal Navigation 1				**Prerequisite**	:	Nav 1
Course Credits	:	5 units	**Lecture Contact Hours per Week**	:	5 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence	:	A-II/1 F1.C1: Plan and conduct a passage and determine position						
KUP	:	A-II/1 F1.C1.KUP3: Thorough knowledge of and ability to use nautical charts, and publications, such as sailing directions, tide tables, notices to mariners, radio navigational warnings and ships' routeing information						
Course Outcomes	:	CO1: Select appropriate navigational charts using chart catalogue CO2: Update navigational charts and publications in accordance with the latest Notice to Mariners CO3: Measure the distance between two points on a Mercator chart CO4: Distinguish the different regions in the IALA Buoyage System as used in navigation						
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **TERRESTRIAL AND COASTAL NAVIGATION 2**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav 3						
Course Descriptive Title	:	Terrestrial and Coastal Navigation 2				**Prerequisite**	:	Nav 2
Course Credits	:	5 units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	6 hours
Competence/s	:	A-II/1 F1.C1: Plan and conduct a passage and determine position						
KUP/s		A-II/1 F1.C1.KUP2: *Terrestrial and coastal navigation* - Ability to determine the ship's position by use of: .1 landmarks .2 aids to navigation, including lighthouses, beacons and buoys .3 dead reckoning, taking into account winds, tides, currents and estimated speed A-II/1 F1.C1.KUP6: .2 ability to determine errors of the gyro and magnetic compasses, using terrestrial means, and to allow for such errors						
Course Outcome/s	:	CO1: Apply relevant information obtained from Charts, Lists of Lights and Other Publications in passage planning. CO2: Determine compass error using terrestrial observations CO3: Apply compass corrections to determine true course and true bearing CO4: Solve problems by great circle sailing in determining courses and distances. CO5: Plot position lines to determine ship's position using terrestrial observation. CO6: Write entries in the ship's logbook using relevant information related to navigation.						
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **CELESTIAL NAVIGATION**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav 4						
Course Descriptive Title	:	Celestial Navigation				**Prerequisite**	:	Nav 3
Course Credits	:	3 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F1.C1: Plan and conduct a passage and determine position						
KUP	:	A-II/1 F1.C1.KUP1: Ability to use celestial bodies to determine the ship's position A-II/1 F1.C1.KUP6: .2 ability to determine errors of the gyro and magnetic compasses, using celestial means, and to allow for such errors						
Course Outcome	:	CO1: Determine compass error by observation of the sun's amplitude CO2: Plot ship's position using observation of three stars during evening twilight						
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the Operational Level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **OPERATIONAL USE OF RADAR / ARPA**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav 5						
Course Descriptive Title	:	Operational Use of RADAR / ARPA				**Prerequisite**	:	D-Watch 1
Course Credits	:	3 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence	:	A-II/1 F1.C3: Use of *RADAR* and *ARPA* to maintain safety of navigation						
KUP/s		A-II/1 F1.C3.KUP1: RADAR navigation (ARPA) .1: Knowledge of the fundamentals of radar and Automatic Radar Plotting Aids .2: Ability to operate and to interpret and analyse information obtained from radar, Including the following: .a Performance, including: .1 factors affecting performance and accuracy .2 setting up and maintaining displays .3 detection of misrepresentation of information, false echoes, sea return, etc., racons and SARTs .b Use, including: .1 range and bearing; course and speed of other ships; time and distance of closest approach of crossing, meeting overtaking ships .2 identification of critical echoes; detecting course and speed changes of other ships; effect of changes in own ship's course or speed or both .3 application of the International Regulations for Preventing Collisions at Sea, 1972, as amended .4 plotting techniques and relative- and true motion concepts .5 parallel indexing A-II/1 F1.C3.KUP2: Principal types of ARPA, their display characteristics, performance standards and the dangers of over-reliance on ARPA A-II/1 F1.C3.KUP3: Ability to operate and interpret and analyse information obtrained from ARPA,						

		including: .1 system performance and accuracy, tracking capabilities and limitations, and processing delays .2 use of operational warnings and system tests .3 methods of target acquisition and their limitations .4 true and relative vectors, graphic representation of target information and danger areas .5 deriving and analyzing information, critical echoes, exclusion areas and trial maneuvres
Course Outcome/s	:	CO1: Perform manual radar plotting techniques using information obtained from RADAR observations in a crossing situation CO2: Use RADAR / ARPA in collision avoidance during restricted visibility
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **OPERATIONAL USE OF ECDIS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav 6						
Course Descriptive Title	:	Operational Use of ECDIS				**Prerequisite**	:	Nav 5
Course Credits	:	2 units	**Lecture Contact Hours per Week**	:	1 hour	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F1.C4: Use of ECDIS to maintain the safety of navigation						
KUP/s	:	A-II/1 F1.C4.KUP1: *Navigation using ECDIS* .1 Knowledge of the capability and limitations of ECDIS operations, including: .a a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data Formats .b the dangers of over-reliance .c familiarity with the functions of ECDIS required by performance standards in force .2 Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including: .a use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings .b safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced) .c confirmation of vessel position by alternative means .d efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements						

		.e adjustment of settings and values to suit the present conditions .f situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors
Course Outcome/s	:	CO1: Demonstrate proficiency in operation, interpretation, and analysis of information obtained from ECDIS
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **VOYAGE PLANNING**	Annex C of CMO No. 67, S. 2017 Issued Date : Dec. 12, 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav 7						
Course Descriptive Title	:	Voyage Planning				**Prerequisite**	:	Nav 6
Course Credits	:	3 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F1.C2: Maintain a Safe Navigational Watch A-II/2 F1.C1: Plan a voyage and conduct navigation A-II/2 F1.C2: Determine position and the accuracy of resultant position fix by any means						
KUP		A-II/1 F1.C2.KUP1.3: The use of routeing in accordance with the General Provisions on Ships' Routeing A-II/2 F1.C1.KUP1: Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks, taking into account, e.g.: .1 restricted waters .2 meteorological conditions .3 ice .4 restricted visibility .5 traffic separation schemes .7 areas of extensive tidal effects A-II/2 F1.C2.KUP1: Position determination in all conditions: .2 by terrestrial observations, including the ability to use appropriate charts, notices to mariners and other publications to assess the accuracy of resulting position fix .3 using modern electronic navigational aids, with specific knowledge of their operating principles, limitations, sources of error, detection of						

		misrepresentation of information and methods of correction to obtain accurate position fixing
Course Outcomes	:	CO 1 Create a voyage plan from berth to berth CO 2 Execute the voyage plan and monitor in accordance with the plan
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. Table A-II/2 Function 1: Navigation at the management level 3. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **Ship, Ship Routines and Ship Construction**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Seam 1						
Course Descriptive Title	:	Ship, Ship Routines and Ship Construction				**Prerequisite**	:	None
Course Credits	:	4 units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F3.C2: Maintain seaworthiness of the ship *A-II/1 F3.C7: Application of leadership and teamworking skills A-II/5 F1.C2: Contribute to berthing, anchoring and other mooring operations A-II/5 F3.C1: Contribute to the safe operation of deck equipment and machinery A-II/5 F3.C2: Apply occupational health and safety precautions A-II/5 F4.C1: Contribute to shipboard maintenance and repair						
KUP/s	:	A-II/1 F3.C2.KUP2: *Ship construction* - General knowledge of the principal structural members of a ship and the proper names for the various parts .1 General knowledge of the principal structural members of a ship and the proper names for the various parts *A-II/1 F3.C7.KUP1: Working knowledge of shipboard personnel (Organizations of crew, authority structure and responsibilities) A-II/5 F1.C2.KUP1: Working knowledge of the mooring system and related procedures, including: .1 working knowledge of the mooring system and related procedures .2 the capacities, safe working loads, and breaking strengths of mooring equipment,including mooring wires, synthetic and fiber lines, winches, anchor windlasses, cap stans, bitts, chocks and bollards .3 the procedures and order of events for making fast and letting go mooring and tug lines and wires, including towing lines						

		.4 the procedures and order of events for the use of anchors in various operations A-II/5 F1.C2.KUP2: Working knowledge of the procedures and order of events associated with mooring to a buoy or buoys A-II/5 F3.C1.KUP1: Knowledge of deck equipment A-II/5 F3.C1.KUP2: Knowledge of the following procedures and ability to: .1 Rig and unrig bosun's chair and staging .2 Rig and unrig pilot ladders, hoists, rat-guards and gangways .3 Use marlin spikes seamanship skills, including the proper use of knots, splices and stoppers A-II/5 F3.C2.KUP1: Working knowledge of safe working practices and personal shipboard safety including: .1 working aloft .2 working over the side .3 working in enclosed spaces .4 permit to work systems .5 line handling .6 lifting techniques and methods of preventing back injury .7 electrical safety .8 mechanical safety .9 chemical and biohazard safety .10 personal safety equipment A-II/5 F4.C1.KUP1: Ability to use painting, lubrication and cleaning materials and equipment A-II/5 F4.C2.KUP2: Ability to understand and execute routine maintenance and repair procedures A-II/5 F4.C2.KUP3: Knowledge of surface preparation techniques A-II/5 F4.C2.KUP4: Understanding manufacturer's safety guidelines and shipboard instructions A-II/5 F4.C2.KUP5: Knowledge of safe disposal of waste materials A-II/5 F4.C2.KUP6: Knowledge of the application, maintenance and use of hand and power tools

		Note: *Inclusion of Ship Organizational Diagram
Course Outcome/s	:	CO1: Describe the functions in each member of a ship's organization CO2: Illustrate the types of ships and its parts. CO3: Demonstrate working knowledge of the mooring system and related procedures CO4: Perform marlinespike seamanship skills and riggings in accordance with shipboard instructions and safety standards CO5: Perform deck maintenance works in accordance with shipboard instructions and safety standards
Reference/s	:	1. Table A-II/1 Function 1: Navigation at the operational level 2. Table A-II/5 Function: Navigation at the support level 3. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **TRIM, STABILITY AND STRESS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Seam 2						
Course Descriptive Title	:	Trim, Stability and Stress				**Prerequisite**	:	Seam 1
Course Credits	:	5 units	**Lecture Contact Hours per Week**	:	5 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence/s	:	A-II/1 F3.C2: Maintain seaworthiness of the ship						
KUP/s	:	A-II/1 F3.C2.KUP1: Ship stability .1 Working knowledge and application of stability, trim and stress tables, diagrams and stress calculating equipment .2 Understanding of the fundamentals of watertight integrity .3 Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy						
Course Outcome/s	:	CO1: Calculate ship stability in compliance with the IMO intact stability criteria under all conditions of loading						
Reference/s	:	1. Table A-II/1 Function3: Controlling the operation of the ship and care for persons on board at the operational level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **CARGO HANDLING AND STOWAGE (NON-DANGEROUS GOODS)**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Seam 3						
Course Descriptive Title	:	**Cargo Handling and Stowage (Non-Dangerous Goods)**				**Prerequisite**	:	Seam 2
Course Credits	:	3 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	2 hours
Competence/s	:	A-II/1 F2.C1: Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes A-II/1 F2.C2: Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks						
KUP/s	:	A-II/1 F2.C1.KUP1: Cargo Handling, Stowage and securing A-II/1 F2.C1.KUP1.2: Knowledge of the effect of cargo, including heavy lifts, on the seaworthiness and stability of the ship A-II/1 F2.C1.KUP1.3: Ability to establish and maintain effective communications during loading and unloading A-II/1 F2.C2.KUP1: Knowledge* and ability to explain where to look for damage and defects most commonly encountered .1 loading and unloading operations .2 corrosion .3 severe weather conditions A-II/1 F2.C2.KUP2: Ability to state which parts of the ship shall be inspected each time in order to cover all parts within a given period of time A-II/1 F2.C2.KUP3: Identify those elements of the ship structure which are critical to the safety of the ship A-II/1 F2.C2.KUP4: State the causes of corrosion in cargo spaces and ballast tanks and how corrosion can be identified and prevented A-II/1 F2.C2.KUP5: Knowledge of procedures on how the inspections shall be carried out A-II/1 F2.C2.KUP6: Ability to explain how to ensure reliable detection of defects and damages A-II/1 F2.C2.KUP7: Understanding of the purpose of the "enhanced survey programme" *Note: It should be understood that Deck Officers need not be qualified in the survey of ships.						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **CARGO HANDLING AND STOWAGE (NON-DANGEROUS GOODS)**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Outcome/s	:	CO1: Interpret a plan for loading and unloading non-dangerous cargo in accordance with established safety rules / regulations, equipment operating instructions and shipboard stowage limitations CO2: Determine the significance of monitoring the cargo during the voyage CO3: Explain the importance when defects and damage to cargo spaces, hatch covers and ballast tanks are found
Reference/s	:	1. Table A-II/1 Function 3: Controlling the operation of the ship and care for persons on board at the operational level 2. Table A-II/1 Function 2: Cargo handling and stowage at the operational level 3. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **CARGO HANDLING AND STOWAGE (DANGEROUS GOODS AND INSPECTIONS)**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Seam 4						
Course Descriptive Title	:	**Cargo Handling and Stowage (Dangerous Goods and Inspections)**				**Prerequisite**	:	Seam 2
Course Credits	:	3 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	2 hours
Competence/s	:	A-II/1 F2.C1: Monitor the loading, stowage, securing, care during the voyage and the unloading of cargoes A-II/1 F2.C2: Inspect and report defects and damage to cargo spaces, hatch covers and ballast tanks A-II/2 F2.C1: Plan and ensure safe loading, stowage, securing, care during the voyage and unloading cargoes A-II/2 F2.C3: Carriage of dangerous goods						
KUP/s	:	A-II/1 F2.C1.KUP1: Cargo Handling, Stowage and securing A-II/1 F2.C1.KUP1.2: Knowledge of safe handling, stowage and securing of cargoes, including dangerous, hazardous and harmful cargoes, and their effect on the safety of life and of the ship A-II/1 F2.C1.KUP1.3: Ability to establish and maintain effective communications during loading and unloading A-II/1 F2.C2.KUP7: Understanding of the purpose of the "enhanced survey programme" A-II/2 F2.C1.KUP6: General knowledge of tankers and tanker operations A-II/2 F2.C3.KUP1: International regulations, standards, codes and recommendations on the carriage of dangerous cargoes, including the International Maritime Dangerous Goods (IMDG) Code and the Code of Safe Practice for Solid Bulk Cargoes (BC Code). A-II/2 F2.C3.KUP2: Carriage of dangerous, hazardous and harmful cargoes; precautions during loading and unloading and care during the voyage						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **CARGO HANDLING AND STOWAGE (DANGEROUS GOODS AND INSPECTIONS)**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Outcome/s	:	CO1: Discuss the purpose of International regulations, standards, codes and recommendations on the carriage of dangerous cargoes, including the International Maritime Dangerous Goods (IMDG) Code and the Code of Safe Practice for Solid Bulk Cargoes (BC Code). CO2: Interpret a cargo plan for loading and unloading dangerous cargo in accordance with established safety rules / regulations, equipment operating instructions and shipboard stowage limitations CO3: Determine the significance of monitoring the cargo during the voyage CO4: Explain the importance when defects and damage to cargo spaces, hatch covers and ballast tanks are found
Reference/s	:	1. Table A-II/1 Function 2: Cargo handling and stowage at the operational level 2. Table A-II/1 Function 3: Controlling the operation of the ship and care for persons on board at the operational level 3. Table A-II/2 Function 2: Cargo handling and stowage at the management level 4. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **SHIP HANDLING AND MANEUVERING**	Annex C of CMO No. 67, S. 2017 Issued Date : Dec. 12, 2017 Revision No: 00 Revision Date: 00

Course Code	:	Seam 5						
Course Descriptive Title	:	Ship Handling and Maneuvering				**Prerequisite**	:	Dwatch 1
Course Credits	:	3 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-II/1 F1.C5: Respond to Emergencies A-II/1 F1.C9: Maneuver the ship						
KUP/s	:	A-II/1 F1.C5.KUP1: Emergency procedures .1 precautions for the protection and safety of passengers in emergency situations .2 initial action to be taken following a collision .3 initial action to be taken following a grounding .4 initial assessment of damage and damage control A-II/1 F1.C9.KUP1: Ship maneuvering and handling .1 Knowledge of: .a the effects of wind and the effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distances current on ship handling .b the effects of wind and current on ship handling .c manoeuvres and procedures for the rescue of person overboard .d squat, shallow-water and similar effects .e proper procedures for anchoring and mooring						
Course Outcome/s	:	CO1: Discuss the principles of ship handling, the effects of deadweight, draught, trim, speed and under keel clearance on turning circles and stopping distances, effects of wind and current on ship handling while maintaining safety of navigation CO2: Perform appropriate maneuvers and procedures to rescue persons overboard using simulator						
Reference/s	:	Table A-II/1 Function 1: Navigation at the Operational level CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation COURSE SPECIFICATIONS **ADVANCED TRIM, STABILITY AND STRESS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Seam 6						
Course Descriptive Title	:	Advanced Trim, Stability and Stress				**Prerequisite**	:	Seam 2
Course Credits	:	6 units	**Lecture Contact Hours per Week**	:	6 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence/s	:	A-II/2 F3.C1: Control trim, stability and stress						
KUP	:	A-II/2 F3.C1.KUP1: Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability A-II/2 F3.C1.KUP2: Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken A-II/2 F3.C1.KUP3: Knowledge of IMO recommendations concerning ship stability						
Course Outcome	:	CO1: Explain the importance of maintaining stability during loading, unloading and in-transit in various conditions CO2: Calculate the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken						
Reference/s	:	1. Table A-II/2 Function 3: Controlling the operation of the ship and care for persons on board at the management level 2. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs						

	Bachelor of Science in Marine Transportation **Minimum Required Equipment**	**Annex D** CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

RECOMMENDED MINIMUM EQUIPMENT, MATERIALS, CHEMICALS AND TEACHING AIDS GOVERNING THE OPERATION OF THE BACHELOR OF SCIENCE IN MARINE TRANSPORTATION PROGRAM. HOWEVER, THE EXACT NUMBER SHOULD CONFORM TO THE CARRYING CAPACITY OF THE INSTITUTION. THE TASK MAINTENANCE REPAIR COLUMN ARE USED FOR HANDS ON EXERCIS ES AND FAMILIARIZATION OF EQUIPMENT, WHEREAS THE SYSTEM INTEGRATION, OPERATION AND FAULT FINDING COLUMN ARE EQUIPMENT NECESSARY TO ADDRESS THE DEFINED INTENDED LEARNING OUTCOMES OF COURSES.

