

COURSE PACKAGE

Part A: Course Specifications

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| Course Code | : MET-O | | | |
| Course Descriptive Title | : Meteorology and Oceanography | | | |
| Prerequisite | : None | | Corequisite | : None |
| Year Level | : First Year | | Semester Offered | : Second Semester |
| Course Credits | : 5 units | Theoretical Contact Hours Per Week | : 4 hours | Demonstration/Practical Work Contact Hours Per Week : 2 hours |
| Course Description | : The course Meteorology and Oceanography enables a prospective marine deck officer to plan and conduct a safe passage that considers the forecasted and observed weather conditions. It delves into the weather elements and systems from mesoscale to synoptic scale. It includes topics that are essential to the achievement of safe navigation at sea such as the atmosphere, atmospheric pressure, wind, visibility, ocean's wind and pressure systems, structures of depressions, anti-cyclones, weather services for shipping, and recording/reporting weather observations, and the application of meteorological information. | | | |
| STCW Reference | STCW Table | Function | Competence | Knowledge, Understanding and Proficiency |
| | A-II/1 | F1. Navigation at the operational level | C1. Plan and conduct a passage and determine position | <i>Meteorology</i> <i>KUP 10.</i> Ability to use and interpret information obtained from shipborne meteorological instruments <i>KUP11.</i> Knowledge of the characteristics of the various weather systems, reporting procedures and recording systems <i>KUP 12.</i> Ability to apply the meteorological information available |
| Course Outcomes | PO-B.3 PO-D.1 | CO1. Describe the characteristics of weather systems and their effect to navigation CO2. Interpret information obtained from ship borne meteorological instruments CO3. Record and report weather observation using Beaufort notation and synoptic code CO4. Analyse the meteorological and oceanographical information and observations in determining the expected | | |

MET-O – Meteorology and Oceanography



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| | | conditions in relation to planning and conducting the voyage |
| Course Intake Limitations | : | The number of students that can be accommodated shall not exceed 40 for lecture and 20 for laboratory. |
| Faculty Requirement | : | <p>Instructor The faculty that will be assigned to handle the course must possess the following qualifications:</p> <ul style="list-style-type: none"> • graduate of Bachelor of Science in Marine Transportation; • with at least 12 months of seagoing experience as Officer-in-charge of a Navigational Watch on seagoing ships of 500 GRT or more; • completed Training Course for Instructors (IMO Model Course 6.09); • completed Training Course on Assessment, Examination and Certification of Seafarers (IMO Model Course 3.12); and • preferably with teaching experience. <p>The following can also handle this course:</p> <ul style="list-style-type: none"> • Meteorologist <p>Assessor The assigned assessor to conduct the assessment for this course shall have the same qualification for the instructor as outlined above.</p> |
| Teaching Facilities and Equipment | : | <p>CLASSROOM The standard classroom size shall be a minimum of 48 square meters, no side shall be less than 6 meters for a class of 40 students. Classroom must be well-lighted and well-ventilated. It should contain the following:</p> <ul style="list-style-type: none"> • Tables and chairs or armed chairs • Whiteboards or chalkboards • Multimedia equipment <p>METEOROLOGICAL INSTRUMENTS</p> <ul style="list-style-type: none"> • Aneroid barometer • Hygrometer (Dry- and wet-bulb thermometer) • Wind vane and anemometer • Weather facsimile or any equipment capable of giving weather report <p><i>Note: The MHEIs may use additional teaching facilities and equipment as deemed necessary to meet the learning outcomes of this course.</i></p> |
| Teaching Aids | : | <p>A1 PowerPoint Presentation (PPT) A2 Handouts A3 Globe or world map A4 Illustration or poster (Clouds, Beaufort scale)</p> |



