## Annex A Curriculum Mapping - Bachelor of Science in Marine Transportation (BSMT) Third year: Total number of teaching hours 1008. Average number of contact hours 31.5 per week REVISED CURRICULUM MAP BACHELOR OF SCIENCE IN MARINE TRANSPORTATION BASED ON THE STCW'78 CONVENTION INCLUDING THE 2010 MANILA AMENDMENTS Function 1 Navigation at the operational level 1 Plan and conduct a passage 1.1.1 Celestial navigation Ability 60 and determine position to use celestial bodies to determine the ship's position 1.1.2 Terrestrial and coastal navigation 214 140 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 Thorough knowledge of and the ability to use nautical charts and publications, such as sailing directions, tide tables, notices to mariners, radio navigational warnings and ship's routeing information Electronic systems of position fixing and navigation 30 Ability to determine the ship's position by use of electronic navigational alds 1.1.4 Echo-sounders to operate the equipment and apply the information correctly 1.1.5 Compass - magnetic and gyro 38 38 Knowledge of the principles of magnetic and gyro-compasses Ability to determine errors of the magnetic and gyro-compasses, using celestial and terrestrial means, and to allow for such errors Steering and control systems Knowledge of steering control systems, operational procedures and change-over from manual to automatic control and vice versa. Adjustment of controls for optimum performance 1.1.7 Meteorology Ability to use and interpret information obtained from shipborne meteorological instruments Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems Ability to apply the meteorological information available



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2	Maintain a safe navigational		Watchkeeping								į					1 1	i	1									1
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		1.2.1	Thorough knowledge of the content, application and intent of the	100	)						-	100										ļ		1			[
			International Regulations for Preventing Collisions at Sea, 1972, as								-				1					1							
			amended				ļ																				ĺ
		1.2.2	Thorough knowledge of the Principles to be observed in keeping a	6																6							
		<u> </u>	navigational watch																								İ
		1.2.4	The use of routeing in accordance with the General Provisions on	4		7												1	T	4			4	1	$\Box$		
			Ship's Routeing			1									1							- 1		1	1	,	ĺ
1		1.2.5	The use of information from navigational equipment for maintaining a	18	1		1	l			_		i		<del> </del>	1			_	18		- -	+-		$\vdash$		<del></del>
			safe navigational watch							İ											Ì						ĺ
-		1.2.6	Knowledge of blind pilotage techniques	2	<del> </del>		<del> </del>			$\dashv$	<del></del>	<del>                                     </del>	<del>  -</del>							2				+	$\vdash$		
-		1.2.7	The use of reporting in accordance with the general principles for a	2	-	<del></del>					_	<del> </del>			_	$\vdash$				2			+	+	<del>                                     </del>		<del> </del>
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		1.2.3	Bridge resource management	8	<b></b>															8	_			/			Ĺ
			Knowledge of the bridge resource management principles																						I		
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2	Use of RADAR and ARPA to		Radar navigation Basic		1		1		+			1			_	1-1		_				12	┥~				
10000000	maintain safety of	1,3.1	Theory and Operation of a Marine Radar System	12		İ				1	ļ				1		j								,		į
1000 (A)	navigation	1	Theory and operation of a market hadar system	**					ļ		į															-	i
	(model course 1.07)	1.3.2	Set Up and Operate Radar in Accordance with Manufacturer's	8	-	<del> </del>	+-+	+			+-					1	$\dashv$					8		+			
	(Injuder Codise 1.07)		Perform Manual Radar Plotting	11			+			<del></del>		1				┼──┤						11	<del></del>		+		
<del> </del>		<del></del>	Use Radar to Ensure Safe Navigation	5			1-1					-										5.		+			
<del></del>			Use Radar to avoid Collisions or Close Encounters	6		_	1-1		$\dashv$			1				1						6		+			
			Describe an ARPA System	4			++				+	1			$\dashv$	1					-	4		++			
			Operate an ARPA System	20	<u> </u>							-				╅━━━┪						20					
		2.0.7	Operate are Are A System	2.0			+-+					+				┪━━┪	-					20		+			
	Jse of ECDIS to maintain		Navigation using ECDIS		<del> </del>		1		$\dashv$		<del></del>	1	-		<del></del>	<del> </del>								+	-		
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			Watchkeeping with ECDIS	9								+-+			-	╅					9		+-				
			ECDIS Route Planning and Monitoring	9	<u></u>	<del> </del> -	$\vdash$					+		_		┼┈┤		-			9		<del> </del>	+			
			ECDIS Targets, Charts & System	7		-			-			1	-+			<del>  </del>					7			+-+			
			ECDIS Responsibility & Assessment	6			1			-		1				1								+-+			