DECK	
1.	Lecture Room
2.	Chart Room
3.	Navigational Equipment
4.	Ship's Bridge Simulator Room
5.	MARCOM Room
6.	Seamanship Room

ITEMS	QUANTITY REQUIRED
1. LECTURE ROOM "The standard classroom shall be a minimum of 1.2 square meters per student. Classrooms must be well-lighted and well-ventilated. It should contain the following:	
1.1 Tables and Chairs or Armed chairs 1.2 Whiteboards/Chalkboards 1.3 Multimedia Equipment 1.4 Teacher's Table	
2. CHART ROOM The ratio of the minimum requirements herein listed shall be proportionate to the total number of maritime students enrolled for the particular course under the following:	
2.1 Chart tables (Dimension: at least 1.0m L x 0.7m W)	Chart tables ratio: 1 table is to 2 students (1:2)
2.2 Navigational charts ▪ Harbor charts – not necessarily of the same chart no. but should be adequate to create one passage plan (scale: larger than 1:50,000)	1 chart per table
▪ Coastal charts – not necessarily of the same chart no. but should be adequate to create one passage plan (scale: 1:50,000 to 1:150,000)	1 chart per table
▪ General charts – not necessarily of the same chart no. but should be adequate to create one	1 chart per table

ITEMS	QUANTITY REQUIRED
passage plan (scale:from 1:150,000 to 1:600,000)	
▪ Sailing charts – not necessarily of the same chart no. but should be adequate to create one passage plan (scale: smaller than 1:600,000)	1 chart per table
▪ Chart projections	
▪ Gnomonic ▪ Mercator plotting sheet from equator to 90 degrees latitude ▪ Routeing chart	1 set 1 set 1 set (Jan – Dec)
2.3 Parallel rulers Navigational triangles Compass Dividers	10 pcs 3 pairs 3 pairs
2.4 IALA Maritime Bouyage System (Drawing/ Illustration)	2 pcs
2.5 Publications (photocopy acceptable) ▪ Pilot Book / Sailing Directions	3 books of different publications
▪ Weekly notice to Mariners	6 pcs
▪ Radio Signals, Radio Time Signal Aids, Radio Navigational Warnings	Vol 1-6
▪ Nautical Tables (e.g. HO publications) or Useful tables	1 pc
▪ Nautical Almanac	1 pc (at least within the last 5 years edition)
▪ Tide Tables	1 pc (at least within the last 5 years edition)
▪ Sight Reduction Tables	1 set
2.6 Maneuvering Board	20 pcs

3.0 LIST OF NAVIGATIONAL EQUIPMENT

- Equipment shall be fully operational
- Equipment may be live stand alone or integrated to a bridge simulator room
- Some equipment may be found in the ship's bridge simulator room and/or in a separate dedicated room

ITEMS	QUANTITY REQUIRED
3.1 Global Positioning System (GPS)	1 unit
3.2 Gyro compass with at least one repeater	1 set
3.3 Pelorus/ Azimuth Circle	1 pc
3.4 Echo sounder	1 unit
3.5 RPM/Speed Indicator	1 unit
3.6 Steering equipment with automatic pilot	1 unit
3.7 Bridge/ engine room telegraph	1 unit
3.8 Hygrometer (dry and wet bulb thermometer)	2 pcs
3.9 Anemometer (marine type)	1
3.10 Aneroid Barometer (marine type)	1
3.11 Weather Facsimile receiver or any equipment capable of giving weather report	1
3.12 Marine chronometer	1
3.13 Marine Sextant	2
3.14 Magnetic compass	1
3.15 Signaling lamp	1
3.16 International signal flags	1 set
3.17 Clinometer	1
3.18 Automatic Identification System (AIS)	1 unit
3.19 Appropriate equipment for giving light and sound signals (e.g. bell, gong, ship's whistle, morse light, etc.)	1 set
3.20 Equipment for display signals (lights and shapes):	
3.20.1 Anchor ball	2 pcs
3.20.2 Diamond shape	2 pcs
3.20.3 Cylindrical shape	2 pcs
3.20.4 Anchor light	1 pc
3.20.5 Not under command light	1 pc
3.20.6 Light to indicate "vessel restricted in her ability to manoeuvre"	1 pc

ITEMS	QUANTITY REQUIRED
4.0 SHIP'S BRIDGE SIMULATOR ROOM **4.1 GENERAL REQUIREMENT** Instruction and assessment in RADAR-ARPA and ECDIS shall be conducted with the use of simulator equipment. 4.1.1 The design, features and capabilities of the simulators used shall be in compliance with Regulation I/12 and guidelines under Section A-I/12 and B-I/12 of the 1978 STCW as amended. 4.1.2 The installation must be capable of covering all the competences and KUPs as stated in the Table of Competence A-II/1 of the STCW Code related to RADAR-ARPA and/or ECDIS. 4.1.3 The number of student stations shall be adequate in order for each student to undergo the minimum required exposure to the equipment 4.1.4 There must be an INSTRUCTOR STATION where exercises are generated and are able to monitor each student station during an exercise or assessment 4.1.5 All other simulators which can be used by the MHEIs for other competences shall follow the same guidelines as in item number 4.1.1. RADAR/ARPA AND GMDSS COMMUNICATION SIMULATOR MAY BE LOCATED IN DEDICATED SIMULATOR ROOM OR THEY MAY BE INTEGRATED TO A BRIDGE SIMULATOR. **The ratio of the minimum requirement for simulator equipment to student shall be as follows:** **Academic Year 2015-2016 – 1:5** **Academic Year 2016-2017 – 1:5** **Academic Year 2017-2018 – 1:4** **Academic Year 2018-2019 – 1:4** **Academic Year 2019-2020 – 1:3**	
4.2 OTHER REQUIREMENTS 4.2.1 Navigational charts corresponding to particular coast or harbor must be available in the simulator room 4.2.2 Parallel rulers / Navigational triangles 4.2.3 Compass divider	1 set for each work station
5.0 MARCOM ROOM - GMDSS / COMMUNICATION SIMULATOR	
5.1 GMDSS simulator capable of simulating the following: DSC, NAVTEX, EPIRB, Satellite communication for a particular GMDSS area. 5.1.1 Instructor/Student and GMDSS station ratio 5.1.2 GMDSS operation able to meet the training objectives to include the determination of limitations and possible errors of the equipment. 5.1.3 Able to provide controlled operating environment capable of producing various conditions such as,	As per performance standards adopted by the IMO

ITEMS	QUANTITY REQUIRED
emergency, hazardous or unusual situations relevant to the training objective. 5.1.4 Provide an interface through which a trainee can interact with the equipment, and the simulated environment. 5.1.5 Allow an instructor to control and monitor exercises.	
5.2 International Radio Laws (ITU) Part I and Part II	1 set
5.3 Admiralty List of Radio Signals (Vol. I & II) [may be found in the Chart Room]	1 set
5.4 INMARSAT Maritime Communication Handbook	1 pc
5.5 International Code of Signals	1 pc
5.6 Morse Signaling Apparatus	1 set
5.7 Semaphore Flags	2 sets
5.8 Single Letter Flags **The ratio of the minimum requirement for GMDSS simulator equipment shall be as follows:** **Academic Year 2015-2016 – 1:5** **Academic Year 2016-2017 – 1:5** **Academic Year 2017-2018 – 1:4** **Academic Year 2018-2019 – 1:4** **Academic Year 2019-2020 – 1:3**	1 set
6.0 SEAMANSHIP ROOM	
6.1 Work benches	6
6.2 Vises attached to work benches for splicing	12
6.3 Models/Drawings/Video of the following:	
▪ Derrick (single or married fall system)	1
▪ Deck crane	1
▪ Anchor windlass	1
▪ Mooring winch/capstan	1
▪ Hatch cover (any type, complete parts)	1
▪ Head and heel blocks	1 each
▪ Types of vessels	1
▪ Various hatch covers	1
6.4 Samples of cargo plans of at least 4 types of ships	1 each
6.5 Bollard	2
6.6 Bitts	2
6.7 Cleats	2
6.8 Anchor with chain	1
6.9 Chipping hammer	10
6.10 Hand scraper, angular	10

ITEMS	QUANTITY REQUIRED
6.11 Long handled scraper	10
6.12 Wire brush	10
6.13 Fid	10
6.14 Marlinspike (6-10 inches)	10
6.15 Rope, at least 12mm in diameter (nylon or Manila rope)	100 mtr
6.16 Wire rope for splicing, at least 8mm in diameter	30 mtr
6.17 Seaman's knife	10
6.18 Sewing palms and kit for canvass works ▪ Sewing needle ▪ Eyelet ▪ Canvass or tarpaulin ▪ Thimble (for sewing) ▪ Punch and Dye	1 set
6.19 Serving mallet	1
6.20 Pilot ladder	1
6.21 Jacob's ladder	1
6.22 Wire cutter	1
6.23 Painting stage w/rigging	1
6.24 Bosun's chair	1
6.25 Cargo net	1
6.26 Safety net	1
6.27 Gun tackle	1
6.28 Two-fold purchase rigged preferably on wooden blocks	1
6.29 Three-fold purchase rigged preferably on wooden blocks	1
6.30 Metal cargo swivel block	1
6.31 Cargo hook SWL at least 5 tons	1
6.32 Chain block, at least 1 ton	1
6.33 Snatch block, size at least 160mm	1
6.34 Safety helmet	25
6.35 Safety goggle	25
6.36 Safety Belt / Safety Harness	3
6.37 Working gloves	25
6.38 Thimble	6
6.39 Shackle (various sizes)	6
6.40 Turnbuckle	6
6.41 Ships Certificates e.g. SOLAS, etc.	At least 5
6.42 Ships Organizational Chart	1
6.43 Tabular Chart for the strength of ropes and wires	1
6.44 Various types of blocks	1

ITEMS	QUANTITY REQUIRED
6.45 IMDG Code: Labels, marks and signs (SN: IMO-220E)	1
6.46 Drawings of various tanker ships showing tanks, pipes and pumping arrangement (oil, chemical & gas)	1
6.47 Drawings/illustration/actual equipment of measuring device and oxygen device	1
6.48 Copy of actual Ship Capacity Plan/Dead Weight Plan	1
6.49 Trim and Stability Table	1
6.50 International Loadline Chart (seasonal Chart)	1
6.51 Computer based software on Trim and Stability [may be found in a separate room]	1
6.52 Diagram of a Ship's Manoeuvring Characteristics	1
6.53 Posters/pictures of River, Bends, Locks, Port Facilities, Navigable canals, rivers, etc.	1
6.54 Posters/pictures of various types of propellers and bow-thruster	1

Summary of Courses that may need Bridge Simulator

Courses	Simulator
Navigation 1, 3, 7	Any of categories 1, 2, and 4
Navigation 5, 6	Any of categories 1, 2, 3 and 4
D-Watch 2 - Deck Watchkeeping	Any of categories 1, 2, and 4
Seam 5 – Ship Handling and Manoeuvring	Any of categories 1, 2, 3 and 4

Standard Classification of Ship's Bridge Simulator

CATEGORY 1	Full Mission Simulator	A full mission simulator capable of simulating a total shipboard bridge operation situation including the capability for advanced manoeuvring in restricted areas.
CATEGORY 2	Multi Task Simulator	A multi task simulator capable of simulating a total shipboard bridge operation situation but excluding the capability for advanced manoeuvring in restricted waterways.
CATEGORY 3	Limited Task Simulator	A limited task simulator capable of simulating a shipboard bridge operation situation for limited (instrumentation or blind) navigation and collision avoidance.
CATEGORY 4	Special Task Simulator	A special task simulator capable of simulating operation and/or maintenance of particular bridge instruments and/or defined navigation/ manoeuvring scenarios.

Competences addressed by the Ship's Bridge Simulator

STCW Reference	Competence	Category			
		1	2	3	4
Table A-II/1.1	Plan and conduct a passage and determine position	✓	✓		✓
Table A-II/1.2	Maintain safe navigational watch	✓	✓		✓
Table A-II/1.3	Use of RADAR and ARPA to maintain safety of navigation	✓	✓	✓	✓
Table A-II/1.4	Use of ECDIS to maintain the safety of navigation	✓	✓	✓	✓
Table A-II/1.5	Respond to emergencies	✓	✓	✓	✓
Table A-II/1.6	Respond to distress signal at sea	✓	✓	✓	✓
Table A-II/1.8	Transmit and receive information by visual signaling	✓	✓	✓	✓
Table A-II/1.9	Manoeuvre the ship	✓	✓	✓	✓

Bachelor of Science in Marine Engineering
CURRICULUM MAPPING

Annex A of CMO No. 67, s. 2017
Revision No: 00
Revision Date: 00

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
A-III/1	***Function 1 Marine engineering at the operational level***										
C1	Maintain a safe engineering watch	KUP1	Thorough knowledge of principles to be observed in keeping a marine engineering watch including:								
		.1	duties associated with taking over and accepting a watch								
		.2	routine duties undertaken during a watch								
		.3	maintenance of the machinery space logs and the significance of the readings taken								
		.4	duties associated with handing over a watch								
		KUP2	Safety and emergency procedures, change over of remote/automatic to local control systems								
		KUP3	Safety precautions to be observed during a watch and immediate actions to be taken in the event of fire or accident, with particular reference to oil systems								
		KUP4	Knowledge of engine-room resource management principles including:								
		.1	allocation, assignment and prioritization of resources								
		.2	effective communication								
		.3	assertiveness and leadership								
		.4	obtaining and maintaining situational awareness								
		.5	consideration of team experience								
C2	Use English in written and oral form	KUP1	Adequate knowledge of the English language to enable the officer to use engineering publications and to perform engineering duties								
C3	Use internal communication systems	KUP1	Operation of all internal communication systems on board								
C4	Operate main and auxiliary machinery and associated control systems	KUP1	Basic construction and operation principles of machinery systems, including:							X	X
		.1	main diesel engine								
		.2	marine steam turbine								
		.3	marine gas turbine								
		.4	marine steam boiler								
		.5	shafting installations and propeller								
		.6	other auxiliaries							X	X
		.6.a	various pumps							x	
		.6.b	air compressor							x	
		.6.c	purifier								x
		.6.d	fresh water generator							x	
		.6.e	heat exchanger							x	
		.6.f	refrigeration								x