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| | <p>A5 Meteorological instrument A6 Weather charts A7 Weather report A8 Admiralty List of Radio Signals A9 Admiralty Sailing Directions A10 Routeing chart</p> <p><i>Note: The MHEIs may use additional teaching aids as deemed necessary to meet the learning outcomes of this course.</i></p> |
| <p>References / Bibliographies</p> | <p>References: R1 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended R2 Officer in Charge of a Navigational Watch (IMO Model Course 7.03) R3 International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended R4 National Oceanic and Atmospheric Administration. National Weather Service Observing Handbook No. 1.</p> <p>Textbooks: T1 Cornish, M., & Ives, E. (2009). <i>Reeds Maritime Meteorology</i> (3rd ed.). London, UK: Adlard Coles Nautical. Retrieved from https://www.bloomsbury.com/uk/reeds-maritime-meteorology-9781472902658/ T2 National Geospatial-Intelligence Agency. (2017). <i>American Practical Navigator</i> (2017 ed., Vol. 1). Springfield, Virginia: National Geospatial-Intelligence Agency. T3 Admiralty. (2020). <i>The Mariner's Handbook</i> (12th ed.). Taunton, UK: UK Hydrographic Office.</p> <p>Bibliographies: B1 Ahrens, C., & Henson, R. (2018). <i>Essentials of Meteorology: An Invitation to the Atmosphere</i> (8th ed.). Boston: Cengage Learning. B2 Stull, R. (2017). <i>Practical Meteorology: An Algebra-based Survey of Atmospheric Science</i>. Vancouver: University of British Columbia. Retrieved from https://www.eoas.ubc.ca/books/Practical_Meteorology/</p> <p>Websites: W1 National Weather Services [US] – Marine Radiofax Charts, URL: https://www.weather.gov/marine/radiofax_charts W2 National Weather Services [US] – Marine Text Forecast and Product Listing, URL: https://www.weather.gov/marine/forecast W3 Bureau of Meteorology [Australia], URL: http://www.bom.gov.au/ W4 WMO-OMM, URL: http://weather.gmdss.org/ W5 Met Office [UK], URL: https://www.metoffice.gov.uk/ W6 Japan Meteorological Agency – Weather, Climate & Earthquake Information, URL: https://www.jma.go.jp/jma/en/menu.html W7 PAGASA's Shipping Forecasts, URL: http://bagong.pagasa.dost.gov.ph/marine W8 earth, URL: https://earth.nullschool.net/</p> |



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| | <p>W9 Windy, URL: https://www.windy.com/</p> <p>W10 <i>Converting temperature scales.</i> (2020). Retrieved from CandidThoughts: https://candidaries.wordpress.com/2020/07/09/converting-temperature-scales/</p> <p>W11 <i>How to convert different units of air pressure.</i> (2020). Retrieved from CandidThoughts: https://candidaries.wordpress.com/2020/07/22/how-to-convert-different-units-of-air-pressure/</p> <p>W12 Government of Canada. <i>Latest ice conditions.</i> Retrieved from Canada.ca: https://www.canada.ca/en/environment-climate-change/services/ice-forecasts-observations/latest-conditions.html</p> <p><i>Note: The MHEIs may use additional references/bibliographies as deemed necessary to meet the learning outcomes of this course.</i></p> |
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Part B: Course Outline and Timetable

| Term | Week | Topic | Time Allotment (in hours) | |
|--|-------|---|---------------------------|--------------------------------|
| | | | Theoretical | Demonstration / Practical Work |
| <p>Note: MHEIs shall determine the number of periods or terms the semester is divided based on their school calendar of activities such as Prelim, Midterm, and Final.</p> | 1 | 1. Course Introduction and the Atmosphere 1.1. Relevance and importance of meteorology and oceanography in navigation 1.2. Climate and weather 1.3. Atmosphere | 2 | |
| | 1 – 2 | 2. Solar Radiation and Air Temperature 2.1. Solar radiation 2.2. Air temperature 2.3. Air temperature reading 2.4. Air Temperature Unit conversion | 4 | 4 |
| | 2 – 3 | 3. Atmospheric Pressure 3.1. Atmospheric Pressure 3.2. Atmospheric pressure reading 3.3. Conversion of units for atmospheric pressure 3.4. Atmospheric pressure on the weather chart | 4 | 2 |
| | 3 – 4 | 4. Wind 4.1. Wind 4.2. Determining the true wind speed and direction 4.3. Interpreting wind information on the weather chart | 6 | 2 |
| | 5 | 5. Humidity and Condensation 5.1. Humidity and Condensation 5.2. Determining the relative humidity and dewpoint | 4 | 2 |
| | 6 | 6. Cloud and Precipitation 6.1. Cloud 6.2. Determining the type of cloud 6.3. Determining the cloud coverage 6.4. Precipitation | 4 | 2 |