		1.4.2	CCD13 Nessponsibility & Assessment			+		-+				<del>  </del>									-		+	+	-+		
5	Respond to emergencies		Emergency procedures		<del> </del>	+	<del>  </del>					<del>  </del>			_	┼┤	$\dashv$	$\dashv$						+			
			Precautions for protection and safety of passengers	و	Ì										1		9						l				
S00000000			Initial action following collision or grounding	5			1					11	- 1			1	5	$\vdash$						1-1			
			Rescuing persons from the sea, assisting a ship in distress and port	4		╅	<del>                                     </del>					<del>                                     </del>			+	+-+	Δ		_	<del></del>				+			
			emergencies	*						1					ļ		7					1					
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6 R	espond to a distress signal	161	Search and rescue			<del> </del>	<del>  </del>				+-	┼┼				+-+	-+-	$\dashv$					+	+	-+	$\rightarrow$	
	t sea		Knowledge of the contents of the International Aeronautical and	ا ہ							I	1					l	4							İ	İ	
ď		3	maritime Search and Rescue (IAMSAR) Manual	7					Ì									1			1					- 1	
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8 Transmit and receive	1.8.1	Visual signalling	1	Ī	. 1									1		1		1	l		1		-	
information by visual		Transmit and receive signals by morse light									<u> </u>													
	1.8.2	Use the international code of signals	10													10								
																					<u> </u>			
99 Manoeuve the ship	1.9.1	Ship manoeuvering and handling			<del>  -</del>		4		_ _								_							
		Turning circles and stopping distances	4											11	4									
		Effect of wind and current on ship handling	2				_								2									
		Manoeuvres for rescue of person overboard	2			[								11	2									
		Squat, shallow water and similar effects	3												3						1			
	1.9.1.5	Proper procedures for anchoring and mooring	4								<u> </u>	-	<del> </del>		4							1		
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Plan a voyage and condu- navigation	1.1.1	Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks		38								_	ļ							38	3			
2 Determine position and	1 7 1	Position determination in all conditions:								-	<u></u>		+		+						<del> </del>			
accuracy of resultant position fix by any mean		Position determination in an conditions:	***************************************	emily contained and							and the same of th					***************************************								
		Terrestrial observations, including the ability to use appropriate charts,		16		-	+	$\dashv$	_		<del></del>		1		<u> </u>	$\neg +$				16	-	$\vdash$	<del></del>	
		notices to mariners and other publications to assess the accuracy of the resulting fix									***			1										
	1.2.1.3	Modern electronic navigational aids with specific knowledge of their		20					_	1		_	<del> </del>		—t-					20	<del>d</del>	<del>                                     </del>		
	777.2	operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing										- Andrews or all combined on the commence project place place project place pl												
												1						1						
8 Forecast weather and oceanographic condition	5	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		24																		24		
	1.8.2	Knowledge of the characteristics of various weather systems, including tropical revolving storms and avoidance of storm centres and the dangerous quadrants		14												Andrew Company of the						14		
	1.8.3	Knowledge of ocean current systems		7																		7		
		Ability to calculate tidal conditions		6															T			6		
	1.8.5	Use all appropriate nautical publications on tides and currents		3																		3		
11 Operate remote controls prophision plant and engineering systems and services.	of_ 1.111	Operating principles of marine power plants		25							The state of the s		**************************************				ander of the control						25	
	1.11.2	Ships' auxiliary machinery		25		1				1 1			1					$\neg \vdash$		1			25	
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	1.11.3	General knowledge of marine engineering terms	1	8	•	l		1		1 1		1	1		- 1		1		1	1	1 1		8	F



Contribute to berthing, A-II/5 anchoring and other	Working knowledge of the mooring system and related procedures	6			6															
mooring operations A-II/5	Working knowledge of the procedures and other events associated with mooring to a buoy or buoys																			
Contribute to the safe A-II/5	Knowledge of deck equipment	6		 	6	_								<u> </u>		<b> </b>				-
	Knowledge of the following procedures and ability to:						***************************************						ł							
equipment and machinery	Rig and unrig bosun's chairs and staging	2			2									1						7
	Rig and unrig pilot ladders, hoists, rat-guards and gangways	2			2	1		1		1					_	1	1			ㅓ