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
		.6.g	air-conditioning and								x
		.6.h	ventilations system								x
		.7	steering gear								X
		.8	automatic control systems								
		.9	fluid flow and characteristics of of lubricating oil, fuel oil and cooling oil								
		.10	deck machinery							x	
		KUP2	Safety and emergency procedures for operation of propulsion plant machinery including control systems								
		KUP3	Preparation, operation, fault detection and necessary measures to prevent damage for the following machinery items and control systems:							X	X
		.1	Main engine and associated auxiliaries							x	
		.2	Steam boilers and associated auxiliaries and steam systems							x	
		.3	Auxiliary prime movers and associated systems							x	
		.4	Other auxiliaries, including refrigeration, air-conditioning and ventilation systems								x
C5	Operate fuel, lubrication, ballast and other pumping systems and associated control systems	KUP1	Operational characteristics of pumps and piping systems, including control systems							X	
		KUP2	Operation of the following pumping systems:							x	
		.1	Routine pumping operations							x	
		.2	Operation of bilge, ballast and cargo pumping systems							x	
		KUP3	Oily-water separators (or similar equipment) requirements and operation							X	
A-III/2	***Function 1 Marine engineering at the management level***										
C1	Manage the operation of propulsion plant machinery	KUP1	Design features and operative mechanism of the following machinery and associated auxiliaries:								
		.1	marine diesel engine								
		.2	marine steam turbine*								
		.3	marine gas turbine*								
		.4	marine steam boiler								
C2	Plan and schedule operations	KUP1	*Theoretical knowledge*								
		.1	Thermodynamics and heat transmission								
		.2	Mechanics and hydromechanics								
		.3	Propulsive characteristics of:								
		.3.a	diesel engines including speed, output and fuel consumption								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
		.3.b	steam boiler including speed (pressure), output (temperature) and fuel consumption								
		.3.c	gas turbines including speed, output and fuel consumption								
		.4	Heat cycle, thermal efficiency and heat balance of the following:								
		.4.a	marine diesel engine								
		.4.b	marine steam turbine								
		.4.c	marine gas turbine								
		.4.d	marine steam boiler								
		.5	Refrigerators and refrigeration cycle								X
		.6	Physical and chemical properties of fuels and lubricants								
		.7	Technology of materials								
		.8	Naval Architecture and ship construction, including damage control								
		KUP2	*Practical knowledge*								X
		.1	Start up and shut down main propulsion and auxiliary machinery, including associated systems								
		.2	Operating limits of propulsion plant								
		.3	The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery								
		.4	Functions and mechanism of automatic control for main engine								
		.5	Functions and mechanism of automatic control for auxiliary machinery including but not limited to:							X	X
		.5.a	generator distribution systems						X		
		.5.b	steam boilers								
		.5.c	oil purifier								x
		.5.d	refrigeration system								x
		.5.e	pumping and piping systems							x	
		.5.f	steering gear system								x
		.5.g	cargo handling equipment and deck machinery							x	
C3	Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery	KUP1	*Theoretical knowledge*								X
		.1	Thermodynamics and heat transmission								
		.2	Mechanics and hydromechanics								
		.3	Propulsive characteristics of:								
		.3.a	diesel engines including speed, output and fuel consumption								
		.3.b	steam boiler including speed (pressure), output (temperature) and fuel consumption								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
		.3.c	gas turbines including speed, output and fuel consumption								
		.4	Heat cycle, thermal efficiency and heat balance of the following:								
		.4.a	marine diesel engine								
		.4.b	marine steam turbine								
		.4.c	marine gas turbine								
		.4.d	marine steam boiler								
		.5	Refrigerators and refrigeration cycle								X
		.6	Physical and chemical properties of fuels and lubricants								
		.7	Technology of materials								
		.8	Naval Architecture and ship construction, including damage control								
		KUP2	*Practical knowledge*								X
		.1	Start up and shut down main propulsion and auxiliary machinery, including associated systems								
		.2	Operating limits of propulsion plant								
		.3	The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery								
		.4	Functions and mechanism of automatic control for main engine								
		.5	Functions and mechanism of automatic control for auxiliary machinery including but not limited to:							X	x
		.5.a	generator distribution systems						x		
		.5.b	steam boilers								
		.5.c	oil purifier								x
		.5.d	refrigeration system								x
		.5.e	pumping and piping systems							x	
		.5.f	steering gear system								x
		.5.g	cargo handling equipment and deck machinery							x	
C4	Manage fuel, lubrication and ballast operations	KUP1	Operation and maintenance of machinery, including pumps and piping systems							X	
A-III/1	***Function 2 Electrical, electronic and control engineering at the operational level***										
C1	Electrical, electronic and control engineering at the operational level	KUP1	Basic configuration and operation principles of the following electrical, electronic and control equipment:						X		
		.1	Electrical equipment:						x		
		.1.a	generator and distribution systems						x		
		.1.b	preparing, starting, paralleling and changing over generators						x		
		.1.c	electrical motors including starting methodologies						x		
		.1.d	high-voltage installations						x		

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
		.1.e	sequential control circuits and associated system devices						x		
		.2	Electronic equipment:								
		.2.a	characteristics of basic electronic circuit elements					X			
		.2.b	flowchart for automatic and control systems								
		.2.c	functions, characteristics and features of control systems for machinery items, including main propulsion plant operation control and steam boiler automatic controls								
		.3	Control systems								
		.3.a	various automatic control methodologies and characteristics								
		.3.b	Proportional-Integral-Derivative (PID) control characteristics and associated system devices for process control								
C2	Maintenance and repair of electrical and electronic equipment	KUP1	Safety requirements for working on shipboard electrical systems, including the safe isolation of electrical equipment required before personnel are permitted to work on such equipment				X		X		
		KUP2	Maintenance and repair of electrical system equipment, switchboards, electric motors, generators and DC electrical systems and equipment						X		
		KUP3	Detection of electric malfunction, location of faults and measures to prevent damage						X		
		KUP4	Construction and operation of electrical testing and measuring equipment				X				
		KUP5	Function and performance tests of the following equipment and their configuration:								
		.1	Monitoring systems								
		.2	Automatic control devices								
		.3	Protective devices				X		X		
		KUP6	The interpretation of electrical and simple electronic diagrams				X	X			
A-III/2	***Function 2 Electrical, electronic and control engineering at the management level***										
C1	Manage operation of electrical and electronic control equipment	KUP1	*Theoretical knowledge*								
		.1.a	Marine electrotechnology						X		
		.1.b	Electronics and power electronics					X			
		.1.c	Automatic control engineering								
		.1.d	Safety devices					X	X		
		.2	Design features and system configurations of automatic control equipment and safety devices for the following:						X		
		.2.a	main engine								
		.2.b	generator and distribution system						x		
		.2.c	steam boiler								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
		.3	Design features and system configurations of operational control equipment for electrical motors						X		
		.4	Design features of high-voltage installations						X		
		.5	Features of hydraulic and pneumatic control equipment								
C2	Manage troubleshooting restoration of electrical and electronic control equipment to operating condition	KUP1	Practical knowledge					X	X		
		.1	Troubleshooting of electrical and electronic control equipment					x	x		
		.2	Function test of electrical, electronic control equipment and safety devices								
		.3	Troubleshooting of monitoring systems								
		.4	Software version control								
A-III/6	***Function 1 Electrical, electronic and control engineering at the operational level***										
C5	Operate computers and computer networks on ships	KUP1	Understanding of:								
		.1.2	main features of data processing								
		.1.3	construction and use of computer networks on ships								
		.1.4	bridge-based, engine-room based and commercial computer use								
A-III/1	***Function 3 Maintenance and repair at the operational level***										
C1	Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board	KUP1	Characteristics and limitations of materials used in construction and repair of ships and equipment								
		KUP2	Characteristics and limitations of processes used for fabrication and repair		X						
		KUP3	Properties and parameters considered in the fabrication and repair of systems and components		X						
		KUP4	Methods for carrying out safe emergency/temporary repairs			X					
		KUP5	Safety measures to be taken to ensure a safe working environment and for using hand tools, machine tools and measuring instruments	X	X	X					
		KUP6	Use of hand tools, machine tools and measuring instruments	X	X	X					
		KUP7	Use of various types of sealants and packings								
C2	Maintenance and repair of shipboard machinery and equipment	KUP1	Safety measures to be taken for repair and maintenance including the safe isolation of shipboard machinery and equipment required before personnel are permitted to work on such machinery or equipment								
		KUP2	Appropriate basic mechanical knowledge and skills								
		KUP3	Maintenance and repair, such as dismantling, adjustment and reassembling of machinery and equipment								
		KUP4	The use of appropriate specialized tools and measuring instruments	X							
		KUP5	Design characteristics and selection of materials in construction of equipment								
		KUP6	Interpretation of machinery drawings and handbooks								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
		KUP7	The interpretation of piping, hydraulic and pneumatic diagrams								
A-III/2	***Function 3 Maintenance and repair at the management level***										
C1	Manage safe and effective maintenance and repair procedures	KUP1	Theoretical knowledge : Marine engineering practice								
		KUP2	Practical knowledge								
		.1	Manage safe and effective maintenance and repair procedures								
		.2	Planning maintenance, including statutory and class verifications								
		.3	Planning repairs								
C2	Detect and identify the cause of machinery malfunctions and correct faults	KUP1	Practical knowledge								
		.1	Detection of machinery malfunction, location of faults and action to prevent damage								
		.2	Inspection and adjustment of equipment								
		.3	Non-destructive examination								
C3	Ensure safe working practices	KUP1	Practical knowledge: Safe working practices								
A-III/5	***Function 3 Maintenance and repair at the operational level (able seafarer)***										
C1	Contribute to the operation of equipment and machinery	KUP1	Safe operation of equipment, including: - hoists and lifting equipment								
		KUP2	Ability to use and understand basic crane, winch and hoist signals								
A-III/1	***Function 4 Controlling the operation of the ship and care for persons on board at the operational level***										
C1	Ensure compliance with pollution prevention requirements	KUP1	*Prevention of pollution of the marine environment*								
		.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment								
		.2	Anti-pollution procedures and all associated equipment								
		.3	Importance of proactive measurers to protect the marine environment (Including IMO Model course 1KUP35)								
C2	Maintain seaworthiness of the ship	KUP 1	*Ship stability*								
		.1	Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment								
		.2	Understanding of the fundamentals of watertight integrity								
		.3	Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy								
		KUP 2	The principal structural members of a ship								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
C3	Prevent, control and fight fires on board (model course 2.03)										
C4	Operate life-saving appliances (model course 1.23)										
C5	Apply medical first aid on board ship (model course 1.14)										
C6	Monitor compliance with legislative requirements	KUP1	Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment								
C7	Application of leadership and teamworking skills (model course 1.39)	KUP1	Knowledge and ability to apply effective resource management:								
		.1	allocation, assignment and prioritization of resources								
		.2	effective communication on board and ashore								
		.3	decisions reflect consideration of team experiences								
		.4	assertiveness and leadership, including motivation								
		.5	obtaining and maintaining situational awareness								
		KUP2	Knowledge and ability to apply decision-making techniques:								
		.1	situation and risk management								
		.2	identify and consider generated options								
		.3	selecting course of action								
		.4	evaluation of outcome effectiveness								
C8	Contribute to the safety of personnel and ship (model courses 1.39)										
A-III/2	***Function 4 Controlling the operation of the ship and care for persons on board at the management level***										
C1	Control trim, stability and stress	KUP1	Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability								
		KUP2	Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and counter measures to be taken								
		KUP3	Knowledge of IMO recommendations concerning ship stability								
C2	Monitor and control compliance with legislative	KUP1	Knowledge of relevant international maritime law embodied in international agreements and conventions								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
	measures to ensure safety of life at sea and protection of the marine environment	KUP 2	Regard shall be paid especially to the following:								
		.1	certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity								
		.2	responsibilities under the relevant requirements of the International Convention on Load Lines								
		.5	maritime declarations of health and the requirements of the International Health Regulations								
		.6	responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo								
		.8	national legislation for implementing international agreements and conventions								
C3	Maintain safety and security of the ship's crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems	KUP1	Thorough knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea)								
		KUP2	Organization of fire and abandon ship drills								
		KUP3	Maintenance of operational condition of life-saving, fire-fighting and other safety systems								
		KUP4	Actions to be taken to protect and safeguard all persons on board in emergencies								
		KUP5	Actions to limit damage and salve the ship following a fire, explosion, collision or grounding								
C4	Develop emergency and damage control plans and	KUP 1	Ship construction, including damage control								
C5	Use of leadership and managerial skill	KUP1	Knowledge of shipboard personnel management training								
		KUP2	A knowledge of related international maritime conventions and recommendations, and national legislation								
		KUP3	Ability to apply task and workload management inluding:								
		.1	planning aand coordination								
		.2	personnel assignment								
		.3	time and resource constraints								
		.4	prioritization								
		KUP4	Knowledge and ability to apply effective resource management								
		.1	allocation, assignment, and prioritization of resources								
		.2	effective communication on board and ashore								
		.3	decisions reflect consideration of team experience								
		.4	assertiveness and leadership inlcuding motivation								
		.5	obtaining and maintaining situation awareness								
		KUP5	Knowledge and ability to apply decision-making techniques								

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Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Mach 1	Mach 2	Mach 3	Electro 1	Electro 2	Electro 3	Aux Mach 1	Aux Mach 2
		.1	situation and risk assessment								
		.2	identify and generate options								
		.3	select course of action								
		.4	evaluation of outcome effectiveness								
		KUP6	Development, implementation, and oversight of standard operating procedures								

	Competences from Table A-III/1 OIC Engineering Watch
	Competences from Table A-III/2 Management Level Engine
	Competences from Table A-III/5 Able Seafarer Engine
	Reinforces the theories discussed in Thermodynamics

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
A-III/1	***Function 1 Marine engineering at the operational level***												
C1	Maintain a safe engineering watch	KUP1	Thorough knowledge of principles to be observed in keeping a marine engineering watch including:							X			
		.1	duties associated with taking over and accepting a watch							x			
		.2	routine duties undertaken during a watch							x			
		.3	maintenance of the machinery space logs and the significance of the readings taken							x			
		.4	duties associated with handing over a watch							x			
		KUP2	Safety and emergency procedures, change over of remote/automatic to local control systems							X			
		KUP3	Safety precautions to be observed during a watch and immediate actions to be taken in the event of fire or accident, with particular reference to oil systems							X			
		KUP4	Knowledge of engine-room resource management principles including:								X		
		.1	allocation, assignment and prioritization of resources								x		
		.2	effective communication								x		
		.3	assertiveness and leadership								x		
		.4	obtaining and maintaining situational awareness								x		
		.5	consideration of team experience								x		
C2	Use English in written and oral form	KUP1	Adequate knowledge of the English language to enable the officer to use engineering publications and to perform engineering duties		X	X							
C3	Use internal communication systems	KUP1	Operation of all internal communication systems on board							X			
C4	Operate main and auxiliary machinery and associated control systems	KUP1	Basic construction and operation principles of machinery systems, including:	X	X	X		X					
		.1	main diesel engine	x									
		.2	marine steam turbine		x								
		.3	marine gas turbine			x							
		.4	marine steam boiler		x								
		.5	shafting installations and propeller			x							
		.6	other auxiliaries										
		.6.a	various pumps										
		.6.b	air compressor										
		.6.c	purifier										
		.6.d	fresh water generator										
		.6.e	heat exchanger										
		.6.f	refrigeration										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
		.6.g	air-conditioning and										
		.6.h	ventilations system										
		.7	steering gear										
		.8	automatic control systems				x	x					
		.9	fluid flow and characteristics of of lubricating oil, fuel oil and cooling oil										
		.10	deck machinery										
		KUP2	Safety and emergency procedures for operation of propulsion plant machinery including control systems	X	X	X							
		KUP3	Preparation, operation, fault detection and necessary measures to prevent damage for the following machinery items and control systems:	X	X	X							
		.1	Main engine and associated auxiliaries	x		x							
		.2	Steam boilers and associated auxiliaries and steam systems		x								
		.3	Auxiliary prime movers and associated systems	x	x	x							
		.4	Other auxiliaries, including refrigeration, air-conditioning and ventilation systems										
C5	Operate fuel, lubrication, ballast and other pumping systems and associated control systems	KUP1	Operational characteristics of pumps and piping systems, including control systems										
		KUP2	Operation of the following pumping systems:										
		.1	Routine pumping operations										
		.2	Operation of bilge, ballast and cargo pumping systems										
		KUP3	Oily-water separators (or similar equipment) requirements and operation										
A-III/2	***Function 1 Marine engineering at the management level***												
C1	Manage the operation of propulsion plant machinery	KUP1	Design features and operative mechanism of the following machinery and associated auxiliaries:	X	X	X							
		.1	marine diesel engine	X									
		.2	marine steam turbine*		x								
		.3	marine gas turbine*			x							
		.4	marine steam boiler		x								
C2	Plan and schedule operations	KUP1	*Theoretical knowledge*	X	X	X							X
		.1	Thermodynamics and heat transmission										
		.2	Mechanics and hydromechanics										
		.3	Propulsive characteristics of:	X	X	X							
		.3.a	diesel engines including speed, output and fuel consumption	x									

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
		.3.b	steam boiler including speed (pressure), output (temperature) and fuel consumption		x								
		.3.c	gas turbines including speed, output and fuel consumption			x							
		.4	Heat cycle, thermal efficiency and heat balance of the following:	X	X	X							
		.4.a	marine diesel engine	x									
		.4.b	marine steam turbine		x								
		.4.c	marine gas turbine			x							
		.4.d	marine steam boiler		x								
		.5	Refrigerators and refrigeration cycle										
		.6	Physical and chemical properties of fuels and lubricants										
		.7	Technology of materials										x
		.8	Naval Architecture and ship construction, including damage control						x			x	
		KUP2	*Practical knowledge*	X			X	X			X		
		.1	Start up and shut down main propulsion and auxiliary machinery, including associated systems	X	X	X					x		
		.2	Operating limits of propulsion plant	X	X	X							
		.3	The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery	X	X	X					x		
		.4	Functions and mechanism of automatic control for main engine					x					
		.5	Functions and mechanism of automatic control for auxiliary machinery including but not limited to:				x						
		.5.a	generator distribution systems										
		.5.b	steam boilers				x						
		.5.c	oil purifier				x						
		.5.d	refrigeration system				x						
		.5.e	pumping and piping systems				x						
		.5.f	steering gear system				x						
		.5.g	cargo handling equipment and deck machinery				x						
C3	Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery	KUP1	*Theoretical knowledge*	X	X	X							X
		.1	Thermodynamics and heat transmission										
		.2	Mechanics and hydromechanics										
		.3	Propulsive characteristics of:	X	X	X							
		.3.a	diesel engines including speed, output and fuel consumption	x									
		.3.b	steam boiler including speed (pressure), output (temperature) and fuel consumption		x								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
		.3.c	gas turbines including speed, output and fuel consumption			x							
		.4	Heat cycle, thermal efficiency and heat balance of the following:	X	X	X							
		.4.a	marine diesel engine	x									
		.4.b	marine steam turbine		x								
		.4.c	marine gas turbine			x							
		.4.d	marine steam boiler		x								
		.5	Refrigerators and refrigeration cycle										
		.6	Physical and chemical properties of fuels and lubricants										
		.7	Technology of materials										x
		.8	Naval Architecture and ship constrcution, including damage control									x	
		KUP2	*Practical knowledge*	X				X			X		
		.1	Start up and shut down main propulsion and auxiliary machinery, including associated systems	X	X	X					x		
		.2	Operating limits of propulsion plant	X	X	X							
		.3	The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery	X	X	X					x		
		.4	Functions and mechanism of automatic control for main engine					x					
		.5	Functions and mechanism of automatic control for auxiliary machinery including but not limited to:					X					
		.5.a	generator distribution systems										
		.5.b	steam boilers		x								
		.5.c	oil purifier										
		.5.d	refrigeration system										
		.5.e	pumping and piping systems										
		.5.f	steering gear system										
		.5.g	cargo handling equipment and deck machinery										
C4	Manage fuel, lubrication and ballast operations	KUP1	Operation and maintenance of machinery, including pumps and piping systems										
A-III/1	***Function 2 Electrical, electronic and control engineering at the operational level***												
C1	Electrical, electronic and control engineering at the operational level	KUP1	Basic configuration and operation principles of the following electrical, electronic and control equipment:				X	X					
		.1	Electrical equipment:										
		.1.a	generator and distribution systems										
		.1.b	preparing, starting, paralleling and changing over generators										
		.1.c	electrical motors including starting methodologies										
		.1.d	high-voltage installations										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
		.1.e	sequential control circuits and associated system devices										
		.2	Electronic equipment:				X	X					
		.2.a	characteristics of basic electronic circuit elements										
		.2.b	flowchart for automatic and control systems				x						
		.2.c	functions, characteristics and features of control systems for machinery items, including main propulsion plant operation control and steam boiler automatic controls					x					
		.3	Control systems				X						
		.3.a	various automatic control methodologies and characteristics				x						
		.3.b	Proportional-Integral-Derivative (PID) control characteristics and associated system devices for process control				x						
C2	Maintenance and repair of electrical and electronic equipment	KUP1	Safety requirements for working on shipboard electrical systems, including the safe isolation of electrical equipment required before personnel are permitted to work on such equipment										
		KUP2	Maintenance and repair of electrical system equipment, switchboards, electric motors, generators and DC electrical systems and equipment										
		KUP3	Detection of electric malfunction, location of faults and measures to prevent damage										
		KUP4	Construction and operation of electrical testing and measuring equipment										
		KUP5	Function and performance tests of the following equipment and their configuration:				X						
		.1	Monitoring systems				x						
		.2	Automatic control devices				x						
		.3	Protective devices				x						
		KUP6	The interpretation of electrical and simple electronic diagrams				X						
A-III/2	***Function 2 Electrical, electronic and control engineering at the management level***												
C1	Manage operation of electrical and electronic control equipment	KUP1	*Theoretical knowledge*	X	X	X	X						
		.1.a	Marine electrotechnology										
		.1.b	Electronics and power electronics										
		.1.c	Automatic control engineering				X	X					
		.1.d	Safety devices										
		.2	Design features and system configurations of automatic control equipment and safety devices for the following:		X			X					
		.2.a	main engine	x		x							
		.2.b	generator and distribution system										
		.2.c	steam boiler		x								

