

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

Course Code	:	Met-O 1
Course Descriptive Title	:	Meteorology and Oceanography 1
Course Credits	:	5 units
Lecture Contact Hours per Week	:	5 hours
Laboratory Contact Hours per Week	:	0 hour
Prerequisite	:	None
Reference/s	:	<ol style="list-style-type: none"> 1. Table A-II/1 of the 1978 STCW Code as amended Function: Navigation at the operational level 2. IMO Model Course 7.03 3. Annex A of CMO No. 20, Series of 2015 (Curriculum Mapping for BSMT)

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
Plan and conduct a passage and determine position	<p><i>Meteorology</i></p> <p>Ability to use and interpret information obtained from shipborne meteorological instruments</p> <p>Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems</p> <p>Ability to apply the meteorological information available</p>	<p>Shipborne meteorological instruments</p> <ul style="list-style-type: none"> - Describes the basic principle of an aneroid barometer - Reads the atmospheric pressure from an ordinary aneroid barometer and precision aneroid barometer if available - Reads the temperature from a thermometer - Describes the function of a hygrometer - The basic principles of wind sensors and demonstrates ordinary readings of wind speed 	5
		<p>The atmosphere, its composition and Physical properties</p> <ul style="list-style-type: none"> - Describes the composition of the earth's atmosphere, mentioning dry air and its constituents, water vapour and aerosols - Draws a typical vertical temperature profile through the lower 100 km of the earth's atmosphere - Defines 'troposphere', 'tropopause', 'stratosphere', 'stratopause', 'mesosphere', 'mesopause' and 'thermosphere' - Describes the main features of the troposphere - States describes the importance of the sun as the principal energy source for atmospheric processes - Describes the nature of solar radiation, (scattering, reflection and absorption) - Explains the effect on insolation of a variation in latitude - Explains the effect on insolation of a variation in the sun's declination 	4

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
		<ul style="list-style-type: none"> - Explains the effect on insolation of a variation in the length of daylight - Defines 'water vapour' - Describes the properties of water vapour in the atmosphere - Defines 'evaporation', 'condensation', 'latent heat of vaporization' - Defines 'saturated air' - Describes the processes of mixing, cooling and the evaporation of water vapour, by which a sample of air may be brought to saturation - Defines 'dewpoint', 'absolute humidity', 'relative humidity', 'vapour pressure' 	
		<p>Atmospheric pressure</p> <ul style="list-style-type: none"> - States that pressure equals force per unit area - States that the atmosphere exerts a pressure on any surface placed within it - States that the atmospheric pressure on a unit area of a surface is equal to the weight of the "air column" extending from that surface to the outer fringes of the atmosphere - Explains states that atmospheric pressure decreases with height above sea level - States that atmospheric pressure acts in all directions - States that the basic unit of pressure is N/m^2 - States that $1 \text{ millibar} = 10^{-3} \text{ bar} = 102 \text{ N/m}^2$ - States that the atmospheric pressure at sea level normally varies between about 940 mbar and 1050 mbar - States that the average pressure at sea level is 1013.2 mbar - States that the surface pressure rises if air is added to the 'column' above the surface, and vice versa - Defines 'isobar' 	4

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
		<p>Wind</p> <ul style="list-style-type: none"> - Defines 'wind' - Describes the Beaufort scale of wind force - Explains qualitatively the pressure gradient force - Explains qualitatively the Coriolis (geostrophic) force - Explains the surface wind circulation around high and low-pressure centres - Inserts surface wind directions on a map showing pressure distribution and indicates relative wind speeds at various places within the pressure field - Explains Buys-Ballot's Law - Explains the method of estimating the strength of the wind from the appearance of the sea surface, using the Beaufort wind scale - Lists the factors, other than the wind speed, which affect the appearance of the sea surface - Explains three difference between apparent and true wind - Determines the true wind velocity by using a vector diagram, given the apparent wind and the ship's course and speed - Describes the method of estimating the wind direction from the appearance of the sea surface - Demonstrates the use of a geostrophic wind scale 	8
		<p>Cloud and precipitation</p> <ul style="list-style-type: none"> - States that clouds form when air containing water vapour rises, cools adiabatically and becomes saturated - Describes the need for and defines condensation nuclei - States that a cloud can consist of ice crystals, supercooled water droplets, water droplets or any combination of these - Lists and describes the ten basic cloud types 	4

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
		<ul style="list-style-type: none"> - Describes the probable base heights of the ten principal cloud types - Defines 'precipitation' - Defines 'rain', 'drizzle', 'hail', 'snow' and 'sleet' 	
		<p>Visibility</p> <ul style="list-style-type: none"> - States that visibility is reduced by the presence of particles in the atmosphere, near the earth's surface - Defines 'fog', 'mist', 'haze' - Applies the concept of processes leading to supersaturation to a classification of fogs as mixing, cooling or evaporation fogs - Explains qualitatively the formation of radiation fog, mentioning areas, seasons and reasons for its dispersal - States describes the effect of pollution on the formation of radiation fog - Explains qualitatively the formation of advection fog, mentioning areas, seasons and reasons for dispersal - Explains qualitatively the conditions leading to the formation of sea smoke, and typical areas where sea smoke may be encountered - Describes methods of estimating the visibility at sea, by day and by night, and the difficulties involved 	5
		<p>The wind and pressure systems over the ocean</p> <ul style="list-style-type: none"> - Explains qualitatively, with the aid of sketches, the circulation cells which would exist on a rotating earth, not inclined to its orbit of rotation around the sun, and with a homogeneous surface 	10