	Use mariin spike seamanship skills, including the proper use of knots, splices and stoppers	12			12															
Contribute to shipboard A-II/5 maintenance and repair	Ability to carry out shipboard maintenance and repair (use painting, lubrication and cleaning materials an equipment)	6			6				And the state of t											
Apply occupational health and safety precautions.  A-II/5	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				xx							te de de la companya de la companya de la companya de la companya de la companya de la companya de la companya								
	Total	831	186																	
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	IOSLOWA	ge si the operational level:  Cargo handling, stowage and securing				-					<del>  -</del>		+-+	-+		<del> </del>	<del> </del>							
1 Monitor the loading,	2.1.1	Knowledge of the effect of cargo, including heavy lifts, on the																						
stowage, securing, care		seaworthiness and stability of the ship										1									Ì			
during the voyage and the		seaworthiness and stability of the ship										l												
unloading of cargoes	7111	Draught, trim and stability	10				╁─┼				╂		+	10	<del>-  </del>	<del>                                     </del>	<del> </del>						-	
		Securing cargoes	1 6		+		╂			-	╂╼╌┼		+	- 10			<del> </del>							
<del>                                     </del>		Deck cargoes	1 4		+		1				+-+		+	4		<del></del>	<del> </del>			-		<del></del>	┼──┤	
		Container cargo	1 2		+-		╁──╁			+	╂──┼		++	2		+	<del></del> -				+		-	
		Bulk cargo (other than grain)					<del>                                     </del>		-	+	+		+-+	3		+	<del> </del>						┼┤	
		Bulk grain cargo	1 - 2		+		++				<del>  -</del>		+	- 3		+-	+						╂─┤	
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	743	Knowledge of safe handling, stowage and securing of cargoes,	╂	╁	+-		+-+			+	+-+		+-+			<del></del>	<del> </del> -						├	
		including dangerous, hazardous and harmful cargoes, and their effect	l		l	Ì	1 1	Î			ł [	į		İ	l									İ
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<u> </u>		Cargo care	<u>                                     </u>				ļ				╂		+		8	+							├	
		Dangerous, hazardous and harmful cargoes	7				<del>  </del>			+	┼┼-				- <u>8 </u>	1			<del></del> -∔				<del>  </del>	
		Cargo-handling equipment and safety			+		1	-+		+	<del>!                                    </del>		┪		-{								<del>  </del>	
		Oil tanker piping and pumping arrangements		4			<del></del>				╂		<del> </del>		2	+							<del>                                     </del>	
		Precautions before entering enclosed or contaminated spaces	2	1			++			-	┨──┤		+		-{	┽	+							
<del></del>	2.1.2.5	Cargo calculations and cargo plans	5		-		1 1			+	1		1	_	->	+-	<del> </del>							
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2 Inspect and report defects	2.2.1.1	Cargo space Inspection	3	1			1	ŀ						3					-			1		
and damage to cargo										İ				-			1	ĺ		1				
spaces, hatch covers and				İ				ļ																
ballast tanks			<u> </u>	ļ			<b> </b>			ـــــــ	$\bot$		44			ऻ					_			
		Hatch covers inspection	3		<u> </u>						<b>├</b>		<b>↓</b>	3										
		Ballast tanks inspection	3											3		<u> </u>	ļ							
		Damage report	3	4			1						4	3		<del> </del>								
	2.2.1.5	Enhanced survey programme	3	<b></b>										3	1									
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1 Plan and ensure sale	2.1.6	General knowledge of tankers and tanker operations		16	5				•			1			16	1		.	1					
loading, stowage, securing,									****						1		1		-			-		
care during the voyage and				1	-				1						-				-	***************************************		***************************************		
unicading cargoes			<u> </u>										4			1								
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3 Carriage of dangerous goods	2.3.1	International regulations, standards, codes and recommendations on		3	3									1	3					1				
		carriage of dangerous goods		<u> </u>		<u></u>					11_													
		Carriage of dangerous, hazardous and harmful cargoes, precautions		26	5			Ţ							26									
		during loading and unloading and care during the voyage		<u> </u>		<u></u>												]	<u> </u>					
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			e operati	on of the ship and care for persons on board at the operational level						-				-						+-							
1		mpliance with prevention		Prevention of pollution of the marine environment and anti-pollution procedures																							
			3.1.1	Knowledge of the precautions to be taken to prevent pollution of the marine environment	18	3						18						***************************************									
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2	Maintain	seaworthiness o	f 3.2.1	Ship stability	44	1			44										1	+	<del> </del>			$\dashv$	-	+	
