

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

Course Code	:	PASGT
Course Descriptive Title	:	Propulsion Ancillary Systems and Gas Turbine
Course Credits	:	3 units
Lecture Contact Hours per Week	:	2 hours
Laboratory Contact Hours per Week	:	3 hours
Prerequisite	:	Thermodynamics
Reference/s	:	<ul style="list-style-type: none"> ○ Table A-III/1 and Table A-III/2 Function: Marine Engineering ○ IMO Model Courses 7.02 and 7.04 ○ STCW'78 as amended ○ Annex A of CMO No. 20, Series of 2015 (Curriculum Mapping for BSMarE)

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
Operate main and auxiliary machinery and associated control systems	Marine Gas Turbine	<p>Operation principles</p> <ul style="list-style-type: none"> - Explains how a gas turbine is used for - Describes the feature of a gas turbine - Describes the operation principles in terms of four processes, compression, combustion (heating), expansion and exhaust - Compares a gas turbine with a steam turbine in terms of advantages and disadvantages - Describes the types of gas turbines 	8 hrs
		<p>Basic construction</p> <ul style="list-style-type: none"> - Using visual aids, describes the three main components of gas turbine as: <ul style="list-style-type: none"> -compressor -combustion chamber -turbine - Describes the types of compressors and their features - Describes the types of combustion chambers and their features 	7 hrs
<p>Operate main and auxiliary machinery and associated control systems</p> <p>Operate main and auxiliary machinery and associated control systems (cont.)</p>	<p>Shafting Installations and Propeller (reduced hours because of duplication with 4.2.2.6)</p> <p>Shafting Installations and Propeller (reduced hours because of duplication with 4.2.2.6) (cont.)</p>	<p>Shafting installations</p> <ul style="list-style-type: none"> - Describes the following installations/equipment constructing shafting: <ul style="list-style-type: none"> - propeller - rope guard - stern tube - stern tube bearing - shaft seal - propeller shaft - intermediate shaft - aft bearing - plumber block - thrust bearing - Describes the details of oil shaft seal and stern tube bearing including their components - Describes the details of thrust bearing 	5 hrs 5 hrs

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
Operate main and auxiliary machinery and associated control systems (cont.)	Shafting Installations and Propeller (reduced hours because of duplication with 4.2.2.6) (cont.)	<p>Propellers</p> <ul style="list-style-type: none"> - Describes various types of propellers and their features - Describes structure and materials for propellers - Defines the following parameters of propeller: <ul style="list-style-type: none"> - diameter - pitch - pitch ratio - boss ratio - pressure side - suction side - leading edge - trailing edge - blade section - blade rake - Explains briefly how propellers fit on propeller shafts - Describes a highly -skewed (skew back) propeller and its advantages - Describes a controllable pitch propeller (CCP) and its mechanism of changing blade angle - States the advantages and disadvantages of a controllable pitch propeller in comparison with fixed pitch propeller (FPP) - Defines the cavitation of propellers and explains its generating mechanism - Defines the propeller singing and explains its generating mechanism and preventive measures 	
Operate main and auxiliary machinery and associated control systems	Fluid Flow and Characteristics of Major Systems	<p>Describes fluid flow of :</p> <ul style="list-style-type: none"> - fuel oil - lubricating oil - cooling fresh water - cooling sea water systems in the diesel engine propulsion plant 	5 hrs

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
Operate main and auxiliary machinery and associated control systems	Main Engine and Associated Auxiliaries	<p>The following can be applied to diesel engine, steam turbine and gas turbine except for some of them</p> <ul style="list-style-type: none"> - Explains the outline of main machinery system listing associated systems including their components - States precautions, safety measures, checking procedures and points to be made as preparations before starting up main engine - States the need for warming up/cooling down main engine or keeping it at hot condition unless cooling down has been done - Explains the standard of completing warming up/cooling down main engine - Explains precautions and typical procedures for warming up/cooling down main engine including theoretical rationale - States precautions for starting associated auxiliaries to establish each system - constructing propulsion machinery such as fuel oil, lubricating oil, cooling system and starting air system - States particularly, precautions against auxiliaries which repair/overhaul was carried out - States precautions to start main engine turning - States the importance of carrying out all procedures in an orderly manner in order to prevent malfunction and damage - States the need to carry out main engine trial run and necessary precautions - States typical procedures for main engine trial run and checking points - States procedures for changing over the propulsion machinery to the state of navigation - Explains the critical speed/revolution caused by torsional vibration of shafting system - Explains how the running conditions can be evaluated if it is in good working order in terms of running parameters, engine performance and operating range - Explains how running parameters such as temperatures, pressures and levels can be <ul style="list-style-type: none"> - determined in normal range - Explains what malfunctions are likely occur due to running parameters getting out of the normal range - Explains in simple words, how to calculate engine output 	24 hrs

