

**ANNEX B OF CMO NO. 20, SERIES OF 2015
BACHELOR OF SCIENCE IN MARINE ENGINEERING
COURSE SPECIFICATIONS**

Course Code	:	Auto 2
Course Descriptive Title	:	Marine Automation
Course Credits	:	4 units
Lecture Contact Hours per Week	:	3 hours
Laboratory Contact Hours per Week	:	3 hours
○ Prerequisite	:	Auto 1
Reference/s	:	<ul style="list-style-type: none"> ○ Table A-III/1 Function: Marine Engineering ○ Table A-III/1 and Table III/2 Function: Electrical, Electronic and Control Engineering ○ Table A-III/1 Function: Maintenance and Repair ○ STCW'78 as amended ○ Annex A of CMO No. 20, Series of 2015 (Curriculum Mapping for BSMarE)



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COURSE SPECIFICATIONS
 Marine Automation
 STCW Table A-III/1 and A-III/2

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COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
Operate main and auxiliary machinery and Associated control systems	Basic construction and operation principles of machinery systems, including: .8 automatic control systems	<ul style="list-style-type: none"> - Names and describes each component constructing the following control methodologies: -ON-OFF control -sequential control -PID control -program control - Describes what control methodologies can be applied to which control systems taking examples such as automatic motor start/stop for ON-OFF control, automatic generator start/stop for sequential control, level/temperature/pressure control for PID control and main engine speed multiplication/reducing program for program control - Describes in simple words, the construction and functions of each component for control systems - Describes operation principles of each component constructing automatic control systems taking examples such as: -pressure switch -temperature switch -resistance bulb -electric-pneumatic converter -electromechanical transducer -valve positioner - control valve - relay - pneumatic/electronic PID controller - 	20 hours



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COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
Maintenance and repair of electrical and electronic equipment	Function and performance tests of the following equipment and their configuration: .1 monitoring systems	<ul style="list-style-type: none"> - States what a monitoring system or data logger is - Explains how a monitoring system is constructed showing its system configuration - Explains functions of the following system components for a monitoring system: <ul style="list-style-type: none"> - CPU unit - I/O interface - monitoring display - log printer - alarm printer - lamp driver - extension alarm system - Explains briefly how each system component works and its operation mechanism - Explains how measured/monitored values can be confirmed if it is correct - Explains how alarm setting values in a monitoring system can be changed - Explains how function/performance tests can be carried out taking a typical system as an 	5 hours
	.2 automatic control devices	(Process control) <ul style="list-style-type: none"> - States what components are comprised in various automatic control systems showing their system configurations - Explains briefly the functions of the following components and their operation mechanism: <ul style="list-style-type: none"> -Sensor -Controller -transducer/converter -positioner -regulator 	10 hours



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COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
Maintenance and repair of electrical and electronic equipment (cont)	.2 automatic control devices (cont)	<ul style="list-style-type: none"> -control valve -actuator -relay -servomotor - Explains how function/performance tests for the each component cited above can be carried out - Describes testing equipment for function/performance of the each component cited above 	
		<ul style="list-style-type: none"> - Explains what is meant by mechatronics and how it is utilized in automatic control systems (System control) - Describes how functions/performances of automatic control systems incorporated in the following operation systems can be tested: <ul style="list-style-type: none"> -main engine -power generation and distribution -boiler -auxiliary machinery 	
	.3 protective devices	<ul style="list-style-type: none"> - States what is meant by protective/safety devices and how they work in simple terms - Explains how protective/safety devices are incorporated in each system in a ship's propulsion machinery stating that protective/safety devices are isolated from their control systems - Explains briefly the following protective/safety devices and operation mechanism: <ul style="list-style-type: none"> -main engine shut down such as over speed, lubricating oil low pressure and etc. -prime mover of generator shut down 	10 hours



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Maintenance and repair of electrical and electronic equipment (cont)	.3 protective devices	<ul style="list-style-type: none"> -boiler shut down such as low water, non-detect flame eye and etc. -purifier shut down - Describes briefly how functions/performances of protective/safety devices can be tested - Explains the need for testing functions/performances of protective/safety devices in the ship's statutory survey 	
Maintenance and repair of shipboard machinery and equipment	The interpretation of piping, hydraulic and pneumatic diagrams	<ul style="list-style-type: none"> - States that piping diagrams indicate all the information necessary for ship's machinery fittings - Explains that piping diagrams include design characteristics of the system and propulsion plant - Explains how to interpret piping diagrams taking a major system as an example - Explains major symbol marks used in piping diagrams - Explains major symbol marks used in hydraulic and pneumatic diagrams - Explains operation mechanism of the major devices used in the hydraulic and pneumatic systems and how they work 	5 Hours
Manage operation of electrical and electronic control equipment (ML)	Design features and system configurations of automatic control engineering and safety devices for the following: .1 main engine .2 generator and distribution system .3 steam boiler	<ul style="list-style-type: none"> - Explains the basic concepts of: <ul style="list-style-type: none"> -Open and closed control loops -Process control -Essential components in process control loops - Explains the operation and use of sensors and transmitters in shipboard systems: <ul style="list-style-type: none"> -Resistance temperature devices -Thermocouples. Flow and pressure measurement -Level measurement -Ambient temperature compensation -Viscosity measurement 	40 Hours Manage operation of electrical and electronic control equipment (ML) (cont)



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Manage operation of electrical and electronic control equipment (ML) (cont)	Design features and system configurations of automatic control equipment and safety devices for the following: .1 main engine .2 generator and distribution system .3 steam boiler	<ul style="list-style-type: none"> - Torque measurement - Force balance transmitters - Oil/water interface and oil in water monitoring - The pneumatic flapper/nozzle system - Pneumatic 20 – 100 kPa, analogue 4 to 20 mA signals, Pneumatic pilot relays - Control air supply - Operational amplifiers - Electrical supply - Discusses Controllers and Basic Control Theory - Disturbances and time delays and means to reduce them - Two step, proportional, integral, and derivative control actions - Identifies the operation and use of Final Control Elements - Diaphragm operated control valves - Flow/lift characteristics of control valves - Control valve actuators and positioners. "Fail - safe", "fail - set" strategies - Wax element valves - Electrically operated valves - Control Loop Analysis - Temperature control systems - Level control systems - Pressure control systems - Split range and cascade control - Single, two and three element control - Explains the operation and use of governors - Need for governors. Governor terms, concepts and operation - Hydraulic governors. Digital governors, Power sharing - Governing systems 	



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Manage operation of electrical and electronic control equipment (ML) (cont)	Features of hydraulic and pneumatic control equipment	<ul style="list-style-type: none"> - System components, Hydraulic Circuits, Hydraulic System Fitting & Maintenance - Fluids, Pneumatic Circuits, Pneumatic System Fitting & Maintenance Components and Trouble shooting 	10 Hours
- total			100

* discrepancy between course specifications and course map total number of hours is allotted for assessment