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
		.3	Design features and system configurations of operational control equipment for electrical motors										
		.4	Design features of high-voltage installations										
		.5	Features of hydraulic and pneumatic control equipment				x						
C2	Manage troubleshooting restoration of electrical and electronic control equipment to operating condition	KUP1	Practical knowledge				X						
		.1	Troubleshooting of electrical and electronic control equipment				X	X					
		.2	Function test of electrical, electronic control equipment and safety devices				x						
		.3	Troubleshooting of monitoring systems				x						
		.4	Software version control					X					
A-III/6	***Function 1 Electrical, electronic and control engineering at the operational level***												
C5	Operate computers and computer networks on ships	KUP1	Understanding of:										
		.1.2	main features of data processing										
		.1.3	construction and use of computer networks on ships										
		.1.4	bridge-based, engine-room based and commercial computer use										
A-III/1	***Function 3 Maintenance and repair at the operational level***												
C1	Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board	KUP1	Characteristics and limitations of materials used in construction and repair of ships and equipment										X
		KUP2	Characteristics and limitations of processes used for fabrication and repair										X
		KUP3	Properties and parameters considered in the fabrication and repair of systems and components										X
		KUP4	Methods for carrying out safe emergency/temporary repairs						x				
		KUP5	Safety measures to be taken to ensure a safe working environment and for using hand tools, machine tools and measuring instruments										
		KUP6	Use of hand tools, machine tools and measuring instruments										
		KUP7	Use of various types of sealants and packings						x				
C2	Maintenance and repair of shipboard machinery and equipment	KUP1	Safety measures to be taken for repair and maintenance including the safe isolation of shipboard machinery and equipment required before personnel are permitted to work on such machinery or equipment						X				
		KUP2	Appropriate basic mechanical knowledge and skills						X				
		KUP3	Maintenance and repair, such as dismantling, adjustment and reassembling of machinery and equipment						X				
		KUP4	The use of appropriate specialized tools and measuring instruments										
		KUP5	Design characteristics and selection of materials in construction of equipment										x
		KUP6	Interpretation of machinery drawings and handbooks										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
		KUP7	The interpretation of piping, hydraulic and pneumatic diagrams										
A-III/2	***Function 3 Maintenance and repair at the management level***												
C1	Manage safe and effective maintenance and repair procedures	KUP1	Theoretical knowledge : Marine engineering practice						X				
		KUP2	Practical knowledge						x				
		.1	Manage safe and effective maintenance and repair procedures						x				
		.2	Planning maintenance, including statutory and class verifications						x				
		.3	Planning repairs						x				
C2	Detect and identify the cause of machinery malfunctions and correct faults	KUP1	Practical knowledge						X	X			X
		.1	Detection of machinery malfunction, location of faults and action to prevent damage						x	x			
		.2	Inspection and adjustment of equipment						x				
		.3	Non-destructive examination						x				x
C3	Ensure safe working practices	KUP1	Practical knowledge: Safe working practices						x				
A-III/5	***Function 3 Maintenance and repair at the operational level (able seafarer)***												
C1	Contribute to the operation of equipment and machinery	KUP1	Safe operation of equipment, including: - hoists and lifting equipment						x				
		KUP2	Ability to use and understand basic crane, winch and hoist signals						x				
A-III/1	***Function 4 Controlling the operation of the ship and care for persons on board at the operational level***												
C1	Ensure compliance with pollution prevention requirements	KUP1	*Prevention of pollution of the marine environment*										
		.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment										
		.2	Anti-pollution procedures and all associated equipment										
		.3	Importance of proactive measurers to protect the marine environment (Including IMO Model course 1KUP35)										
C2	Maintain seaworthiness of the ship	KUP 1	*Ship stability*									x	
		.1	Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment									x	
		.2	Understanding of the fundamentals of watertight integrity									x	
		.3	Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy									x	
		KUP 2	The principal structural members of a ship									x	

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
C3	Prevent, control and fight fires on board (model course 2.03)												
C4	Operate life-saving appliances (model course 1.23)												
C5	Apply medical first aid on board ship (model course 1.14)												
C6	Monitor compliance with legislative requirements	KUP1	Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment										
C7	Application of leadership and teamworking skills (model course 1.39)	KUP1	Knowledge and ability to apply effective resource management:								x		
		.1	allocation, assignment and prioritization of resources								x		
		.2	effective communication on board and ashore							x	x		
		.3	decisions reflect consideration of team experiences								x		
		.4	assertiveness and leadership, including motivation								x		
		.5	obtaining and maintaining situational awareness								x		
		KUP2	Knowledge and ability to apply decision-making techniques:								x		
		.1	situation and risk management								x		
		.2	identify and consider generated options								x		
		.3	selecting course of action								x		
		.4	evaluation of outcome effectiveness								x		
C8	Contribute to the safety of personnel and ship (model courses 1.39)												
A-III/2	***Function 4 Controlling the operation of the ship and care for persons on board at the management level***												
C1	Control trim, stability and stress	KUP1	Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability									x	
		KUP2	Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and counter measures to be taken									x	
		KUP3	Knowledge of IMO recommendations concerning ship stability									x	
C2	Monitor and control compliance with legislative	KUP1	Knowledge of relevant international maritime law embodied in international agreements and conventions										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
	measures to ensure safety of life at sea and protection of the marine environment	KUP 2	Regard shall be paid especially to the following:										
		.1	certificates and other documents required to be carried on board ships by International conventions, how they may be obtained and their period of validity										
		.2	responsibilities under the relevant requirements of the International Convention on Load Lines										
		.5	maritime declarations of health and the requirements of the International Health Regulations										
		.6	responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo										
		.8	national legislation for implementing international agreements and conventions										
C3	Maintain safety and security of the ship's crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems	KUP1	Thorough knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea)										
		KUP2	Organization of fire and abandon ship drills										
		KUP3	Maintenance of operational condition of life-saving, fire-fighting and other safety systems										
		KUP4	Actions to be taken to protect and safeguard all persons on board in emergencies										
		KUP5	Actions to limit damage and salve the ship following a fire, explosion, collision or grounding										
C4	Develop emergency and damage control plans and	KUP 1	Ship construction, including damage control									x	
C5	Use of leadership and managerial skill	KUP1	Knowledge of shipboard personnel management training										
		KUP2	A knowledge of related international maritime conventions and recommendations, and national legislation										
		KUP3	Ability to apply task and workload management inluding:										
		.1	planning aand coordination										
		.2	personnel assignment										
		.3	time and resource constraints										
		.4	prioritization										
		KUP4	Knowledge and ability to apply effective resource management										
		.1	allocation, assignment, and prioritization of resources										
		.2	effective communication on board and ashore										
		.3	decisions reflect consideration of team experience										
		.4	assertiveness and leadership inlcuding motivation										
		.5	obtaining and maintaining situation awareness										
		KUP5	Knowledge and ability to apply decision-making techniques										

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Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PPD	PPS	PASGT	Auto 1	Auto 2	Maint	EWK 1	EWK 2	Nav Arch	E Mat
		.1	situation and risk assessment										
		.2	identify and generate options										
		.3	select course of action										
		.4	evaluation of outcome effectiveness										
		KUP6	Development, implementation, and oversight of standard operating procedures										

	Competences from Table A-III/1 OIC Engineering Watch
	Competences from Table A-III/2 Management Level Engine
	Competences from Table A-III/5 Able Seafarer Engine
	Reinforces the theories discussed in Thermodynamics

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
A-III/1	***Function 1 Marine engineering at the operational level***												
C1	Maintain a safe engineering watch	KUP1	Thorough knowledge of principles to be observed in keeping a marine engineering watch including:										
		.1	duties associated with taking over and accepting a watch										
		.2	routine duties undertaken during a watch										
		.3	maintenance of the machinery space logs and the significance of the readings taken										
		.4	duties associated with handing over a watch										
		KUP2	Safety and emergency procedures, change over of remote/automatic to local control systems										
		KUP3	Safety precautions to be observed during a watch and immediate actions to be taken in the event of fire or accident, with particular reference to oil systems										
		KUP4	Knowledge of engine-room resource management principles including:										
		.1	allocation, assignment and prioritization of resources										
		.2	effective communication										
		.3	assertiveness and leadership										
		.4	obtaining and maintaining situational awareness										
		.5	consideration of team experience										
C2	Use English in written and oral form	KUP1	Adequate knowledge of the English language to enable the officer to use engineering publications and to perform engineering duties										
C3	Use internal communication systems	KUP1	Operation of all internal communication systems on board										
C4	Operate main and auxiliary machinery and associated control systems	KUP1	Basic construction and operation principles of machinery systems, including:										
		.1	main diesel engine										
		.2	marine steam turbine										
		.3	marine gas turbine										
		.4	marine steam boiler										
		.5	shafting installations and propeller										
		.6	other auxiliaries										
		.6.a	various pumps										
		.6.b	air compressor										
		.6.c	purifier										
		.6.d	fresh water generator										
		.6.e	heat exchanger										
		.6.f	refrigeration										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
		.6.g	air-conditioning and										
		.6.h	ventilations system										
		.7	steering gear										
		.8	automatic control systems										
		.9	fluid flow and characteristics of of lubricating oil, fuel oil and cooling oil			x							
		.10	deck machinery										
		KUP2	Safety and emergency procedures for operation of propulsion plant machinery including control systems										
		KUP3	Preparation, operation, fault detection and necessary measures to prevent damage for the following machinery items and control systems:										
		.1	Main engine and associated auxiliaries										
		.2	Steam boilers and associated auxiliaries and steam systems										
		.3	Auxiliary prime movers and associated systems										
		.4	Other auxiliaries, including refrigeration, air-conditioning and ventilation systems										
C5	Operate fuel, lubrication, ballast and other pumping systems and associated control systems	KUP1	Operational characteristics of pumps and piping systems, including control systems										
		KUP2	Operation of the following pumping systems:										
		.1	Routine pumping operations										
		.2	Operation of bilge, ballast and cargo pumping systems										
		KUP3	Oily-water separators (or similar equipment) requirements and operation										
A-III/2	***Function 1 Marine engineering at the management level***												
C1	Manage the operation of propulsion plant machinery	KUP1	Design features and operative mechanism of the following machinery and associated auxiliaries:										
		.1	marine diesel engine										
		.2	marine steam turbine*										
		.3	marine gas turbine*										
		.4	marine steam boiler										
C2	Plan and schedule operations	KUP1	*Theoretical knowledge*	X			X						
		.1	Thermodynamics and heat transmission	x									
		.2	Mechanics and hydromechanics				X						
		.3	Propulsive characteristics of:	x									
		.3.a	diesel engines including speed, output and fuel consumption	x									

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
		.3.b	steam boiler including speed (pressure), output (temperature) and fuel consumption	x									
		.3.c	gas turbines including speed, output and fuel consumption	x									
		.4	Heat cycle, thermal efficiency and heat balance of the following:	x									
		.4.a	marine diesel engine	x									
		.4.b	marine steam turbine	x									
		.4.c	marine gas turbine	x									
		.4.d	marine steam boiler	x									
		.5	Refrigerators and refrigeration cycle										
		.6	Physical and chemical properties of fuels and lubricants			x							
		.7	Technology of materials										
		.8	Naval Architecture and ship construction, including damage control										
		KUP2	*Practical knowledge*										
		.1	Start up and shut down main propulsion and auxiliary machinery, including associated systems										
		.2	Operating limits of propulsion plant										
		.3	The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery										
		.4	Functions and mechanism of automatic control for main engine				x						
		.5	Functions and mechanism of automatic control for auxiliary machinery including but not limited to:										
		.5.a	generator distribution systems										
		.5.b	steam boilers										
		.5.c	oil purifier										
		.5.d	refrigeration system										
		.5.e	pumping and piping systems										
		.5.f	steering gear system										
		.5.g	cargo handling equipment and deck machinery										
C3	Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery	KUP1	*Theoretical knowledge*	X			X						
		.1	Thermodynamics and heat transmission	x									
		.2	Mechanics and hydromechanics				x						
		.3	Propulsive characteristics of:	x									
		.3.a	diesel engines including speed, output and fuel consumption	x									
		.3.b	steam boiler including speed (pressure), output (temperature) and fuel consumption	x									

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
		.3.c	gas turbines including speed, output and fuel consumption	x									
		.4	Heat cycle, thermal efficiency and heat balance of the following:	x									
		.4.a	marine diesel engine	x									
		.4.b	marine steam turbine	x									
		.4.c	marine gas turbine	x									
		.4.d	marine steam boiler	x									
		.5	Refrigerators and refrigeration cycle										
		.6	Physical and chemical properties of fuels and lubricants			x							
		.7	Technology of materials										
		.8	Naval Architecture and ship construction, including damage control										
		KUP2	*Practical knowledge*										
		.1	Start up and shut down main propulsion and auxiliary machinery, including associated systems										
		.2	Operating limits of propulsion plant										
		.3	The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery										
		.4	Functions and mechanism of automatic control for main engine										
		.5	Functions and mechanism of automatic control for auxiliary machinery including but not limited to:										
		.5.a	generator distribution systems										
		.5.b	steam boilers										
		.5.c	oil purifier										
		.5.d	refrigeration system										
		.5.e	pumping and piping systems										
		.5.f	steering gear system										
		.5.g	cargo handling equipment and deck machinery										
C4	Manage fuel, lubrication and ballast operations	KUP1	Operation and maintenance of machinery, including pumps and piping systems										
A-III/1	***Function 2 Electrical, electronic and control engineering at the operational level***												
C1	Electrical, electronic and control engineering at the operational level	KUP1	Basic configuration and operation principles of the following electrical, electronic and control equipment:										
		.1	Electrical equipment:										
		.1.a	generator and distribution systems										
		.1.b	preparing, starting, paralleling and changing over generators										
		.1.c	electrical motors including starting methodologies										
		.1.d	high-voltage installations										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
		.1.e	sequential control circuits and associated system devices										
		.2	Electronic equipment:										
		.2.a	characteristics of basic electronic circuit elements										
		.2.b	flowchart for automatic and control systems										
		.2.c	functions, characteristics and features of control systems for machinery items, including main propulsion plant operation control and steam boiler automatic controls										
		.3	Control systems										
		.3.a	various automatic control methodologies and characteristics										
		.3.b	Proportional-Integral-Derivative (PID) control characteristics and associated system devices for process control										
C2	Maintenance and repair of electrical and electronic equipment	KUP1	Safety requirements for working on shipboard electrical systems, including the safe isolation of electrical equipment required before personnel are permitted to work on such equipment										
		KUP2	Maintenance and repair of electrical system equipment, switchboards, electric motors, generators and DC electrical systems and equipment										
		KUP3	Detection of electric malfunction, location of faults and measures to prevent damage										
		KUP4	Construction and operation of electrical testing and measuring equipment										
		KUP5	Function and performance tests of the following equipment and their configuration:										
		.1	Monitoring systems										
		.2	Automatic control devices										
		.3	Protective devices										
		KUP6	The interpretation of electrical and simple electronic diagrams										
A-III/2	***Function 2 Electrical, electronic and control engineering at the management level***												
C1	Manage operation of electrical and electronic control equipment	KUP1	*Theoretical knowledge*										
		.1.a	Marine electrotechnology										
		.1.b	Electronics and power electronics										
		.1.c	Automatic control engineering										
		.1.d	Safety devices										
		.2	Design features and system configurations of automatic control equipment and safety devices for the following:										
		.2.a	main engine										
		.2.b	generator and distribution system										
		.2.c	steam boiler										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
		.3	Design features and system configurations of operational control equipment for electrical motors										
		.4	Design features of high-voltage installations										
		.5	Features of hydraulic and pneumatic control equipment				x						
C2	Manage troubleshooting restoration of electrical and electronic control equipment to operating condition	KUP1	Practical knowledge										
		.1	Troubleshooting of electrical and electronic control equipment										
		.2	Function test of electrical, electronic control equipment and safety devices										
		.3	Troubleshooting of monitoring systems										
		.4	Software version control										
A-III/6	***Function 1 Electrical, electronic and control engineering at the operational level***												
C5	Operate computers and computer networks on ships	KUP1	Understanding of:						X				
		.1.2	main features of data processing						x				
		.1.3	construction and use of computer networks on ships						x				
		.1.4	bridge-based, engine-room based and commercial computer use						x				
A-III/1	***Function 3 Maintenance and repair at the operational level***												
C1	Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board	KUP1	Characteristics and limitations of materials used in construction and repair of ships and equipment										
		KUP2	Characteristics and limitations of processes used for fabrication and repair										
		KUP3	Properties and parameters considered in the fabrication and repair of systems and components										
		KUP4	Methods for carrying out safe emergency/temporary repairs										
		KUP5	Safety measures to be taken to ensure a safe working environment and for using hand tools, machine tools and measuring instruments										
		KUP6	Use of hand tools, machine tools and measuring instruments										
		KUP7	Use of various types of sealants and packings										
C2	Maintenance and repair of shipboard machinery and equipment	KUP1	Safety measures to be taken for repair and maintenance including the safe isolation of shipboard machinery and equipment required before personnel are permitted to work on such machinery or equipment										
		KUP2	Appropriate basic mechanical knowledge and skills										
		KUP3	Maintenance and repair, such as dismantling, adjustment and reassembling of machinery and equipment										
		KUP4	The use of appropriate specialized tools and measuring instruments										
		KUP5	Design characteristics and selection of materials in construction of equipment										
		KUP6	Interpretation of machinery drawings and handbooks		X								