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
Operate main and auxiliary machinery and associated control systems (cont.)	Main Engine and Associated Auxiliaries (cont.)	<ul style="list-style-type: none"> - Explains how the engine revolution is controlled - Explains in simple words, the operating range including shaft revolution, ship's speed, engine output, engine torque and their relationships - States the definition of torque rich - Explains in simple words, the difference of output characteristic between diesel engine and steam turbine - Explains the meanings of major running parameters to be strictly observed - States the importance of engine room rounds to detect sign of faults/malfunions, emphasizing that running sound, leaking and vibration can be detected through engine room rounds and these factors cannot be detected with monitoring system - Describes how to carry out the cleaning of turbocharger under way - Explains how to keep running of main diesel engine under the condition of cutting fuel oil to one cylinder or more - Explains how to keep running of main diesel engine under the condition of reducing the number of turbochargers - Describes the conditions which create dangerous oil mists in crankcases - Describes the correct action to take when hazardous conditions are indicated in a crankcase - Explains the importance of keeping scavenge air spaces and supercharge air-spaces drained and clean - Describes the correct procedure and actions to take if a fire occurs in the scavenge air space or in the supercharge air space when an engine is running - Describes the action to be taken if a turbocharger surges 	
Operate main and auxiliary machinery and associated control systems	Auxiliary Prime Movers and Associated Systems	<p>(Diesel engine)</p> <ul style="list-style-type: none"> - States precautions before starting an engine such as confirming fuel oil line, starting air line, cooling sea/fresh water line established and amount of lubricating oil inside the sump tank - Describes briefly components constructing each associated system for an 	6 hrs

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
		<p>engine</p> <ul style="list-style-type: none"> - States preparations and procedures for manual start of an engine - States the conditions of remote-auto start of an engine - States the differences between manual start and remote-auto start of an engine - Describes briefly the control system and its components including their function - States the safety devices and their functions - Lists the normal operating pressures and/or temperatures for: <ul style="list-style-type: none"> -exhaust gas -inlet air -circulating water at inlet and outlet -lubricating oil -fuel 	
<p>Manage the operation of propulsion plant machinery at the Management Level (ML)</p>	<p>Propeller shaft and associated ancillaries</p>	<ul style="list-style-type: none"> - Describes with the aid of sketches/computer aided drawing, material selection and design features of propeller shaft and associated ancillaries: <ul style="list-style-type: none"> o Establishing the shaft centre line o Deviation while building o Alignment deviation in service - Fair curve alignment - Shaft checks - Shaft bearings - Plain bearings - Tilting pad bearings - Roller bearings - Coupling bolts - Stern tubes - Stern tube sealing arrangements - Fixed pitch propellers - Methods of mounting fixed pitch propellers - Keyed propellers - Keyless propellers - Controllable pitch propellers - Gears and clutches 	<p>5 hrs</p>

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	PERFORMANCE	APPROX HOURS
		<ul style="list-style-type: none"> - Reverse reduction gearbox - Flexible couplings - Air operated clutches - 	
Plan and schedule operations at the Management Level (ML)	Propeller and load diagrams	<ul style="list-style-type: none"> - Explains the following with the aid of sketches where applicable: <ul style="list-style-type: none"> o Propeller curve o Propeller design point o Fouled hull, sea margin and heavy propeller o Constant ship speed lines o Propulsion Characteristics Diesel 	5 hrs
Plan and schedule operations at the Management Level (ML)	Propulsion characteristics diesel	<ul style="list-style-type: none"> - Explains the following with the aid of sketches where applicable: <ul style="list-style-type: none"> o Continuous service rating o Engine margin o Limits for continuous operation o Limits for overload operation o Specific fuel oil consumption (SFOC) o SFOC based on reference ambient conditions stated in ISO 3046/1-1986 o Adjustment of SFOC for lower calorific value of fuels and ambient conditions different from ISO reference conditions 	5 hrs
Plan and schedule operations at the Management Level (ML)	Marine Diesel Engine	<ul style="list-style-type: none"> - Explains the following with the aid of sketches where applicable: <ul style="list-style-type: none"> o Dual cycle o Thermal efficiency of dual cycle o Heat balance of marine diesel engine 	5 hrs
Total No. of Hours			80 Hours

* discrepancy between course specifications and course map is intended for assessment