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
		<ul style="list-style-type: none"> - Draws the mean surface pressure and wind distribution over the earth's surface in January and July - Describes the characteristics and location of the doldrums, intertropical convergence zone, trade winds, sub-tropical oceanic highs, westerlies and polar easterlies - Describes a monsoon regime - Lists the areas which experience a true monsoon regime - Applies previous concepts to a qualitative explanation of the causes of monsoon regimes - Applies previous concepts to a qualitative explanation of the weather associated with the January and July monsoons of the Indian Ocean, China Sea, north coast of Australia, west coast of Africa and the north east coast of Brazil - Applies the concept of horizontal temperature differences to a qualitative explanation of the formation of land and sea breezes - Explains the formation of anabatic and katabatic winds - States lists the regions of occurrence of anabatic and katabatic winds - States provides examples of local winds 	
		<p>Structure of depressions</p> <ul style="list-style-type: none"> - Defines 'air mass' - Explains the formation of an air mass - Defines 'source region' - Explains the characteristics required of a source region - Describes the source-region characteristics of arctic, polar, tropical and equatorial air-mass types - Defines 'warm front', 'cold front' - Knows the symbols for warm and cold fronts and identifies them on a weather map 	12

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
		<ul style="list-style-type: none"> - Describes, with the aid of a diagram, the weather experienced during the passage of an idealized warm front - Describes, with the aid of a diagram, the weather experienced during the passage of an idealized cold front - Defines 'depression' - Identifies a depression on a surface synoptic or prognostic chart - Describes the stages in the life cycle of a polar front depression - Describes a family of depressions - Draws a diagram of a polar front depression, for both northern and southern hemispheres, showing isobars, warm and cold fronts, wind circulation and warm sector - Draws a cross-section through a polar front depression, on the poleward and equatorial side of the centre, showing fronts, cloud and precipitation areas - Describes the usual movement of a polar front depression - Applies previous concepts to an explanation of the weather changes experienced when a frontal depression passes with its centre on the poleward side of an observer in the northern hemisphere and in the southern hemisphere - Describes the process leading to the occlusion of a - 	
		<p>a polar front depression</p> <ul style="list-style-type: none"> - Identifies a trough of low pressure on a surface synoptic or prognostic chart - Describes the weather associated with the passage of a trough 	
		Anticyclones and other pressure systems	6

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
		<ul style="list-style-type: none"> - Defines 'anticyclone' - Draws a synoptic pattern of an anticyclone, for both northern and southern hemispheres, showing isobars and wind circulation - Identifies an anticyclone on a surface synoptic or prognostic chart - Describes the weather associated with anticyclones - Describes a ridge of high pressure - Draws a synoptic pattern for a ridge, showing isobars and wind directions - Describes a typical weather sequence during the passage of a ridge between depressions across the observer's position - Describes a col or a void between a convergence of pressure systems - Draws a synoptic pattern for a col or a void between a convergence of pressure systems, showing isobars and wind directions - Describes the weather associated with a col or a void between a convergence of pressure systems - Identifies ridges and cols or voids between the convergence of pressure systems on a surface synoptic or prognostic chart 	
		<p>Weather services for shipping</p> <ul style="list-style-type: none"> - Describes the organization, functions and objectives of the World Meteorological Organisation - Describes the sources of weather information available to shipping including internet and email - Describes the information flow between merchant ships and Meteorological - Offices - Describes the services provided for shipping by Meteorological Offices 	5

COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	TOPICS/PERFORMANCE	APPROX HOURS
		<ul style="list-style-type: none"> - Describes the appropriate weather bulletin and the contents of each of its sections - Describes the types of information received by facsimile machine - Describes the services provided for storm warnings 	
		<p>Recording and reporting weather observations</p> <ul style="list-style-type: none"> - Explains the need for meteorological codes - Uses the Ship's Code and Decode Book to code a ship's full report - Uses the Ship's Code and Decode Book to decode a ship's full report - Uses the Ship's Code and Decode Book to decode a reduced report from a shore station - Uses Beaufort letter abbreviations for present and past weather and total cloud amount - Interprets a ship or shore station plot 	6
		<p>Weather forecasting</p> <ul style="list-style-type: none"> - Applies previous concepts to the interpretation of symbols and isobaric patterns on weather charts and facsimile charts - Applies previous concepts to the interpretation of synoptic and prognostic charts to ascertain wind directions, areas of strong winds, cloud and precipitation areas, fog areas, ice, and areas of fine weather - Explains how weather observations at a ship can be used to improve the forecast derived from synoptic and prognostic charts - Evaluates the weather forecast information received 	10
TOTAL			79