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CURRICULUM MAPPING

Annex A of CMO No. 67, s. 2017
Revision No: 00
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Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
		KUP7	The interpretation of piping, hydraulic and pneumatic diagrams		X								
A-III/2	***Function 3 Maintenance and repair at the management level***												
C1	Manage safe and effective maintenance and repair procedures	KUP1	Theoretical knowledge : Marine engineering practice										
		KUP2	Practical knowledge										
		.1	Manage safe and effective maintenance and repair procedures										
		.2	Planning maintenance, including statutory and class verifications										
		.3	Planning repairs										
C2	Detect and identify the cause of machinery malfunctions and correct faults	KUP1	Practical knowledge										
		.1	Detection of machinery malfunction, location of faults and action to prevent damage										
		.2	Inspection and adjustment of equipment										
		.3	Non-destructive examination										
C3	Ensure safe working practices	KUP1	Practical knowledge: Safe working practices										
A-III/5	***Function 3 Maintenance and repair at the operational level (able seafarer)***												
C1	Contribute to the operation of equipment and machinery	KUP1	Safe operation of equipment, including: - hoists and lifting equipment										
		KUP2	Ability to use and understand basic crane, winch and hoist signals										
A-III/1	***Function 4 Controlling the operation of the ship and care for persons on board at the operational level***												
C1	Ensure compliance with pollution prevention requirements	KUP1	*Prevention of pollution of the marine environment*							x			
		.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment							X			
		.2	Anti-pollution procedures and all associated equipment							X			
		.3	Importance of proactive measurers to protect the marine environment (Including IMO Model course 1KUP35)							X			
C2	Maintain seaworthiness of the ship	KUP 1	*Ship stability*										
		.1	Working knowledge and application of stability, trim and stress tables, diagrams and stress-calculating equipment										
		.2	Understanding of the fundamentals of watertight integrity										
		.3	Understanding of fundamental actions to be taken in the event of partial loss of intact buoyancy										
		KUP 2	The principal structural members of a ship										

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
C3	Prevent, control and fight fires on board (model course 2.03)							X					
C4	Operate life-saving appliances (model course 1.23)							X					
C5	Apply medical first aid on board ship (model course 1.14)							X					
C6	Monitor compliance with legislative requirements	KUP1	Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment								X		X
C7	Application of leadership and teamworking skills (model course 1.39)	KUP1	Knowledge and ability to apply effective resource management:										
		.1	allocation, assignment and prioritization of resources										
		.2	effective communication on board and ashore										
		.3	decisions reflect consideration of team experiences										
		.4	assertiveness and leadership, including motivation										
		.5	obtaining and maintaining situational awareness										
		KUP2	Knowledge and ability to apply decision-making techniques:									X	
		.1	situation and risk management									x	
		.2	identify and consider generated options									x	
		.3	selecting course of action									x	
		.4	evaluation of outcome effectiveness									x	
C8	Contribute to the safety of personnel and ship (model courses 1.39)							X					
A-III/2	***Function 4 Controlling the operation of the ship and care for persons on board at the management level***												
C1	Control trim, stability and stress	KUP1	Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability										
		KUP2	Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and counter measures to be taken										
		KUP3	Knowledge of IMO recommendations concerning ship stability										
C2	Monitor and control compliance with legislative	KUP1	Knowledge of relevant international maritime law embodied in international agreements and conventions							X	X		

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
	measures to ensure safety of life at sea and protection of the marine environment	KUP 2	Regard shall be paid especially to the following:								X		
		.1	certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity								x		
		.2	responsibilities under the relevant requirements of the International Convention on Load Lines								x		
		.5	maritime declarations of health and the requirements of the International Health Regulations								x		
		.6	responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo								x		
		.8	national legislation for implementing international agreements and conventions								x		
C3	Maintain safety and security of the ship's crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems	KUP1	Thorough knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea)									x	
		KUP2	Organization of fire and abandon ship drills					X					
		KUP3	Maintenance of operational condition of life-saving, fire-fighting and other safety systems										
		KUP4	Actions to be taken to protect and safeguard all persons on board in emergencies										
		KUP5	Actions to limit damage and salve the ship following a fire, explosion, collision or grounding										
C4	Develop emergency and damage control plans and	KUP 1	Ship construction, including damage control										
C5	Use of leadership and managerial skill	KUP1	Knowledge of shipboard personnel management training									X	
		KUP2	A knowledge of related international maritime conventions and recommendations, and national legislation									X	
		KUP3	Ability to apply task and workload management inluding:									X	
		.1	planning aand coordination									x	
		.2	personnel assignment									x	
		.3	time and resource constraints									x	
		.4	prioritization									x	
		KUP4	Knowledge and ability to apply effective resource management									X	
		.1	allocation, assignment, and prioritization of resources									x	
		.2	effective communication on board and ashore									x	
		.3	decisions reflect consideration of team experience									x	
		.4	assertiveness and leadership Inlcuding motivation									x	
		.5	obtaining and maintaining situation awareness									x	
		KUP5	Knowledge and ability to apply decision-making techniques									X	

	Bachelor of Science in Marine Engineering CURRICULUM MAPPING	Annex A of CMO No. 67, s. 2017 Revision No: 00 Revision Date: 00

Competence Index	COMPETENCE	KUP Index	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	Thermo	Draw	Ind Chem	Mech	BT	ICT	Mar Env	Mar Law	Mgmt 1	Mgmt 2
		.1	situation and risk assessment									x	
		.2	identify and generate options									x	
		.3	select course of action									x	
		.4	evaluation of outcome effectiveness									x	
		KUP6	Development, implementation, and oversight of standard operating procedures									x	

	Competences from Table A-III/1 OIC Engineering Watch
	Competences from Table A-III/2 Management Level Engine
	Competences from Table A-III/5 Able Seafarer Engine
	Reinforces the theories discussed in Thermodynamics

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **BASIC CONTROL ENGINEERING**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Auto 1						
Course Descriptive Title	:	Basic Control Engineering				**Prerequisite**	:	Electro 2 Mech
Course Credit	:	4 Units	**Lecture Contact Hours per Week**	:	3 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/1.F1.C4: Operate main and auxiliary machinery and associated control systems A-III/2.F1.C2: Plan and schedule operations A-III/1.F2.C1: Operate electrical, electronic and control systems A-III/1.F2.C2: Maintenance and repair of electrical and electronic equipment A-III/2.F2.C1: Manage operation of electrical and electronic control equipment A-III/2.F2.C2: Manage troubleshooting restoration of electrical and electronic control equipment to operating condition						
KUP	:	A-III/1.F1.C4.KUP1.8: Basic construction and operation principles of machinery systems of automatic control systems A-III/2.F1.C2.KUP5: Practical knowledge of the functions and mechanism of automatic control for auxiliary machinery including: .5.b steam boilers .5.c oil purifier .5.d refrigeration system .5.e pumping and piping systems .5.f steering gear system .5.g cargo handling equipment and deck machinery A-III/1.F2.C1.KUP1.2.b: Basic configuration and operation principles of electronics equipment of flowchart for automatic and control systems						

		A-III/1.F2.C1.KUP1.3.: Basic configuration and operation principles of control equipment: 3.a various automatic control methodologies and characteristics 3.b Proportional-Integral-Derivative (PID) control characteristics and associated system devices for process control A-III/1.F2.C2.KUP5: Function and performance tests of the following equipment and their configuration: .1 monitoring systems .2 automatic control devices .3 protective devices A-III/1.F2.C2.KUP6: The interpretation of electrical and simple electronic diagrams A-III/2.F2.C1.KUP1.1.c: Theoretical knowledge of automatic control engineering A-III/2.F2.C1.KUP1.5: Theoretical knowledge of the features of hydraulic and pneumatic control equipment A-III/2.F2.C2.KUP1: Practical knowledge on: .1 Troubleshooting of electrical and electronic control equipment .2 Function test of electrical, electronic control equipment and safety devices .3 Troubleshooting of monitoring systems .4 Software version control
Course Outcome	:	CO1: Differentiate basic construction and principles in automation regarding various measuring instruments and automation devices used onboard ships. CO2: Interpret process and instrument diagrams of automation system based on the industry standards CO3: Demonstrate performance test in accordance with the manufacturers standards for the: Monitoring systems; Automatic control devices; and Protective devices
Reference/s	:	1. Table A-III/1 Function 2: Electrical, electronic and control engineering at the operational level 2. Annex A CMO No.67 series of 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **MARINE AUTOMATION**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Auto 2						
Course Descriptive Title	:	Marine Automation				**Prerequisite**	:	Auto 1
Course Credit	:	4 Units	**Lecture Contact Hours per Week**	:	3 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/1.F2.C1: Operate electrical, electronic and control systems A-III/1.F1.C4: Operate main and auxiliary machinery and associated control systems A-III/2.F1.C2: Plan and schedule operations A-III/2.F1.C3: Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/2.F2.C1: Manage operation of electrical and electronic control equipment A-III/2.F2.C2: Manage troubleshooting, restoration of electrical and electronic control equipment to operating condition						
KUP	:	A-III/2.F2.C2.KUP1.1: Practical knowledge on troubleshooting of electrical and electronic control equipment A-III/2.F2.C2.KUP1.4: Practical knowledge on software version control A-III/I.F1.C4.KUP1.8: Basic construction and operation principles of automatic control in machinery systems on board A-III/2.F1.C2 and C3.KUP2.4: Practical knowledge of the functions and mechanism of automatic control for main engine A-III/2.F1.C3.KUP2.5.c: Functions and mechanism of automatic control for auxiliary machinery of steam boilers A-III/I.F2.C1.KUP1.2.c: Basic configuration and operation principles of the electronic equipment: functions, characteristics and features of control systems for machinery items, including main propulsion plant operation control and steam boiler automatic controls						

		A-III/2.F2.C1.KUP1.1.c: Theoretical knowledge on automatic control engineering A-III/2.F2.C1.KUP1.2: Practical knowledge of the design features and system configuration of automatic control equipment and safety devices for main engine, generator and distribution system and steam boiler
Course Outcome	:	CO1: Construct and operate a pneumatic control circuit for a specific application CO2: Differentiate programmable logic control (PLC) from distributed control system (DCS) and supervisory control and data acquisition (SCADA) based on their design and applications CO3: Design a simple process control system for a heat exchanger using a temperature sensor, a PID controller and a final control valve CO4: Analyze a given diagram of the main engine remote control system, generator and distribution power management system and steam boiler control system in order to develop a simple troubleshooting chart
Reference/s	:	1. Table A-III/1 Function I : Operate Main and Auxiliary Machinery and Associated Control Systems 2. Table A-III/1 Function 2 : Maintenance and repair of electrical and electronic equipment 3. Table A-III/2 Function 2 : Manage operation of electrical and electronic control equipment 4. Table A-III/1 Function 3 : Maintenance and repair of shipboard machinery and equipment 5. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **AUXILIARY MACHINERY 1**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Aux Mach 1						
Course Descriptive Title	:	Auxiliary Machinery 1				**Prerequisite**	:	Thermo Mech
Course Credits	:	6 Units	**Lecture Contact Hours per Week**	:	5 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-III/1.F1.C4 Operate main and auxiliary machinery and associated control systems A-III/1.F1.C5 Operate fuel, lubrication, ballast and other pumping systems and associated control systems A-III/2.F1.C2 Plan and schedule operations A-III/2.F1.C3 Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/2.F1.C4 Manage fuel, lubrication and ballast operations						
KUP	:	A-III/1.F1.C4.KUP1.6: Basic construction and operation principles of machinery systems namely (.a) various pumps:(gear pump, centrifugal pump, vane pump, screw pump, reciprocating pump), (.b) air compressor, (.c)fresh water generator, (.d) heat exchanger A-III/1.F1.C4.KUP1.10: Basic construction and operation principles of machinery systems on deck machineries such as crane, mooring winch and windlass A-III/1.F1.C4.KUP3: Preparation, operation, fault detection and necessary measures to prevent damage for machinery items and control systems (associated auxiliaries of main engine, steam boiler, and auxiliary prime mover only) A-III/1.F1.C5.KUP1: Operational characteristics of pumps and piping systems, including control systems A-III/1.F1.C5.KUP2: Operation of routine pumping operations and operation of bilge, ballast and cargo pumping systems A-III/1.F1.C5.KUP3: Oily-water separators (or similar equipment) requirements and operation A-III/2.F1.C2 and C3. KUP 2.1: Start up and shut down main propulsion and auxiliary machinery, including associated system						

Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **AUXILIARY MACHINERY 1**		Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

		A-III/2.F1.C2 and C3. KUP 2.2: Operating limits of propulsion limits A-III/2.F1.C2 and C3. KUP 2.3: The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery. A-III/2.F1.C2 and C3.KUP2.5: Practical knowledge of the functions and mechanism of automatic control cargo-handling equipment and deck machinery A-III/2.F1.C4.KUP1: Operation and maintenance of machinery including pumps and piping systems
Course Outcome	:	CO.1. Operate, maintain and troubleshoot the following auxiliary machineries in accordance with its manufacturer's specification: 1. Various pumps (gear, centrifugal, vane, screw, reciprocating) 2. Air compressor 3. Fresh water generator 4. Heat exchanger 5. Deck machinery such as crane, mooring winch and windlass CO2. Operate ballast and pumping system according to ship's piping system configuration CO3. Operate oily-water separator according to manufacturer's specifications CO4. Troubleshoot the faults on automatic control of cargo-handling equipment and deck machinery such as crane, mooring winch and windlass
Reference/s	:	1. Table A-III/1 and Table A-III/2 Function: Marine Engineering STCW'78 as amended 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **AUXILIARY MACHINERY 2**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Aux Mach 2						
Course Descriptive Title	:	Auxiliary Machinery 2				**Prerequisite**	:	Aux Mach 1
Course Credit	:	5 Units	**Lecture Contact Hours per Week**	:	4 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/1.F1.C4 Operate main and auxiliary machinery and associated control system A-III/2.F1.C2 Plan and schedule operation A-III/2.F1.C3 Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machineries						
KUP	:	A-III/1.F1.C4.KUP1.6: Basic construction and operation principles of machinery systems, such as (.a) purifiers, (.b) refrigeration, (.c)air-conditioning systems and (.d) ventilations system A-III/1.F1.C4.KUP1.7: Basic construction and operation principles of steering gear A-III/1.F1.C4.KUP3.4: Preparation, operation, fault detection and necessary measures to prevent damage of purifiers, refrigeration, air-conditioning and ventilation systems A-III/2.F1.C2 and C3.KUP1.5:Theoretical knowledge of refrigerators and refrigeration cycles A-III/2.F1.C2 and C3.KUP2.5: Practical knowledge of the functions and mechanism of automatic control for (.c) oil purifier, (.d) refrigeration systems and (.f) steering gear systems						
Course Outcome	:	CO1: Operate and troubleshoot purifier systems using manufacturers manual CO2: Operate and troubleshoot refrigeration systems using manufacturers manual CO3: Operate and troubleshoot steering gear systems using manufacturers manual						
Reference/s	:	1. Table A-III/1 F1- Marine engineering at operational level 2. Table A-III/2 F1- Marine engineering at Management level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **MARITIME DRAWING AND DIAGRAMS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Draw						
Course Descriptive Title	:	Maritime Drawing and Diagrams				**Prerequisite**	:	None
Course Credits	:	1 Unit	**Lecture Contact Hours per Week**	:	0 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-III/1.F3.C2: Maintenance and repair of shipboard machinery and equipment						
KUP		A-III/1.F3.C2.KUP6: Interpretation of Machinery Drawings and Handbooks A-III/1.F3.C2.KUP7:The interpretation of piping, hydraulic and pneumatic diagrams						
Course Outcome	:	CO1: Draw sketches of shipboard machinery parts using standard symbols CO2: Interpret engineering drawings in accordance with the machinery manual to identify components that will be requested for maintenance and repair. CO3: Interpret the following E/R piping diagrams a. Seawater cooling system b. Freshwater cooling system c. Fuel oil system d. Lubricating oil system e. Exhaust gas system f. Main engine and Generator engine fuel oil purification system g. General seawater service and ballast system h. Service air system i. Starting air system CO4: Interpret the drawing and symbol of M/E Pneumatic maneuvering system diagram CO5: Interpret the drawing and symbol of Steering Gear Electro-hydraulic system diagram						
Reference/s	:	1. Table A-III/1 Function 3: Maintenance and Repair 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **ENGINEERING MATERIALS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	E Mat						
Course Descriptive Title	:	Engineering Materials				**Prerequisite**	:	None
Course Credit	:	4 Units	**Lecture Contact Hours per Week**	:	4 Hours	**Laboratory Contact Hours per Week**	:	0 Hours
Competence/s	:	A-III/2.F1.C2: Plan and schedule operations A-III/2.F1.C3: Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/1.F3.C1: Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board A-III/1.F3.C2: Maintenance and repair of shipboard machinery and equipment A-III/2.F3.C2: Detect and identify the cause of machinery malfunctions and correct faults Table A-III/1 F3 - Maintenance and repair at the operational level • Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board • Maintenance and repair of shipboard machinery and equipment Table A-III/2 F1 – Marine engineering at the Management level • Plan and schedule operations.						
KUP/s	:	A-III/I.F3.C1.KUP1: Characteristics and limitations of materials used in construction and repair of ships and equipment A-III/I.F3.C1.KUP2: Characteristics and limitations of processes used for fabrications A-III/I.F3.C1.KUP3: Properties and parameters considered in the fabrication and repair of systems and components A-III/2.F1.C2 and C3 KUP1.7:Theoretical knowledge of the technology of materials						