| Term | Week | Topic | Time Allotment (in hours) | |
|------|---------|--|---------------------------|--------------------------------|
| | | | Theoretical | Demonstration / Practical Work |
| | 7 | 7. Visibility 7.1. Fog, mist and haze 7.2. Other elements that affects visibility | 2 | |
| | 7 – 8 | 8. Wind and Pressure Systems 8.1. Pressure gradient winds 8.2. Geostrophic winds 8.3. Global wind circulation – Three cell theories 8.4. Local and regional weather and climate systems | 6 | 4 |
| | 9 | 9. Fronts and Air Masses 10. Frontal Depression | 4 | 2 |
| | 10 | 11. Anticyclone | 4 | 2 |
| | 11 | 12. Tropical Revolving Storms | 4 | 2 |
| | 12 – 13 | 13. Sea and Swell Waves and the Ocean Currents | 8 | 4 |
| | 14 | 14. Sea Ice 14.1. Types of floating ice 14.2. Development of sea ice 14.3. Ice bergs 14.4. Ice accretion 14.5. Safe navigation around sea ice | 4 | 2 |
| | 15 – 16 | 15. Weather Recording and Reporting 15.1. Bridge logbook entries 15.2. Beaufort notations 15.3. Voluntary Observing Ships (VOS) scheme 15.4. Synoptic code 15.5. Station model plot | 8 | 4 |
| | 17 | 16. Weather Services for Shipping 17. Weather Routeing | 4 | 2 |

| Term | Week | Topic | Time Allotment (in hours) | |
|------|------|-----------------------------------|---------------------------|--------------------------------|
| | | | Theoretical | Demonstration / Practical Work |
| | | Sub-total (Contact Hours) | 68 | 34 |
| | | Total Contact Hours | 102 | |
| | | Examination and Assessment | | |

Note:

1. The MHEIs are to develop their respective timetable according to their resources but meets with the minimum time allocation for the contact hours.
2. The MHEIs shall determine the time allotment for the conduct of summative assessments



Part C: Course Syllabus

| COs | Topics Learning Outcomes | References/ Bibliographies | Teaching Aids |
|------------|---|---|------------------------|
| CO1 | <p>1. Course Introduction and the Atmosphere <i>Relevance and importance of meteorology and oceanography in navigation</i></p> <p>1.1. Explain the importance of meteorological and oceanographical information in navigation</p> <p><i>Climate and weather</i></p> <p>1.2. Explain the difference between climate and weather</p> <p><i>Atmosphere</i></p> <p>1.3. Describe the vertical profile of the atmosphere and the characteristics of the different layers and boundaries in terms of air temperature and pressure variability</p> <p>1.4. Outline the weather elements and their units of measurement and instrument for observation</p> | R1, R2, T1, T2, B1, B2 | A1, A2, A3, A4, A5 |
| CO1 CO2 | <p>2. Solar Radiation and Air Temperature <i>Solar radiation</i></p> <p>2.1. Describe the effects of the variation of the solar radiation to weather and climatic conditions</p> <p><i>Air temperature and Air temperature reading</i></p> <p>2.2. Obtain air temperature reading from the thermometer</p> <p><i>Air Temperature Unit conversion</i></p> <p>2.3. Convert different units of temperature</p> | R2, T1, T2, B1, B2, W8, W9, W10 | A1, A2, A3, A4, A5 |
| CO1 CO2 | <p>3. Atmospheric Pressure <i>Atmospheric Pressure</i></p> <p>3.1. Explain the effect of solar radiation to atmospheric pressure</p> <p><i>Atmospheric pressure reading</i></p> <p>3.2. Obtain atmospheric pressure reading from the ship's aneroid barometer</p> <p><i>Conversion of units for atmospheric pressure</i></p> <p>1.3 Convert different units of atmospheric pressure</p> <p><i>Atmospheric pressure on the weather chart</i></p> <p>3.3. Locate high- and low- pressure regions on the weather chart</p> | R2, T1, T2, B1, B2, W1, W3, W5, W6, W8, W9, W11 | A1, A2, A3, A4, A5, A6 |