		T	3.2.1	1 Working knowledge and application of stability, trim and stress tables,																							
				diagrams and stress-calculating equipment					]																		
			3.2.1	2 Understanding of fundamental actions to be taken in the event of					Τ											T							
				partial loss of intact buoyancy							1												l	- 1			
-		i i	3.2.1.	3 Understanding of the fundamentals of watertight integrity		7								$\sqcap$		T		7	1	T	1						
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		1	3.2.2	Ship construction	63			63		11			1						7	T	1		$\neg \uparrow$			_	
			3.2.2.	1 General knowledge of the principal structural members of a ship and	1												$\neg \vdash$			7	<u> </u>						
				the proper names for the various parts	ļ						-					_		-			<del> </del>						
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3	Prevent, c fires on bo	ontrol and fight pard		Fire prevention and fire-fighting appliances																							
	(model co	urse 2.03)																									
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4	Operate li appliances	The second secon		Life-saving																							
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6		ompliance with	3.6.1	Basic working knowledge of the relevant IMO conventions concerning	33	1 1							33	33		Ì	1							1			
	egislative	requirements		safety of life at sea, security and protection of the marine environment									ĺ			İ							1				
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		of leadership orking skills	3.7.1	Working knowledge of shipboard personnel management and training	40			20											40	}							
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79.6688.67	model cou	ırse 1.39)	3.7.2	A knowledge of related international maritime conventions and							_								ж								
		1010 040 4 30	<del>-  </del>	recommendations, and national legislation  Ability to apply task and workload management including:						$\vdash$				<del>  </del>	-+					<b></b>	+						
		IMO MC 1.39	3.7.3			<del>                                     </del>		+-+		-	$\dashv$		+	├──┼			+	-	+	+	<del> </del>						
		-		Planning and coordination				-					+						+	┼	-						
				Personnel assignment	<del> </del>					<del>  </del>			-						+	+-	+				-		
				Time and resource constraints Prioritization									+	$\vdash$					+-		<del> </del>					-	
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	IMO MC 1.39	3.7.4			<del> </del>	ļ																						
			Allocation, assignment and prioritization of resources		<del> </del>	ļ	ļļ						<u> </u>												<u> </u>			
			2 Effective communication on board and ashore			ļ							<u> </u>												<u> </u>	1		
			Decisions reflect consideration of team experiences		<u> </u>	ļ							<b></b>												ļ			
	ļ		Assertiveness and leadership, including motivation		<u> </u>	<del> </del>			<u></u>				<del> </del>												ļ			
			Obtaining and maintaining situational awareness			<del> </del>	ļl						ļ												<u> </u>			
	IMO MC 1.39	3.7.5		<del></del>		ļ	ļ						ļ												<u> </u>			
	<del>  </del>		L Situation and risk management		<del> </del>	<u> </u>							<del> </del>												<u></u>			
	<del> </del>		2 Identify and consider generated options		<del> </del>	ļ						<u> </u>	<u> </u>												<u> </u>			
			Selecting course of action	<del></del>		ـــــ				_			<del> </del>												ļ			
		3.7.5.	Evaluation of outcome effectiveness										<u> </u>												<u> </u>			
Cruston Inches (2000) N. (100) 20		N/2040			<del></del>		ļl						<del> </del>									L						
	e to the safety o		BT	ĺ				1	Ì	l		ĺ	İ			l	į	Ì									j	
personnel				<u> </u>	<b>↓</b>	<del> </del>						<del>-</del>	<del> </del> -			l						L				<b> </b>		
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	im, stability and	3.1.1.	7 Stability		83	3			1						83				l									
stress	,											4	<u> </u>										ļ					
		3.1.2	Effect on stability in the event of damage to and consequent flooding of	of	11	-				1	1				11	İ										}		Ì
		l	a compartment and countermeasurers to be taken	ł			]	ľ		1	1					1			l						-			-
	1			]			]									- 1												
		3.1.3	Knowledge of IMO recommendations concerning ship stability		2	2									2													
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2 Monitor ar	nd control	3.2.1	Knowledge of relevant international maritme law embodied in		24							5	24															
compliance	e with legislativ		international agreements and conventions (Content of this subject is	1				1	1		-		1		1		1	- 1	1									
measures	to ensure safety		based on the coverage for the model course ML Nav 7.01. This to give	-														1										