		A-III/1.F3.C2.KUP5: Design characteristics and selection of materials in construction of equipment A-III/2.F3.C2.KUP1.3: Practical knowledge of the non-destructive examination
Course Outcome/s	:	CO1: Differentiate various metal characteristics, properties and limitations CO2: Select appropriate materials conforming to important parameters for fabrication of typical ship-related components
Reference/s	:	1. Table A-III/1 F3 - Maintenance and repair at the operational level 2. Table A-III/2 F1 – Marine engineering at the Management level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **BASIC ELECTRICITY**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Electro 1						
Course Descriptive Title	:	Basic Electricity				**Prerequisite**	:	None
Course Credits	:	4 Units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-III/1.F2.C2: Maintenance and repair of electrical and electronic equipment						
KUP/s		A-III/1.F2.C2.KUP1: Safety requirements for working on shipboard electrical systems including safe isolation of electrical equipment required before personnel are permitted to work on such equipment A-III/1.F2.C2.KUP4: Construction and operation of electrical testing and measuring equipment A-III/1.F2.C2.KUP5.3: Function and performance tests of the following equipment and their configuration on protective devices (such as fuse, no voltage breaker, etc.) A-III/1.F2.C2.KUP6: Interpretation of electrical diagrams						
Course Outcome/s	:	CO1: Use appropriate measuring instruments in determining electrical parameters CO2: Assess the usability of the battery by determining its condition CO3: Solve electrical circuit problems using relevant formula applying circuit analysis CO4: Troubleshoot different basic circuit faults on various applications onboard ships						
Reference/s	:	1. Table A-III/1 Function: Electrical, Electronic and Control Engineering STCW'78 as amended 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **BASIC ELECTRONICS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Electro 2						
Course Descriptive Title	:	Basic Electronics				**Prerequisite**	:	Electro 1
Course Credits	:	3 Units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-III/1.F2.C1: Operate electrical, electronic and control systems A-III/1.F2.C2: Maintenance and repair of electrical and electronic equipment A-III/2.F2.C1: Manage operation of electrical and electronic control equipment A-III/2.F2.C2: Manage troubleshooting restoration of electrical and electronic control equipment to operating condition						
KUP/s		A-III/1 F2.C1.KUP1.2.a: Basic configuration and operation principles of the characteristics of basic electronic circuit elements A-III/2.F2.C1.KUP1: Theoretical knowledge on (.1.b) marine electronics, power electronics and (.1.d) safety devices A-III/1.F2.C2.KUP6: The interpretation of simple electronic diagrams A-III/2 F2.C2.KUP1.1: Practical knowledge on troubleshooting of electrical and electronic control equipment						
Course Outcome/s	:	CO1: Differentiate the construction and principle of operation for various semiconductors used in power electronics CO2: Construct a ladder diagram for a given sequence control circuit CO3: Troubleshoot sequential control and electronic circuit problems using test instruments						
Reference/s	:	1. Table A-III/1 and Table III/2 Function: Electrical, Electronic and Control Engineering STCW'78 as amended 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **MARINE ELECTRICITY AND ELECTRICAL MAINTENANCE**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Electro 3						
Course Descriptive Title	:	Marine Electricity and Electrical Maintenance				**Prerequisite**	:	Electro 1
Course Credit	:	5 Units	**Lecture Contact Hours per Week**	:	3 Hours	**Laboratory Contact Hours per Week**	:	6 Hours
Competence/s	:	A-III/1.F2.C1: Operate electrical, electronic and control systems A-III/1.F2.C2: Maintenance and repair of electrical and electronic equipment A-III/2.F1.C2: Plan and schedule operations A-III/2.F1.C3: Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/2.F2.C1: Manage operation of electrical and electronic control equipment A-III/2.F2.C2: Manage troubleshooting restoration of electrical and electronic control equipment to operating condition						
KUP/s	:	A-III/1.F2.C1.KUP1.1: Basic configuration principles of the following electrical equipment: .1.a generator and distribution systems .1.b preparing, starting, paralleling and changing over generators .1.c electrical motors including starting methodologies .1.d high-voltage installations .1.e sequential control circuits and associated system devices A-III/1.F2.C2.KUP1: Safety requirements for working on shipboard electrical systems, including the safe isolation of electrical equipment required before personnel are permitted to work on such equipment A-III/1.F2.C2.KUP2: Maintenance and repair of electrical system equipment, switchboards, electric motors, generator and DC electrical systems and equipment A-III/1.F2.C2.KUP3: Detection of electric malfunction, location of faults and measures to prevent damage						

		A-III/1.F2.C2.KUP5.3: Function and performance tests of protective devices and their configuration: A-III/2.F2.C1.KUP1.1: Theoretical Knowledge on (.a) marine electrotechnology and (.d) safety devices A-III/2.F2.C1.KUP1.2.b: Design features and system configurations of automatic control equipment and safety devices for generator and distribution system A-III/2.F2.C1.KUP1.3: Design features and system configurations of operational control equipment for electrical motors A-III/2.F2.C1.KUP1.4: Design features of high voltage installations A-III/2.F2.C2.KUP1.1: Practical knowledge on troubleshooting of electrical and electronic control equipment A-III/2.F1.C2 and C3.KUP2.5a: Practical knowledge on the functions and mechanism of automatic control for auxiliary machinery of generator distribution systems
Course Outcome/s	:	CO1: Demonstrate paralleling and changeover of generators according to establish rules and procedures CO2: Wire and Test a direct-on-line (DOL) motor starter using a control circuit CO3: Detect malfunction and rectify fault for a given motor starter CO4: Develop a procedure in the operation of low-voltage electrical equipment and systems in accordance to operating manuals CO5: Develop a safety procedure in the operation of high-voltage installations onboard ships and offshore vessel
Reference/s	:	1. Table A-III/1 F2 - Electrical and Electronic and Control Engineering at the operational level 2. Table A-III/2 F2 – Electrical, Electronic and Control Engineering at the Management Level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **ENGINE ROOM WATCH KEEPING PRINCIPLES 1**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	EWK 1						
Course Descriptive Title	:	Engine Room Watch Keeping Principles 1				**Prerequisite**	:	None
Course Credit	:	3Units	**Lecture Contact Hours per Week**	:	3 Hours	**Laboratory Contact Hours per Week**	:	
Competence/s	:	A-III/1.F1.C1: Maintain a safe engineering watch A-III/1.F1.C3: Use internal communication systems A-III/2.F3.C2: Detect and identify the cause of machinery malfunctions and correct faults A-III/1.F4.C7: Application of leadership and team working skills (model course 1KUP39)						
KUP/s	:	A-III/1.F1.C1.KUP1: Thorough knowledge of principles to be observed in keeping an engineering watch: (.1) duties associated with taking over and accepting a watch (.2) routine duties undertaken during a watch (.3) maintenance of the machinery space logs and significance of the reading taken (.4) duties associated with handing over a watch A-III/1.F1.C1.KUP2: Safety and emergency procedures, change-over of remote/automatic to local control of all systems A-III/1.F1.C1.KUP3: Safety precautions to be observed during a watch and immediate actions to be taken in the event of fire or accident, with particular reference to oil systems A-III/1.F1.C3.KUP1: Operation of all internal communication systems on board A-III/2.F1.C2.KUP1.1: Practical knowledge on detection of machinery malfunction, location of faults and action to prevent damage A-III/1.F4.C7.KUP1.2: Knowledge and ability to apply effective resource management on effective communication on board and ashore						
Course Outcome/s	:	CO1: Demonstrate proper engineering watch CO2: Perform immediate actions taken in the event of fire and other emergency cases						
Reference/s	:	1. Table A-III/1 Function 1: Marine engineering at operational level 2. Chapter VIII, Part 4-2, Part 5-2, Part 5-4 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **ENGINE WATCH KEEPING WITH ENGINE ROOM RESOURCE MANAGEMENT**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	EWK 2						
Course Descriptive Title	:	Engine Watch Keeping with Engine Room Resource Management				**Prerequisite**	:	EWK1 MGT1
Course Credit	:	1 Unit	**Lecture Contact Hours per Week**	:		**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/1.F1.C1: Maintain a safe engineering watch A-III/2.F1.C2: Plan and schedule operations A-III/2.F1.C3: Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/1.F4.C7: Application of leadership and team working skills (model course 1KUP39)						
KUP/s	:	A-III/1.F4.C7.KUP1: Knowledge and ability to apply effective resource management: .1 allocation, assignment and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership, including motivation .5 obtaining and maintaining situational awareness A-III/1.F4.C7.KUP2: Knowledge and ability to apply decision-making techniques: .1 situation and risk management .2 identify and consider generated options .3 selecting course of action .4 evaluation of outcome effectiveness A-III/2.F1.C2 and C3.KUP2.1: Practical knowledge of the start up and shut down main propulsion and auxiliary machinery, including associated systems A-III/2.F1.C2 and C3.KUP2.3: Practical knowledge of the efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **ENGINE WATCH KEEPING WITH ENGINE ROOM RESOURCE MANAGEMENT**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Outcome/s	:	CO1: Perform (conduct, Handover and relief) safe engineering watch that conforms with established procedures and standards on boardship. CO2: Monitor engineering equipment and systems according to manufactures recommendations and maintain records in conformity with the principles to be observed in keeping an engineering watch CO3: Act accordingly with safety precautions during safety and emergency procedures, change over of remote/automatic to local control of all systems CO4: Execute a plan for the operation of the main propulsion plant and machinery in conformance with engine room resource management principles
Reference/s	:	1. Table A-III/1 Function 1: Marine engineering at operational level 2. Table A-III/2 Function 1: Marine engineering at management level 3. Chapter VIII, Part 4-2, Part 5-2, Part 5-4?????? 4. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **INDUSTRIAL CHEMISTRY AND TRIBOLOGY**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	IChem						
Course Descriptive Title	:	Industrial Chemistry and Tribology				**Prerequisite**	:	None
Course Credit	:	3Units	Lecture Contact Hours per Week	:	2 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	AIII/1.F1.C4: Operate main and auxiliary machinery and associated control systems AIII/2.F1.C3: Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery						
KUP/s	:	AIII/1.F1.C4.KUP9: Basic construction and operation principles of machinery systems, including: fluid flow and characteristics of lubrication oil, fuel oil and cooling system AIII/2.F1.C3.KUP6: Physical and chemical properties of lubricants AIII/2.F2.C3.KUP2.3: The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery						
Course Outcome/s	:	CO1: Differentiate the characteristics of a boiler water from an engine cooling water CO2: Differentiate physical and chemical properties of various fuels and lubricants according to their specific applications CO3: Test and analyze a given sample of fuel oil, lubricating oil, boiler water and cooling and recommend treatment to achieve the standard.						
Reference/s	:	1. Industrial Chemistry IMO Model Course 7.04 2. Table A-III/2 F1: Marine Engineering at the management level 3. CMO No. 67, Series of 2017 (PSG for AY 2018-2019)						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **SOFTWARE APPLICATION AND NETWORK SYSTEM USED IN SEAGOING SHIPS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	ICT						
Course Descriptive Title	:	Software Application and Network System Used in Seagoing Ships				**Prerequisite**	:	
Course Credit	:	2 Units	**Lecture Contact Hours per Week**	:	1 hour	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-III/6 F1.C5: Operate computers and computer networks on ships						
KUP	:	A-III/6.F1.C5.KUP1: Understanding of: .1 Main features of data processing .2 construction and use of computer networks on ships .3 bridge-based, engine room-based and computer use						
Course Outcome	:	CO 1. Effectively use computer applications for documents used onboard ship. CO 2. Manage computer networks used onboard ships in terms of modularity and expandability CO 3. Troubleshoot computer as per manufacturer's instructions.						
Reference/s	:	1. STCW 1978, as amended – Table A-III/6 - Specification of minimum standard of competence for electro-technical officers 2. Instrument Engineers Handbook: Process Software and Digital Network, Bela G. Liptak 3. Marine Ship manager Technical Software (any brand)						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **HAND AND MEASURING TOOLS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mach 1						
Course Descriptive Title	:	Hand and Measuring Tools				**Prerequisite**	:	None
Course Credits	:	2 Units	**Lecture Contact Hours per Week**	:	1 hour	**Laboratory Contact Hours per Week**	:	4 hours
Competence/s	:	A-III/1.F3.C1: Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board A-III/1.F3.C2: Maintenance and repair of shipboard machinery and equipment						
KUP/s		A-III/1.F3.C1.KUP5: Safety measures to be taken to ensure safe working environment and for using hand tools, machine tools and measuring instruments A-III/1.F3.C1.KUP6: Use of hand tools, machine tools and measuring instruments A-III/1.F3.C2.KUP4: The use of appropriate specialized tools and measuring instruments						
Course Outcome/s	:	CO1: Apply safety measures in the use of hand tools, machine tools and measuring instruments CO2: Demonstrate the appropriate use of hand tools CO3: Safely Operate power tools. CO4: Demonstrate appropriate use of measuring instruments to ensure precise and accurate measurements in the maintenance, repair and fabrication works onboard ship.						
Reference/s	:	1. Table A-III/1 of the 1978 STCW Code as amended 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **MACHINING TOOLS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mach 2						
Course Descriptive Title	:	Machining Tools				**Prerequisite** **Co-requisite**	: :	None Mach 1
Course Credits	:	2 Units	**Lecture Contact Hours per Week**	:	1 hour	**Laboratory Contact Hours per Week**	:	4 hours
Competence/s	:	A-III/1.F3.C1: Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board						
KUP/s		A-III/1.F3.C1.KUP2: Characteristics and limitations of processes used for fabrication and repair A-III/1 F3.C1.KUP3 Properties and parameters considered in the fabrication and repair of systems and components A-III/1.F3.C1.KUP5: Use of machine tools (late machine, drill press, circular cutter and pipe bender) and measuring instruments A-III/1.F3.C1.KUP6: Use of hand tools, machine tools and measuring instruments						
Course Outcome/s	:	CO1: Apply safety measures in the use of machine tools and measuring instruments CO2: Fabricate metal work pieces using turning, facing and outside threading methods						
Reference/s	:	1. Table A-III/1 of the 1978 STCW Code as amended 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **GAS AND ELECTRIC WELDING**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mach 3						
Course Descriptive Title	:	Gas and Electric Welding				**Prerequisite**	:	Mach 1 E Mat
Course Credit	:	2 Units	**Lecture Contact Hours per Week**	:	1 Hour	**Laboratory Contact Hours per Week**	:	4 Hours
Competence/s	:	A-III/1.F3.C1: Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board						
KUP/s	:	A-III/1.F3.C1.KUP4: Methods for carrying out safe emergency/temporary repairs using electric arc and gas welding equipment A-III/1.F3.C1.KUP5: Safety measures to be taken to ensure a safe working environment for using electric arc and gas welding equipment A-III/1.F3.C1.KUP6: Use of hand tools, machine tools and measuring instruments						
Course Outcome/s	:	CO1: Demonstrate the appropriate use of safety and protective clothing equipment during fabrication and repairs CO2: Perform cutting, joining metals, etc., of typical ship-related components to designated tolerances and sizes using electric arc and gas welding equipment						
Reference/s	:	1. Table A-III/1 F3 – Maintenance and repair at the operational level 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **MAINTENANCE AND REPAIR**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Maint						
Course Descriptive Title	:	Maintenance and Repair				**Prerequisite**	:	Aux Mach 2 PPD PPS PASGT Mach 3
Course Credit	:	3 Units	**Lecture Contact Hours per Week**	:	2 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/2.F1.C2: Plan and schedule operations A-III/1.F3.C1: Appropriate use of hand tools, machine tools and measuring instruments for fabrication and repair on board A-III/1.F3.C2: Maintenance and repair of shipboard machinery and equipment A-III/2.F3.C1: Manage safe and effective maintenance and repair procedure A-III/2.F3.C2: Detect and identify the cause of machinery malfunctions and correct faults A-III/2.F3.C3: Ensure safe working practices A-III/5.F3.C1: Contribute to the operation of equipment and machinery						
KUP	:	A-III/2.F1.C2.KUP1.8: Theoretical knowledge of the naval architecture and ship construction, including damage control A-III/1.F3.C1.KUP4: Methods for carrying out safe emergency/temporary repairs A-III/1.F3.C1.KUP7: Use of various types of sealants and packings A-III/1.F3.C2.KUP1: Safety measures to be taken for repair and maintenance including the safe isolation of shipboard machinery and equipment required before personnel are permitted to work on such machinery or equipment A-III/1.F3.C2.KUP2: Appropriate basic mechanical knowledge and skills A-III/1.F3.C2.KUP3: Maintenance and repair, such as dismantling, adjustment and reassembling of						