| COs | Topics Learning Outcomes | References/ Bibliographies | Teaching Aids |
|------------|--|---|------------------------------|
| CO1 CO2 | <p>4. Wind <i>Wind</i></p> <p>4.1. Explain the relationship of pressure gradient with wind</p> <p><i>Determining the true wind speed and direction</i></p> <p>4.2. Determine the true wind speed and direction from the observed relative wind and ship's vector</p> <p><i>Interpreting wind information on the weather chart</i></p> <p>4.3. Obtain wind information from the weather chart's isotach, wind barbs and wind rose</p> <p>4.4. Determine the Beaufort wind scale based on the wind condition and vice versa</p> | R2, T1, T2, B1, B2, W1, W3, W5, W6, W8, W9 | A1, A2, A3, A4, A5, A6 |
| CO1 CO2 | <p>5. Humidity and Condensation <i>Humidity and Condensation</i></p> <p>5.1. Describe the effects of humidity to the weather condition</p> <p><i>Determining the relative humidity and dewpoint</i></p> <p>5.2. Determine the relative humidity and dew point from the ship's hygrometer</p> | R2, T1, T2, B1, B2, W1, W3, W5, W6, W8, W9 | A1, A2, A3, A4, A5, A6 |
| CO1 | <p>6. Cloud and Precipitation <i>Cloud</i></p> <p>6.1. Describe the formation and development of cloud</p> <p><i>Determining the type of cloud</i></p> <p>6.2. Identify the ten basic cloud types and its characteristics</p> <p><i>Determining the cloud coverage</i></p> <p>6.3. Determine the cloud coverage by visual observation</p> <p><i>Precipitation</i></p> <p>6.4. Describe the different types of precipitation such as rain, drizzle, hail, snow and sleet and their effects to navigation</p> | R2, T1, T2, B1, B2, W1, W3, W5, W6, W8, W9 | A1, A2, A3, A4, A5, A6 |
| CO1 | <p>7. Visibility</p> <p>7.1. Identify the different factors that affects the visibility</p> <p>7.2. Explain the formation of fogs and haze</p> <p>7.3. Explain the methods of estimating visibility at sea</p> <p>7.4. Identify the area on the weather chart that is experiencing a poor visibility</p> | R2, T1, T2, B1, B2, W1, W3, W4, W5, W6 | A1, A2, A3, A4, A5, A6 |
| CO1 | 8. Wind and Pressure Systems | R2, T1, T2, B1, | A1, A2, |