	ea and protectio		students general knowledge of the responsibilities under international	İ				ŀ					ĺ		1	-		1	1									
	rine environmen		agreements and conventions that impact on the role of management	-				I									ļ	-										
			level officers)	1			1	ł		- 1					ł				-	1								
		3.2.1.6	Responsibilities under other international maritime law embodied in	1	20							<u> </u>	12		$\neg$		$\neg \neg$										-	
		İ	international agreements and conventions that impact on the role of		İ											i	1	į									}	
			management level deck officers		-			ĺ					İ		İ	l	1	Ì	i	ĺ	ı	l	Ì				Ì	
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	1	1	Total	219	140		1				_	1	1															
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General Ot	perator Certifica	ie	Global Maritime Distress and Safety System (GMDSS)	120															120									
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		e	Total Competences from Table A-II/1 OIC Navigational Watch		}																							
			Total Competences from Table A-II/1 OIC Navigational Watch Competences from Table A-II/2 ML Deck			7/2	60			341 66		\$100	69		26	42	81	:28	1139	40	2163	211	66	7/8		54	388	50
		P	Total  Competences from Table A-II/1 OIC Navigational Watch  Competences from Table A-II/2 ML Deck  Competences from Table A-II/5 Able Seafarer Deck	0		7/2	60 3.8	7.4	24 2.8	444 % G- 9 4	1	<b>3.00</b>	69	33% 2.1	<b>96</b>	42	83	33. 2.1	1139	40	<b>46</b> 2.9	<b>91</b> 2.6	66 4.1	<b>78</b>	<b>79</b>	54 3.4	3,6 3	50
		e	Total  Competences from Table A-II/1 OIC Navigational Watch  Competences from Table A-II/2 ML Deck  Competences from Table A-II/5 Able Seafarer Deck  Competence from Table A-VI/6-2	0		7/2	60	7.4	2.8	144 %6 <u>.</u> 9 4	2.8	<b>2.000</b> 3 6.3	69 4.3	2.1	<b>96</b> 6	42, 2.6	81 5.1	32 2.1	1139	40 2.5	4 <i>6</i> 2.9	21	66 4.1	<b>78</b> 4.9	<b>79</b> 4.9	3.4	58 6 3.6 3	50
		ee.	Total  Competences from Table A-II/1 OIC Navigational Watch  Competences from Table A-II/2 ML Deck  Competences from Table A-II/5 Able Seafarer Deck  Competence from Table A-VI/6-2  Common subject BSMT and BSMarE	Σ Σ/16		<i>77.</i> 4.8	3.8	7.4	2.8	9 4	2.8	6.3	4.3	2.1	6	2.6	5.1	2.1	1:99	2.5	2.9	2.6	4.1	4,9	4.9	3.4	3.6 3	8.8
		ie e	Total Competences from Table A-II/1 OIC Navigational Watch Competences from Table A-II/2 ML Deck Competences from Table A-II/5 Able Seafarer Deck Competence from Table A-VI/6-2 Common subject BSMT and BSMarE Not part of the CHED curriculum			<i>77.</i> 4.8	3.8 80	96	2.8	144 <b>6</b> 9 4	2.8	96	4.3	32	6 96	2.6	5.1	2.1	139 8.7	2.5	2.9 80	2.6	4.1 80	4.9 80	4.9	3.4	3.6 3 64 6	50 3.8



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REV							IALOR OF SCIENCE IN MARINE ENGINEERING BASED ON INCLUDING THE 2010 MANILA AMENDMENTS	Table A-	Table A-	E-mat	Draw	Mach 1					Electro 1	Nav.						ļ		PASGT [PP 18]	pps [PP 2]	Aux Mach 1	Aux Mach 2		Auto 2	Total
										64	48 8	30 8	0 80	96	48	80	96 8	30 32	64	48	48	32	48	48	144 1	21 80	128	128	112 8	0 96	96	108
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Son Afficial Control	ilntain a tch	safe i	engine	ering	1.1.1	len	norough knowledge of principles to be observed in keeping an marine agineering watch, including:	7			$\perp$												7			_	<u> </u>					<u> </u>
					1.1.2	loc	ifety and emergency procedures; change-over of remote/ automatic to cal control						$oldsymbol{ol}}}}}}}}}}}}}}}}}}$			-		_					8	_								<u> </u>
					1.1.3	to	fety precautions to be observed during a watch and immediate action be taken in the event of fire or accident, with particular reference to																8									İ
No	te: This	KUP is	not in	l cluded i	n 1.1.4		stems nowledge of engine-room resource management principles, including:	1 8		11	1	_	T	+					1					1			1					
an	of the c	ourses	of BS	MarE						++	$\perp$		+		1	$\dashv$	-			$\left  \cdot \cdot \right $			$\dashv$	$\dashv$		+	+		-		+-	<del> </del>
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		1		ļ			allocation, assignment and priorization of resources			-			+		-	$\dashv$		-	+	-							+				+	
		╂		<del> </del>	+-		effective communication assertiveness and leadership			+-+	十		+	-	_	-	-	_	1	1-1				1			1					
+	······	+-		<b></b>	1		obtaining and maintaining situational awareness																			$\bot$					$\prod$	
							consideration of team experience		<u> </u>	-	-			-	-		+	_	+-					_					-+		-	-
Us	e Englist	n in wi	ritten	end ora	1.2.1		lequate knowledge of the English language to enable the officer to use Igineering publications and to perform engineering duties	20																								
		1	344,300,747,73											1_										_			<u> </u>					
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+		╂			<del>                                     </del>						1		1					1								1					#	