		machinery and equipment A-III/2.F3.C1.KUP1: Theoretical knowledge of the marine engineering practice A-III/2.F3.C1.KUP2: Practical knowledge on (.1) manage safe and effective maintenance and repair procedures, (.2) planning maintenance, including statutory and class verifications and (.3) planning repairs A-III/2.F3.C2.KUP1: Practical knowledge on (.1) detection of machinery malfunction, location of faults and action to prevent damage and (.2) inspection and adjustment of equipment and (.3) non-destructive examination A-III/2.F3.C3.KUP1: Practical knowledge of the safe working practices A-III/5.F3.C1.KUP1: Safe operation of equipment of hoists and lifting equipment A-III/5.F3.C1.KUP2: Ability to use and understand basic crane, winch and hoist signals
Course Outcome	:	CO1: Differentiate the various type of maintenance CO2: Develop a planned maintenance system for a specific shipboard machinery based on manufacturers manual CO3: Disassemble and assemble various pumps based on manufacturers manual CO4: Disassemble and assemble a turbo charger of a marine diesel engine based on manufacturers manual CO5: Disassemble and assemble a reciprocating air compressor based on manufacturers manual CO6: Disassemble and assemble a plate type and tube type hear exchanger based on manufacturers manual
Reference/s	:	1. Table A-III/1 Function 3: Maintenance and Repair at the Operational Level 2. Table A-III/2 Function 3: Maintenance and Repair at the Management Level 3. Table A-III/5 Function 1: Marine Engineering at the Support Level 4. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **PROTECTION OF THE MARINE ENVIRONMENT**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mar Env						
Course Descriptive Title	:	Protection of the Marine Environment				**Prerequisite**	:	None
Course Credit	:	3 Units	**Lecture Contact Hours per Week**	:	3 Hours	**Laboratory Contact Hours per Week**	:	0 Hours
Competence/s	:	A-III/1.F4.C1 Ensure compliance with pollution-prevention requirements A-III/2.F4.C2 Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea, security and protection of marine environment						
KUP/s	:	A-III/1.F4.C1.KUP1.1: Knowledge of the precaution to prevent pollution to marine environment A-III/1.F4.C1.KUP1.2: Anti-pollution procedures in all associated equipment A-III/1.F4.C1.KUP1.3: Importance of proactive measures to protect the marine environment A-III/2.F4.C2.KUP1.4 Knowledge of relevant international maritime law embodied in international agreements and conventions						
Course Outcome/s	:	CO1: Evaluate impact of the shipping operations to the environment. CO2: Relate the balance between the 3P's (people, planet and profit) in order to attain sustainable shipping CO3: Apply MARPOL Annex 1-6 legislation to a specific situation by recommending corrective actions						
Reference/s	:	1. Table A-III/1 Function 4: Controlling the Operation of the Ship and care for persons on board at the Operational Level 2. Table A-III/2 Function 1 Marine Engineering at the Management Level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **MARITIME LAW**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mar Law						
Course Descriptive Title	:	Maritime Law				**Prerequisite**	:	None
Course Credits	:	4 units	**Lecture Contact Hours per Week**	:	4 hours	**Laboratory Contact Hours per Week**	:	0 hours
Competence/s	:	A-III/1.F4.C6: Monitor compliance with legislative requirements A-III/2.F4.C2: Monitor and control compliance with legislative measures to ensure safety of life at sea and protection of the marine environment.						
KUP	:	A-III/1.F4.C6.KUP1: Basic working knowledge of the relevant IMO conventions concerning safety of life at sea. A-III/2 F4.C2.KUP1: Knowledge of international maritime law embodied in international agreements and conventions A-III/2 F4.C2.KUP2: Regard shall be paid especially to the following subjects: (.1) certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and their period of validity (.2) responsibilities under the relevant requirements of the International Convention on Load Lines (.3) maritime declarations of health and the requirements of the International Health Regulations (.4) responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo (.5) national legislation for implementing international agreements and conventions						

Course Outcome	:	CO1. Evaluate SOLAS Convention as amended in terms of managing seafarer competency towards loss prevention CO2. Evaluate Maritime Labor Convention of 2006 on how it could improve the working environment of seafarers CO3. Analyze the Load Line Convention of 2006 as amended on how it could improve safety of shipping and prevention of pollution at sea CO4. Apply UNCLOS to the West Philippine Sea (South China Sea) dispute and determine the strength of the Philippine position for its claims CO5. Differentiate the given various IMO conventions vis-a-vis national legislation or regulation in terms of content and coverage or scope
Reference/s	:	1. Table A-II/1 of the 1978 STCW Code as amended Function: Navigation at the operational level 2. Table A-II/2 of the 1978 STCW Code as amended Function: Navigation at the management level 3. Table A-III/1 Function 1: Marine engineering at the operational level 4. Table A-III/2 Function 1: Marine engineering at the management level 5. Maritime Labor Convention 2006 6. United Nations Convention on the Law of the Sea 7. Protection & Indemnity Insurance 8. Safety of Life at Sea (SOLAS) (over view only) 9. International Convention for the Prevention of Pollution from Ships (MARPOL) 10. STCW as amended 11. Admiralty law 12. Maritime Commerce /Shipping Contract/Claims 13. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **LEADERSHIP AND TEAMWORK**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mgmt 1					
Course Descriptive Title	:	Leadership and Teamwork				**Prerequisite**	: None
Course Credits	:	3 Units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	: 0 hours
Competence/s	:	A-III/2.F4.C5: Use of leadership and managerial skill A-III/1.F4.C7: Application of leadership and teamworking skills (model course 1KUP39) A-III/2.F4.C3: Maintain safety and security of the ship's crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems					
KUP/s	:	A-III/2.F4.C5.KUP1: Working knowledge of shipboard personnel management training A-III/2.F4.C5.KUP2: A knowledge of related international maritime conventions and recommendations, and national legislation A-III/2.F4.C5.KUP3: Ability to apply task and workload management including: .1 planning and coordination .2 personnel assignment .3 time and resource constraints .4 prioritization A-III/2.F4.C5.KUP4: Knowledge and ability to apply effective resource management: .1 allocation, assignment, and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experience .4 assertiveness and leadership including motivation .5 obtaining and maintaining situation awareness					

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **LEADERSHIP AND TEAMWORK**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

		A-III/2.F3.C7.KUP5: Knowledge and ability to apply decision-making techniques: .1 situation and risk assessment .2 identify and generate options .3 select course of action .4 evaluation of outcome effectiveness A-III/2.F4.C5.KUP6: Development, implementation, and oversight of standard operating procedures A-III/1.F4.C3.KUP1: Thorough knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea)
Course Outcome/s	:	CO1: Appraise the content and application of ISM Code, STCW '78 as amended and MLC 2006 pertaining to the Personnel Management CO2: Organize and manage a safe and efficient operation of ship at a given scenario thru role play or other forms of simulation.
Reference/s	:	1. Table A-III/1 Function 1: Marine engineering at the operational level 2. Table A-III/2 Function 1: Marine engineering at the management level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **INTEGRATED MANAGEMENT SYSTEM**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mgmt 2						
Course Descriptive Title	:	Integrated Management System				**Prerequisite**	:	None
Course Credit	:	2 Units	**Lecture Contact Hours per Week**	:	2 Hours	**Laboratory Contact Hours per Week**	:	0 Hours
Competence/s	:	A-III/1.F4.C6: Monitor compliance with legislative requirements						
KUP/s	:	A-III/1.F4.C6.KUP1: Basic working knowledge of the relevant IMO conventions concerning safety of life at sea, security and protection of the marine environment						
Course Outcome/s	:	CO1: Relate the provisions of ISM Code to various ship operations CO2: Differentiate the training requirements for seafarers with and without security duties, as required by the provisions of STCW 78, as amended to the ISPS Code CO3: Analyze the provisions of the ISO 9001:2015 in relation to the ISM code in terms to their peculiarities CO4: Explain the importance of the STCW 78, as amended in the attainment of the goal-based ships operations through the deployment of competent seafarers CO5: Analyze the provisions of the ISO 14001:2015 that can help ship operators improve their environmental performance through a more efficient use of resources and reduction of waste CO6: Determine compliance of a given SMS procedure to OHSAS 18001, Occupational Health and Safety Standard provisions to demonstrate due diligence, good governance, low risk and competent management that is committed to health and safety in the workplace CO7: Conduct an impact assessment on a particular ship operation on the safety, security, health, environment and quality (SSHEQ) in relation to the attainment of the IMO mission statement.						
Reference/s	:	1. Table A-III/1 Function 4: Controlling the Operation of the Ship and care for persons on board at the Operational Level 2. Table A-III/2 Function 1 Marine Engineering at the Management Level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **NAVAL ARCHITECTURE**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Nav Arch						
Course Descriptive Title	:	Naval Architecture				**Prerequisite**	:	Co-Req. - Mechanics
Course Credits	:	2 units	**Lecture Contact Hours per Week**	:	2 hours	**Laboratory Contact Hours per Week**	:	0
Competence/s	:	*A-III/1 F4.C7: Application of leadership and teamworking skills **A-II/5 F3.C1: Contribute to the safe operation of deck equipment and machinery A-III/2 F1.C2: Plan and schedule operations A-III/2 F1.C3: Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/1 F4.C2: Maintain seaworthiness of the ship A-III/2 F4.C1: Control trim, stability, and stress A-III/2 F4.C4: Develop emergency and damage control plans and handle emergency situations						
KUP/s	:	A-III/1 F4.C7.KUP1: Working knowledge of shipboard personnel management and training. A-II/5 F3.C1.KUP2.3: Knowledge of the following procedures and ability to use marline spike seamanship skills, including the proper use of knots, splices, and stoppers. A-III/2 F1.C2 and C3.KUP1.8: Theoretical Knowledge on naval architecture and ship construction, including damage control A-III/1 F4. C2.KUP1: Ship stability on (.1) working knowledge and application of stability, trim and stress tables, diagrams, and stress-calculating equipment, (.2) understanding of the fundamentals of watertight integrity, and (.3) understanding of fundamental actions to be taken in the event of loss of intact buoyancy A-III/1 F4.C2.KUP2: The principal structural member of a ship A-III/2 F4.C1.KUP1: Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability A-III/2 F4.C1.KUP2: Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken A-III/2 F4.C1 KUP3: Knowledge of IMO recommendations concerning ship stability A-III/2 F4. C4.KUP1: Ship Construction including damage control						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **NAVAL ARCHITECTURE**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Outcome/s	:	CO1: Describe the functions of each member of a ship's organization CO2: Describe the different types of ship in reference to their design and purpose CO3: Describe ship's measurements and dimensions CO4: Describe the functions of basic ship's structural members CO5: Perform marlinespike seamanship skills in accordance with shipboard instructions and safety standards CO6: Prepare bunkering and oil transfer plans in reference to applicable stability concepts, fundamentals, techniques, and IMO guidelines. CO7: Conduct lining of pipe arrangements of various engine systems with reference to the lay-out, design, position of installed equipment and machineries, and current stability condition of ship. CO8: Prepare contingency plans that will help preserve the stability of the ship and control the extent of damage caused by unwanted events such as loss of intact stability, grounding, or collision.
Reference/s	:	1. Table A-II/5 Function 3: Controlling the operation of the ship and care for persons on board at the support level. 2. Table A-III/1 Function 4: Controlling the operation of the ship and care for persons on board at the operational level. 3. Table A-III/2 Function 1: Marine engineering at the management level 4. Table A-III/2 Function 4: Controlling the operation of the ship and care for persons on board at the management level. 5. CMO No.67 series of 2017: Revised PSG for BS Marine Transportation and BS Marine Engineering Programs NOTE: *A-III/1 F4. C7. Application of leadership and teamworking skills – is included to discuss shipboard organization particularly during shipboard emergencies (Same with BSMT Program).. **A-II/5 F3.C1. Contribute to the safe operation of deck equipment and machinery – is included to address the marlinspike competency (Same with BSMT Program).

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **PROPULSION ANCILLARY SYSTEMS AND GAS TURBINE**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	**PASGT**						
Course Descriptive Title	:	Propulsion Ancillary Systems and Gas Turbine				**Prerequisite**	:	Thermo Aux Mach 1 Mech IChem Auto 1
Course Credit	:	3 Units	**Lecture Contact Hours per Week**	:	2 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/I.F1.C4: Operate main and auxiliary machinery and associated control systematic A-III/2.F1.C1: Manage the operation of propulsion plant machinery A-III/2.F1.C2: Plan and schedule operations A-III/2.F1.C3: Operation surveillance, performance, assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/2.F2.C1: Manage operation of electrical and electronic control equipment						
KUP/s	:	A-III/1.F1.C4.KUP1: Basic construction and operation principles of (.3) marine gas turbine and (.5) shafting installations including propeller A-III/1.F1.C4.KUP2: Safety and emergency procedures for operation of propulsion plant machinery, including control systems A-III/1.F1.C4.KUP3: Preparation, operation, fault detection and necessary measures to prevent damage for (.1) main engine associated auxiliaries, (.3) auxiliary prime movers associated systems A-III/2.F1.C1.KUP1.3: Design features and operative mechanism of marine gas turbine and associated auxiliaries						

		A-III/2.F1.C2 and C3.KUP1.3.c: Theoretical knowledge of the propulsive characteristics of gas turbines, including speed, output and fuel consumption A-III/2.F1.C2 and C3.KUP1.4.c: Heat cycle, thermal efficiency and heat balance of marine gas turbine A-III/2.F1.C2 and C3.KUP2.1: Practical knowledge of startup and shut down of main propulsion and auxiliary machinery including associated systems A-III/2.F1.C2 and C3.KUP2.2: Practical knowledge of the operating limits of gas turbine propulsion plant A-III/2.F1.C2 and C3.KUP2.3: Practical knowledge of the efficient operations, surveillance, performance assessment and maintaining safety of gas turbine propulsion plant and auxiliary machinery A-III/2.F2.C1.KUP1.2.a: Theoretical knowledge of the design features and system configurations of automatic control equipment and safety devices for main engine
Course Outcome/s	:	CO1: Differentiate the construction and the operating principles of the different types of gas turbine CO2: Operate gas turbine and its associated machinery to ensure safety of operations and avoid pollution of marine environment CO3: Compare the construction, design and operating principles of the different types of stern tube seals and propellers based on their applications
Reference/s	:	1. Table A-III/1 Function 1: Marine Engineering at the Operational Level 2. Table A-III/2 Function 1: Marine Engineering at the Management Level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **POWER PLANT DIESEL**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	PPD						
Course Descriptive Title	:	Power Plant Diesel				**Prerequisite**	:	Thermo Aux Mach 1 Mech IChem Auto 1
Course Credit	:	5 Units	**Lecture Contact Hours per Week**	:	4 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/1.F1.C4: Operate main and auxiliary machinery and associated control systematic A-III/2.F1.C1: Manage the operation of propulsion plant machinery A-III/2.F1.C2: Plant and schedule operations A-III/2.F1.C3: Operation surveillance, performance, assessment and maintaining safety of propulsion plant and auxiliary machinery A-III/2.F2.C1: Manage operation of electrical and electronic control equipment Table A-III/1 Function 1: Marine Engineering at the operational level • Operate main and auxiliary machinery and associated control systems Table A-III/2 Function 1: Marine Engineering at the management level • Manage the operation of propulsion plant (ML) • Plan and schedule operations (theoretical knowledge)						