| COs | Topics Learning Outcomes | References/ Bibliographies | Teaching Aids |
|-------------------|---|--|----------------------------|
| CO2 | <p>Pressure gradient winds, Global wind circulation – Three cell theories and Local and regional weather and climate systems</p> <p>8.1. Describe the pattern of the local, regional and global wind circulation 8.2. Describe the effects of monsoon to weather conditions</p> <p>Geostrophic winds</p> <p>8.3. Use the geostrophic wind scale to determine the theoretical value of wind</p> | B2, W1, W3, W5, W6, W8, W9 | A3, A4, A5, A6 |
| CO1 | <p>9. Fronts and Air Masses</p> <p>9.1. Describe the characteristics of the principal world air masses 9.2. Describe the cyclogenesis (formation) and cyclosis (decay) of frontal systems 9.3. Describe the frontal systems on the weather chart and their associated weather conditions</p> | R2, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7 |
| CO1 CO4 | <p>10. Frontal Depression</p> <p>10.1. Describe the formation and development of the frontal depression 10.2. Describe the frontal depressions on the weather chart 10.3. Describe the warning signs of an approaching frontal depression as experienced at sea 10.4. Describe the associated weather condition of the frontal depression in different stages 10.5. Determine the location of the centre of the cyclone system using <u>Buy Ballot's Law</u></p> | R2, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7 |
| CO1 | <p>11. Anticyclone</p> <p>11.1. Describe the dynamics of anticyclone system with other weather systems particularly with cyclonic weather systems 11.2. Describe the anticyclone systems on the weather chart and their associated conditions</p> | R2, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7 |
| CO1 CO2 CO4 | <p>12. Tropical Revolving Storms</p> <p>12.1. Describe the warning signs of an approaching tropical revolving storm and the associated weather condition during its different stages 12.2. Interpret the information contained in the weather chart on tropical revolving storm 12.3. Indicate the safe and unsafe sectors of the tropical revolving storms 12.4. Compare and contrast tropical revolving storm with frontal depression</p> | R2, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7 |
| CO1 CO2 | <p>13. Sea and Swell Waves and the Ocean Currents</p> <p>13.1. Describe the formation of sea and swell and their effects to navigation 13.2. Describe the movements of current and their effects to navigation 13.3. Determine the significant wave height using Gröen and Dorrestein nomogram 13.4. Obtain information about the ocean current from the nautical chart and publications</p> | R2, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7 |

| COs | Topics Learning Outcomes | References/ Bibliographies | Teaching Aids |
|------------|--|--|--------------------------------|
| CO1 CO2 | <p>14. Sea Ice Types of floating ice, Development of sea ice and Ice bergs 14.1. Describe the formation of sea ice and iceberg</p> <p>Ice accretion 14.2. Describe the formation of ice accretion, the associated dangers and the remedies</p> <p>Safe navigation around sea ice 14.3. Describe the safe navigation in the vicinity of sea ice and in polar regions 14.4. Determine the safest route in the vicinity of the sea ice based on the information received from the sea ice chart</p> | R2, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6 | A1, A2, A3, A4, A5, A6, A7 |
| CO3 | <p>15. Weather Recording and Reporting Beaufort notations 15.1. Code and decode weather condition using “Beaufort notation”</p> <p>Voluntary Observing Ships (VOS) scheme, Station model plot and Synoptic code 15.2. Code and decode weather condition using “station model plot” 15.3. Code and decode weather condition using “synoptic code”</p> <p>Bridge logbook entries 15.4. Fill entries in the bridge logbook on the observed weather condition</p> | R2, R3, R4, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7 |
| CO2 CO4 | <p>16. Weather Services for Shipping 16.1. Outline the different weather sources and services for shipping 16.2. Obtain information about the available weather services for shipping using the List of Radio Signals 16.3. Interpret the information received from weather reports and maps and the ones observed using shipborne meteorological instruments</p> | R2, R3, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7, A8 |
| CO1 CO4 | <p>17. Weather Routeing 17.1. Explain the relevance and importance of weather routeing 17.2. Apply the weather information obtained from weather reports and charts in relation to the planned voyage</p> | R2, R3, T1, T2, B1, B2, W1, W2, W3, W4, W5, W6, W7, W8, W9 | A1, A2, A3, A4, A5, A6, A7, A8 |

Note: The MHEIs are to develop Part D: Detailed Teaching Syllabus and Instructional Materials (IMs), and Part E: Course Assessment and Assessment Tools (ATs) which satisfactorily meets with the requirements of the course as prescribed in the course outcomes and learning outcomes.