200	interna tems	al com	muni	cation	1.3.1	Ор	peration of all internal communication systems on board	2					_	-			$\perp$	$\pm$	_				5				1					
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4 Operate main and auxiliary	1.4.1	Basic construction and operation principles of machinery systems,																
machinery and associated		including:		 							<del></del>	┼-┼-	<del></del>				$\dashv$	
	1.4.1.1	Main diesel engine	100					4-4-		<b>↓</b>	<del>                                     </del>	1 1	10	R		-├├-	4	
	1.4.1.2	Marine steam turbine	50									<del>  </del>			50			
	1.4.1.3	Marine gas turbine	15	 						<del></del>		<del>                                     </del>	-	15		+-	-	
	1.4.1.4	Marine boller '	40	 		_				+	<del>                                     </del>	<del>                                     </del>			40			
	1.4.1.5	Shafting Installations and propeller	20							4	<del>                                     </del>	<del>                                     </del>	<del>                                     </del>	10		<del>_  </del> -		
	1.4.1.6	Other auxiliaries	120					1			<del>                                     </del>	+-	-	<del>- </del>	5	0 55		<del></del>
	1.4.1.7	Steering gear	20							$\bot \bot$	<b>↓</b>	<del>                                     </del>	$\vdash$			20	4	
	1.4.1.8	Automatic control systems	20								<b>↓</b> ↓		<b>↓</b>		<del></del>		20	20
	1.4.1.9	Fluid flow and characteristics of lubricating oil, fuel oil and cooling	15			15												
	ļ	systems										<del>  </del>	1	_			_	
	1.4.1.10	Deck machinery	10								<del>                                     </del>	4-4-	<b></b>		L	.0		
	1.4.2	Safety and emergency procedures for operation of propulsion plant	30				1							30 30	30			
1 1	]	machinery including control systems										1-1-	$\bot$		<del>  -</del>			
	1.4.3	Preparation, operation, fault detection and necessary measures to	ļ		i					1 1								
		prevent damage for the following machinery items and control systems	1					1 1	+ 1									
				 								<del>  </del>	1				_	$\vdash$
	1.4.3.1	Main engine and associated auxiliaries	16								+-		1	16 16		6		
	1.4.3.2	Steam boilers and associated auxiliaries and steam systems	16	 	$\bot$						<b></b>				16			
	1.4.3.3	Auxiliary prime movers and associated systems	8											8 8	2	8		<del></del>
	1.4.3.4	Other auxiliaries, including refrigeration, air-conditioning and	30			1	İ									30		
		ventilation systems		 							<b>┼</b>		+-+		-			
				 						+	<del>                                     </del>	<del> </del>	-	-	<del> </del>	-	+	
5 Operate fuel, lubrication,	1.5.1	Operational characteristics of pumps and piping systems, including	10			1	1		1 1						3	ro	ŀ	
ballast and other pumping		control systems		 								<del>  </del>	+		<del>                                     </del>			
	1.5.2	Operation of pumping systems									——			_	$\vdash$	<del>_</del>		<del>                                     </del>
	1.5.2.1	routine pumping operations	2					4-4		4	4		<del>                                     </del>		-	2		<del> </del>
	1.5.2.2	operation of bilge, ballast and cargo pumping systems	20					$\bot \bot$		4	<del>                                     </del>	4-4-	+-+			20		<del></del>
	1.5.3	Oily-water separators (or similar equipment) requirements and	8			l		]								8		
	ŀ	operation									<del>                                     </del>		4-4-		$\vdash$			
							<u> </u>											



1 Manage ti	he operation of	1.1.1	Design features, and operative mechanism of the following machinery													1	20 7 20 20 8 8 8 8 125 5 125 148 4 5 3 3 3					
propulsion	n plant machinery		and associated auxiliaries:					+		4		-			1-1	-	1	$\dashv$	+			——
		1.1.1.1	Marine diesel engine		15				-	11		<b>↓</b>			+		1 12			<del>  </del>	+	
		1.1.1.2	Marine steam turbine*		5	——		1	$\perp$			<u> </u>			1		+		5	<del>                                     </del>		-
ĺ		1.1.1.3	Marine gas turbine*		5			1		4-4	<u> </u>	<u> </u>	_ _	——	╂┼-		+					
		1.1.1.4	Marine steam boiler		10			4					_		<del>                                     </del>		+		.0	<del>                                     </del>	-	
1		1.1.1.5	Propeller shaft and associated ancillaries		5							1 1			1		4			<u> </u>		
		T										1	_ _		1		11			<u> </u>		
2 Plan and s	chedule operations	1.2.1	Thermodynamics and heat transmission	]	54				54			$\bot \bot$			4		$\perp$					
		1.2.2	Mechanics and hydromechanics		54				5	4					1		4-4			<del>                                     </del>	$\bot$	
		1.2.3	Propulsive characteristics of diesel engines, steam and gas turbines,		20				15								5	5 1	70			,
}	1 1		including speed, output and fuel consumption	]																		
	1	1.2.4	Heat cycle, thermal efficiency and heat balance of the following:												1							.