KUP/s	:	A-III/1.F1.C4.KUP1.1: Basic construction and operation principles of marine diesel engine A-III/1.F1.C4.KUP2: Safety and emergency procedures, for operation of propulsion plant machinery, including control systems A-III/1.F1.C4.KUP3: Preparation, operation, fault detection and necessary measures to prevent damage of (.1) main diesel engine and associated auxiliaries and (.3) auxiliary prime movers and associated systems A-III/2.F1.C1.KUP1.1: Design features and operative mechanism of marine diesel engines and associated auxiliaries A-III/2.F1.C2 and C3.KUP1.3.a: Theoretical knowledge on the propulsive characteristics of diesel engine including speed, output and fuel consumption A-III/2.F1.C2 and C3.KUP1.4.a: Theoretical knowledge on heat cycle, thermal efficiency and heat balance of marine diesel engine A-III/2.F1.C2 and C3.KUP2.1: Practical knowledge on start up and shut down main propulsion and auxiliary machinery including associated system A-III/2.F1.C2 and C3.KUP2.2: Practical knowledge on operating limits of diesel propulsion plant A-III/2.F1.C2 and C3.KUP2.3: Practical knowledge on the efficient operations, surveillance, performance assessment and maintaining safety of diesel propulsion plant and auxiliary machinery A-III/2.F2.C1.KUP2.2.a: Design features and system configurations of automatic control equipment and safety devices for main engine
Course Outcome/s	:	CO1: Differentiate the construction and the operating principles of two-stroke from four-stroke marine diesel engines CO2: Prepare and operate the main engine and associated auxiliaries for ship departure from port in accordance with the established rules and procedures to ensure safety of operations and avoid pollution of marine environment CO3: Monitor and record engine performance including fault detection and actions to be taken during operations that consistently meets the requirement
Reference/s	:	1. Table A-III/1 Function 1: Marine Engineering at the operational level 2. Table A-III/2 Function 1: Marine Engineering at the management level 3. Annex A of CMO No. 67, S. 2017: Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **POWER PLANT STEAM**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	PPS						
Course Descriptive Title	:	Power Plant Steam				**Prerequisite**	:	Thermo Aux Mach 1 Mech IChem Auto 1
Course Credit	:	6 Units	**Lecture Contact Hours per Week**	:	5 Hours	**Laboratory Contact Hours per Week**	:	3 Hours
Competence/s	:	A-III/1.F1.C4: Operate main and auxiliary machinery and associated control systematic A-III/2.F1.C1: Manage the operation of propulsion plant machinery A-III/2.F1.C2: Plant and schedule operations A-III/2.F1.C3: Operation surveillance, performance, assessment and maintaining safety of propulsion plant and auxiliary machinery A-IIi/2.F2.C1: Manage operation of electrical and electronic control equipment Table A-III/1 Function 1: Marine engineering at the operational level • Operate main and auxiliary machinery and associated control systems Table A-III/2 Function 1: Marine engineering at the management level • Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery at the Management Level (ML) • Manage the operation of propulsion plant machinery at the Management Level (ML) • Plan and schedule operations at the Management Level (ML)						
KUP	:	A-III/1.F1.C4.KUP1: Basic construction and operation principles of (.4) marine steam boiler and (.2) steam turbine A-III/1.F1.C4.KUP2: Safety and emergency procedures, cooperation of propulsion plant machinery, including control systems						

		A-III/1.F1.C4.KUP3: Preparation, operation, fault detection and necessary measures to prevent damage for (.2) main steam boiler, steam turbine and associated auxiliaries, (.3) auxiliary prime movers and associated systems A-III/2.F1.C1.KUP1: Design features and operative mechanism of (.4) marine steam boiler, (.2) steam turbine and associated auxiliaries A-III/2.F1.C2 and C3.KUP1.3.b: Theoretical knowledge on propulsive characteristics of steam boiler including pressure, temperature output and fuel consumption A-III/2.F1.C2 and C3.KUP1.4: Theoretical knowledge on heat cycle, thermal efficiency and heat balance of (.b) marine steam boiler and (.d) steam turbine A-III/2.F1.C2 and C3.KUP2.1: Practical knowledge on startup and shut down main propulsion and auxiliary machinery including associated system A-III/2.F1.C2 and C3.KUP2.2: Practical knowledge on operating limits of steam boiler and steam turbine propulsion plant A-III/2.F1.C2 and C3.KUP2.3: Practical knowledge on the efficient operations, surveillance, performance assessment and maintaining safety of steam boiler and steam turbine propulsion plant and auxiliary machinery A-III/2.F1.C3.KUP2.5b: Practical knowledge on the functions and mechanism of automatic control for auxiliary machinery including steam boilers A-III/2.F2.C1.KUP2.2.c: Practical knowledge on the design features and system configurations of automatic control equipment and safety devices for steam boiler
Course Outcome	:	CO1: Differentiate the construction and the operating principles of water tube from a fire tube marine boiler CO2: Differentiate the construction and the operating principles of the different types of steam turbine CO3: Safely operate (from cold condition) the steam boiler and associated auxiliaries in accordance with the established rules and procedures to ensure safety of operations and avoid pollution of marine environment CO4: Monitor and record operation of steam propulsion plant performance and analyze conditions CO5: Apply the analysis in fault detection and initiate actions to be taken during operations that consistently meets the requirement

Reference/s	:	1. Table A-III/1 Function 1: Marine engineering at the operational level 2. Table A-III/2 Function 1: Marine engineering at the management level 3. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **MECHANICS AND HYDROMECHANICS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Mech						
Course Descriptive Title	:	Mechanics and Hydromechanics				**Prerequisite**	:	None
Course Credits	:	3 Units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	0 hour
Competence/s	:	A-III/2.F1.C2: Plan and schedule operations A-III/2.F1.C3: Manage the Operation, Surveillance, Performance Assessment and Maintaining Safety of Propulsion Plant and Auxiliary Machinery A-III/2.F2.C1: Manage operation of electrical and electronic control equipment						
KUP/s		A-III/2.F1.C2 and C3.KUP1.2: Theoretical knowledge on mechanics and hydromechanics A-III/2.F2.C1.KUP1.5: Theoretical knowledge on features of hydraulic and pneumatic control equipment A-III/2.F1.C2.KUP2.4: Practical knowledge of the functions and mechanism of automatic control for main engine (pneumatic and hydraulic system controllers) A-III/2.F2.C1.KUP1.5: Theoretical knowledge on features of hydraulic and pneumatic control equipment						
Course Outcome/s	:	CO1. Solve shipboard problems involving mechanics and hydromechanics						
Reference/s	:	1. Table A-III/2 Function: Marine Engineering 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering COURSE SPECIFICATIONS **THERMODYNAMICS**	Annex C of CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

Course Code	:	Thermo						
Course Descriptive Title	:	Thermodynamics				**Prerequisite**	:	None
Course Credits	:	4 Units	**Lecture Contact Hours per Week**	:	3 hours	**Laboratory Contact Hours per Week**	:	3 hours
Competence/s	:	A-III/2.F1.C2: Plan and schedule operations A-III/2 F1.C3: Manage the Operation, Surveillance, Performance Assessment and Maintaining Safety of Propulsion Plant and Auxiliary Machinery						
KUP		A-III/2.F1.C2 and C3.KUP1.1: Theoretical knowledge on thermodynamics and Heat Transmission A-III/2.F1.C2 and C3.KUP1.3: Theoretical knowledge on propulsive characteristics of: .3.a diesel engines including speed, output and fuel consumption .3.b steam boiler including pressure and temperature output and fuel consumption .3.c gas turbines including speed, output and fuel consumption A-III/2.F1.C2 and C3.KUP1.4: Theoretical knowledge on Heat cycle, thermal efficiency and heat balance of the following: .4.a marine diesel engine .4.b marine steam turbine .4.c marine gas turbine .4.d marine steam boiler A-III/2.F1.C2 and C3.KUP1.5:Refrigerators and refrigeration cycle					
Course Outcome	:	CO1: Solve the heat balance in the engine room CO2: Explain how heat affects the performance of the following machineries: a. Main engine b. Marine boiler c. Steam turbine d. Gas turbine e. Refrigeration system						
Reference/s	:	1. Table A-III/2 Function 1: Marine Engineering at management level 2. Annex A of CMO No. 67, S. 2017 : Revised PSG for BSMT and BSMarE Programs						

	Bachelor of Science in Marine Engineering **Minimum Required Equipment**	**Annex D** CMO No. 67, S. 2017 Revision No: 00 Revision Date: 00

RECOMMENDED MINIMUM EQUIPMENT, MATERIALS, CHEMICALS AND TEACHING AIDS GOVERNING THE OPERATION OF THE BACHELOR OF SCIENCE IN MARINE ENGINEERING PROGRAM. HOWEVER, THE EXACT NUMBER SHOULD CONFORM TO THE CARRYING CAPACITY OF THE INSTITUTION. THE TASK MAINTENANCE REPAIR COLUMN ARE USED FOR HANDS ON EXERCIS ES AND FAMILIARIZATION OF EQUIPMENT, WHEREAS THE SYSTEM INTEGRATION, OPERATION AND FAULT FINDING COLUMN ARE EQUIPMENT NECESSARY TO ADDRESS THE DEFINED INTENDED LEARNING OUTCOMES OF COURSES.

Course	Task Maintenance and Repair		System Integration, Operation and Fault Finding
	Key Area Equipment	Quantity Required	
1. Mach 1 Mach 2 Mach 3	Mechanical Workshop		
	1.1. Work benches fitted with vise on each end	6 sets	
	1.2. Gas welding equipment accessories and PPE	6 sets 1 torch /cubicle	
	1.3. Electric, arc welding equipment, accessories and PPE	6 sets 1 machine /cubicle	
	1.4. Pedestal grinder	3 units	
	1.5. drilling machine (approx. 35 mm min. Diameter drill capacity)	3 units	
	1.6. Electric power hand drill with at least 10 mm diameter drilling capacity	6 units	
	1.7. Electric power hand grinder/cutter	4 units	
	1.8. Metal cutting shear (snip)	6 sets	
	1.9. Anvil	6 pcs	
	1.10. Inside and outside steel vernier caliper	6 pcs	
	1.11. Inside and outside micrometers	6 pcs	
	1.12. Depth gauge caliper	6 pcs	
	1.13. Dial micrometer with magnetic base	4 sets	
	1.14. Steel ruler	6 pcs	
	1.15. Flat Chisel	12 pcs	
	1.16. Cross-out chisel	12 pcs	
	1.17. Diamond point chisel	12 pcs	
	1.18. Round nose chisel	12 pcs	

Course	Task Maintenance and Repair		System Integration, Operation and Fault Finding
	Key Area Equipment	Quantity Required	
	1.19. Center punch, 60 mm	12 pcs	
	1.20. Center punch, 90mm	12 pcs	
	1.21. Hacksaw	6 pcs	
	1.22. Tap and dies	6 pcs	
	1.23. Die nuts	6 pcs	
	1.24. Wrench, socket type, 10mm to 24mm	6 sets	
	1.25. Wrench, open type (metric), 10 mm to 24mm	6 sets	
	1.26. Combination Wrench, open-close type (metric), 10 mm to 24mm	6 sets	
	1.27. Double-cut rough files	12 pcs	
	1.28. Second-cut smooth files	12 pcs	
	1.29. Single-cut smooth files	12 pcs	
	1.30. Second cut files	12 pcs	
	1.31. Machinist's combination set	12 pcs	
	1.32. Try square (steel)	12 pcs	
	1.33. Protractor (steel)	12 pcs	
	1.34. Dividers (steel)	12 pcs	
	1.35. Sledge hammer (various sizes, steel/wooden)	6 pcs	
	1.36. Ball peen hammer	12 pcs	
	1.37. Straight peen hammer (various sizes)	12 pcs	
	1.38. Tongs (various sizes)	12 pcs	
	1.39. Pliers, mechanical (various sizes)	12 pcs	
	1.40. Screw driver, Philips, various sizes	12 pcs	
	1.41. Screw driver, flat, various sizes	12 pcs	
	1.42. Vise grip	6 pcs	
	1.43. Feeler gauge (metric/inches)	6 pcs	
	1.44. Pitch gauge	6 pcs	
	1.45. Drill bit, 13-25 mm, tapered shank	6 pcs	
	1.46. Drill bit, 15-30 mm, cylinder shank	3 pcs	
	1.47. Drift punch	6 pcs	
	1.48. Lockers for storing personal belongings		
	1.49. Washing facility		

Course	Task Maintenance and Repair		System Integration, Operation and Fault Finding
	Key Area Equipment	Quantity Required	
	1.50. Scrap disposal containers	1 in workshop area	
	1.51. 150 mm swing lathe machine with accessories	6 sets	
	1.52. Shaper (350mm travel) with accessories	1 set	
	1.53. Milling machine (horizontal, vertical or universal) with cutting tools and accessories	1 set	
	1.74. Hydraulic pipe bender with accessories	1 set	
	1.75. Pipe wrench various sizes	2 sets	
	1.76. Grease gun	2 sets	
	1.77. Oil applicator	2 sets	
	1.78. Wire gauge	2 sets	
	1.79. Surface gauge	2 sets	
	1.80. Blow torch	2 sets	
	1.81. Reamer handset, assorted	2 sets	
	1.82. Torque wrench	2 sets	
	1.83. Pipe cutter and threading tools	2 sets	
2. Marine Diesel	Marine Diesel engine-complete for dismantling with the following components: • Cylinder liner • Fuel valve/injector • Cylinder relief valve • Air-starting valve/starting mechanism (not all have ASV) • Crankcase relief valve • Jerk fuel valve pump • Cylinder head • Turbocharger • Bearing shells • Piston and connecting rod • Engine governor • Starting system • Fuel and lube oil filters	1 set	Marine Diesel Engine (operational) with auxiliaries or ERS Category 3.
3. Auxiliary Machinery	3.1. Reciprocating displacement pump	1 set	All items in item 3 should be operational or an ERS Category 3 that can be used for the student to learn and

Course	Task Maintenance and Repair		System Integration, Operation and Fault Finding
	Key Area Equipment	Quantity Required	
			demonstrate its operation
	3.2. Gear pump	1 set	
	3.3. Rotary vane pump	1 set	
	3.4. Screw displacement pump	1 set	
	3.5. Centrifugal pump	1 set	
	3.6. Reciprocating air driven pump	1 set	
	3.7. Other parts/components: • Gland • Mechanical Seal • Drain Cock • globe valve • gate valve • relief valve • quick closing valve • change-over valve chest • mud box (strainer) • steam trap • shell and tube cooler • plate-type cooler	1 set each	
	3.8. Reciprocating air compressor (2 stage or higher) with the following components • Cylinder cover • Piston • relief valve • fusible plug • suction and delivering valve • water-space safety valve • bursting disc	1 set	
	3.9. Centrifugal separator/Purifier	1 set	
4. Power Plant 2 – Steam Plant	4.1. Boiler for demonstration only	1 set	Operational Boiler or ERS Category 3
	4.2. Boiler water test kit	1 set	
	4.3. Boiler safety valves (for dismantling)	1 set	
5. Refrigeration	5.1 Marine Refrigeration with main components	1 set	Working model or training module to demonstrate the refrigeration processes and operation

Course	Task Maintenance and Repair		System Integration, Operation and Fault Finding
	Key Area Equipment	Quantity Required	
	5.2. Expansion Valves	4 sets	
	5.3. Open Type Refrigerating Compressor (Complete)	1 set	
	5.4. Oil Separator	1 set	
	5.5. Thermostat	4 sets	
	5.6. Pressure switch	5 sets	
	5.7. Vacuum pump with service manifold (Gas Analyzer)	1 set	
6. Electro-technology	6.1. Test Measuring Instruments	5 of each	1.Electrical Training Module for AC circuits - can simulate faults for troubleshooting 2.Electronic Training Module - can connect circuits for diodes, transistors, thyristors and other semiconductor components 3.Motor Control Module - can connect 3-phase ac direct-on-line, reversible and wye-delta motor starters - can produce or insert faults for troubleshooting 4.Operational 3 phase alternator with synchronizing equipment of main switch-board or ERS Category 3
	a. Digital Multi-tester	5 set	
	b. Analog Multi-tester	5 set	
	c. Insulation Tester	5 set	
	d. Analog Clamp Meter	5 set	
	e. Digital Clamp Meter	5 set	
	f. Live Line Tester	5 set	

Course	Task Maintenance and Repair		System Integration, Operation and Fault Finding
	Key Area Equipment	Quantity Required	
7. Automation	7.1 Sample of sensors and other instruments as defined in the curriculum		Process Simulator that contains process to be controlled, process transmitter/ sensor, controller (PID, PI, PD), correcting elements/ final control elements
	7.2. Differential Pressure Switch	1 set	
	7.3. Pressostat	1 set	
	7.4. Thermistor	1 pc	
	7.5. Thermocouple	1 pc	
	7.6. 100Ω Resistance Bulb	1 pc	
	7.7. U-Tube Manometer	1 pc	
	7.8. Transmitters (Pneumatic & Electric)	1 set each	

Classification of Machinery Simulators

Category 1	Full Mission Simulator	A full mission simulator capable of simulating all machinery operations in engine control room and machinery spaces, by the use of operational panels in machinery spaces.
Category 2	Multi Task Simulator	A multi task simulator capable of simulating several machinery operations in engine control room and machinery spaces, but with limited use of operational panels in machinery spaces.
Category 3	Limited Task Simulator	A limited task simulator capable of simulating some machinery operations in engine control room for procedural training.
Category 4	Special Task Simulator	A special task simulator capable of simulating operation and/or maintenance of particular machinery equipment, and/or defined engineering scenarios.

Competencies addressed by the Engine Room Simulator

STCW Reference	Competence	Category			
		1	2	3	4
Table A-III/1.1	Maintain safe engineering watch	✓	✓		✓
Table A-III/1.3	Use internal communications systems	✓	✓		✓
Table A-III/1.4	Operate main and auxiliary machinery and associated controls	✓	✓	✓	✓
Table A-III/1.5	Operate fuel, lubrication, ballast and other pumping systems and associated control systems	✓	✓	✓	✓
Table A-III/1.6	Operate electrical, electronic and control systems	✓	✓	✓	✓
Table A-III/1.7	Maintenance and repair of electrical and electronic equipment				✓
Table A-III/1.11	Maintain seaworthiness of the ship	✓	✓		✓

NOTE:

"The listed equipment is minimal for reference of MHEI's. Additional equipment is required based on the Course Specifications of the courses included in the BSMarE program. MHEI's are required to demonstrate how Course Outcomes are evaluated and assessed."