															$oldsymbol{\perp}$		$\bot$					
	<del>                                     </del>	1.2.4.1	Marine diesel engine		5				5								5					
<del></del>	+	1.2.4.2	Marine steam turbine*		5				5								$\perp$		5			
	<del></del>	1.2.4.3	Marine gas turbine*	1	5				5									5				
	<del>                                     </del>	1.2.4.4	Marine steam boiler	<del>  </del>	5			11	1.0	11			$\neg$			T		$\top$	5			,
		1.2.5	Refrigerators and refrigeration cycle	1	10			1 1	10	1				1						10		
		1.2.6	Physical and chemical properties of fuels and lubricants	·	8	_		8		1 1		1-1				1	$\top$		7			
	·r	1.2.7	Technology of materials	<del> </del>		7		11	$\dashv$	1	$\dashv$	1	-				1		1	1 1		<del>- 1</del>
	_ <del> </del>	1.2.8	Naval architecture and ship construction, including damage control	<del> </del>	XX .		<del>   -</del>	+		++		XX			1		1			XX		
		1.2.8	Navai architecture and ship construction, michaning damage control		^^														-			. 1
		ļ						+				+-+			1	_	+	$\dashv$	-	<del>                                     </del>	+	-
				<del> </del>	20			+-+				++			1	20	170	7	20 20	1		-+-
	r, surveillance, 🤲 🦠	1.3,1	Start up and shut down main propulsionand auxiliary machinery,		20			1 1		1 1									7			i 1
pedormar	nce assessment and	ļ	including associated systems	ļ						$\dashv$		+		<del></del>		<del></del>	+ ,		-	,	-	
		1.3.2	Operating limits of propulsion plant	<b> </b>	8					+		╅┯┼				.25						
		1.3.3	The efficient operation, surveillance, performance assessment and		148	-									]	.25	123	3 12	721740	<u>'</u>		
		1	maintaining safety of propulsion plant and auxiliary machinery					1				1 1			1 1			1	1			
								20		4-4	_	+-	_				+	<del></del>	—	<del>                                     </del>		
		1.3.4	Functions and mechanism of automatic control for main engine*		10	Į												ļ				1.0
ł		į							1	.0					4					<b>↓</b>	-	
		1.3.5	Functions and mechanism of automatic control for auxiliary machinery	1							1								ı			1
1			including but not limited to:	j																		$\vdash$
		1.3.5.1	Generator distribution systems		4												4					
		1.3.5.2	Steam boilers		5														5		5	<del></del>
		1.3.5.3	Oil purifier		3															3	3	
	<del>                                     </del>	1.3.5.4	Refrigeration system		3							$\mathbb{L}\mathbb{I}$								3	3	
	+	1.3.5.5	Pumping and piping systems		1			77	$\neg \vdash$												1	
<del> </del>	+	1.3.5.6	Steering gear system		2							TT								2	2	
	<del>  </del>	1.3.5.7	Cargo-handling equipment and deck machinery		1			11										T	7	il I	1	
	<del>                                     </del>	1.0,5.1	coargo manating equipment and dear materiales y				$\Box$	11		-		1-1							$\top$	$T^{T}$	1	
		ļ	Operation and maintenance of machinery, including pumps and piping	<del>  </del>	10	_		1 1	$\dashv$	+ +		1-1				_	1		1.0			
	rel, lubrication and				- "																	
	erations ==	1.445	systems					+-+	-	-		1-1		$\neg \uparrow \neg$	1-1		1				1	
ballast ope	1 1	1.4.1.1	Bilge and ballast	<b></b>				+-+		+		<del> </del> +		-+	<del>  -</del>		1-1	_		<del>                                     </del>		
bailast ope	<del></del>		Prevention of the sea by oil									+										<del></del>
ballast ope		<del></del>		; [	- 1	1	1	1					•			. I	1 1	' 1	1			
ballast ope		1.4.1.3	Sewage and sludge			-						+-+					+	+	-	┼┼-		
ballastiope		<del></del>	Sewage and sludge Total	606	428				1			##	1			_				<del>                                     </del>		

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And the second s		rol engineering at the operational level															5800		
1 Operate electrical, electronic	2.1.1	Basic configuration and operation principles of the following electrical,															1		
and control systems	6	electronic and control equipment:											<del>  </del>	++	+				
	2.1.1.1	Electrical equipment	165			1	ļ <u></u>							+	80				
	2.1.1.2	Electronic equipment	45			-		-			20			┼┼-	1	+	$\dashv$		5
	2.1.1.3	Control systems	70			-								┼├					<b>15</b> 15
	<u> </u>		<u> </u>			ļ								<del> </del>					
2 Maintenance and repair of	2.2.1	Safety requirements for working on shipboard electrical systems,	10					1		10	1			[	1.0				
electrical and electronic		including the safe isolation of electrical equipment required before									1 1			1					
equipment		personnel are permitted to work on such equipment		-					1									- 1	
									<b> </b>					<del>  </del>					
	2.2.2	Maintenance and repair of electrical system equipment, switchboards,	50			] [									50				
		electric motors, generators and DC electrical systems and equipment		İ														1	[
	2.2.3	Detection of electric malfunction, location of faults and measures to	20			]									20			1	
	<u></u>	prevent damage																	
	2.2,4	Construction and operation of electrical testing and measuring	10						[	10		ļ						-	
	<u> </u>	equipment														$\bot$			
	2.2.5	Function and performance tests of the following equipment and their									1								
	]	configuration:																	
	2.2.5.1	Monitoring systems	5																5
	2.2.5.2	Automatic control devices	10																10
	2.2.5.3	Protective devices	10							10					10				10
	2.2.6	The interpretation of electrical and simple electronic diagrams	5							5	5								5
				1				1			i l				1				
															T				
1 Manage operation of electrical	2.1.1.1	Marine electro technology		10											10				
	2.1.1.2	Electronics, power electronics		30	7					1	30								
	2.1,1.3	Automatic control engineering and safety devices		40															40 40
	2.1.2	Design features and system configurations of automatic control																	
		equipment and safety devices for the following:		1											1 1	1 1			
	2.1.2.1	General requirements		2												TT			
	2.1.2.2	Main engine		20												20 20			
	2.1.2.3	Generator and distribution system		2	1										2				
	2.1.2.4	Steam boller	<del></del>	2	$\top$										11		2		2
	2.1.3	Design features and system configuration of operational control		40	1			_		11				1-1-	20	1			
		equipment for electrical motors		77								1						1	
	2.1.4	Design features of high-voltage installations		22	1-			-		11				1 1	22	1-1-			
	2.1.5	Features of hydraulic and pneumatic control equipment		10	_			1	10	11	$\neg \uparrow \neg \uparrow$				1-1-	1-1-	7		10
		researce or rivations and pricontinue control equipment		<del></del>	+-								<u> </u>		11	11			
2 Manage troubleshooting	2.2.1	Troubleshooting of electrical and electronic control equipment		66	$\dashv$			_		111	66			11-	66	1			66 66
restoration of electrical and	a.a., 4	Troubleshooting of electrical and electronic control equipment		~~								4							
	2.2.2	Function test of electrical, electronic control equipment and safety		12	+	$\vdash \dashv$					-+-1		- -	TTT	++	1-1-	$\dashv \dashv$	$\neg + \neg$	12
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9 Main	tenance ani	d repair c	if .	3.2,1	Safety measures to be taken for repair and maintenance including the	5				7																5		
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	1			3.2.2	Appropriate basic mechanical knowledge and skills	5																				5		
				3.2.3	Maintenance and repair, such as dismantling, adjustment and	145															-					55		
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				3.2.4	The use of appropriate specialized tools and measuring instruments	5				5	j										I							
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			3	3.2.5	Design characteristics and selection of materials in construction of	15	Ì	15			1		1	1			Ì	-		Ì	Ī							
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			9	3.2.6	Interpretation of machinery drawings and handbooks	38	<del></del>		38		<u> </u>								$\bot$				4			-	4-4	
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12.5	Activities of the second	mpliance w		4.6.1	Basic working knowledge of the relevant IMO conventions concerning	25				ı					25		25								
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				4.7.3	Ability to apply task and workload management including:																	Ţ			
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					Competences from Table A-III/5 Able Body Engine	Σ		66	13 85	80	43 1	04 7	1 90	35 1	21 180	49	30	46	25 3	5 14	9 294	352	134	333	27 1	23 147	245	178	317
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