

**Registration code – NAUT CP2**

## **CHARTWORK AND PILOTAGE, LEVEL 2 (C&P 2)**

**Duration – 180 hours**

### **Pre-requisites**

- Grade 9 level of mathematics, algebra and geometry
- Basic computer skills

### **Course description**

This course provides the deck officer with an in-depth knowledge of the practices and theory involved in piloting a vessel.

Topics covered in this course include: pilotage, steering; symbols; sailing directions; lists of lights; tidal currents; navigation in confined waters; navigation aids; buoyage system; bridge practices; charts; chart usage; fixing position; estimating position; courses; conversion of course; distance measurement; range of visibility; reliability of charts; publications; tidal terms; calculation of tides; set and rate of tides; records.

### **Required for the following certificates of competencies:**

- Fishing Master, 3rd Class
- Chief Mate 500T, Domestic
- Watchkeeping Mate, Near Coastal
- Watchkeeping Mate
- Master 150T, Domestic

<b>Subject</b>	<b>Knowledge required</b>
<b>Competence:</b>	<b>Plan and conduct a passage and determine position</b>
<b>Ability to determine the ship's position by use of: landmarks; aids to navigation, including lighthouses, beacons and buoys; dead reckoning, taking into account winds, tides, currents and estimated speed</b>	<b>Definitions and Datums – Earth</b> Definition of great circles, small circle, spherical angle, spherical triangle, poles of a great circle; Definition of earth's poles, equator and meridians; Definition of latitude and parallels of latitude, prime meridian and longitude; Definition of difference of latitude, and difference of longitude; Definition of international nautical mile, cable and knot; The earth as an ellipsoid; Definition of compression, and state its value; Definition of directions on the earth's surface; The direction of the ship's head on a gyro-compass (gyro course); The direction of the ship's head on a magnetic compass (compass course); The North American Datum of 1983 (NAD83) and the Geodetic Reference System of 1980.  <b>Position lines and position fixing</b> Definition of position; Ability to fix the ship's position by means at the disposal of the

	<p>OOW, including electronic navigational aids; Considerations to be taken into account, including errors and limitations of equipment; the correction and plotting of bearings taken visually or by radar and the limitations of accuracy inherent in each of these methods; Given the radar distance of a charted object, ability to plot the position circle on a chart; Ability to plot a position on the chart from simultaneous cross bearings and from a bearing and distance off; Definition of dead reckoning position (DR), estimated position and fixed position; Ability to plot a dead reckoning position on the chart; Ability to plot an estimated position on the chart; Ability to plot position lines – straight line, circle, hyperbola; Ability to find a position line by bearing, horizontal angle, vertical sextant angle, transit line and radio aids; Ability to determine a position by a combination of bearing distance and the methods in the above objective; Ability to find a position by simultaneous bearings of two objects; Ability to find the distance that the ship will pass off a given point when abeam; Ability to construct a position line to clear a navigational danger by a given distance.</p>
<b>Subject</b>	<b>Knowledge required</b>
<p><b>Ability to determine the ship's position by use of landmarks; aids to navigation, including lighthouses, beacons and buoys; dead reckoning, taking into account winds, tides, currents and estimated speed</b></p>	<p><b>Courses and distances</b>  Definition of course and distance; Ability to convert true courses laid-off to magnetic courses, including determination of variation at any place; conversion of true courses to gyro, magnetic and compass courses and vice versa; determining the up-to-date value of variation and interpolating for variation at a given locality from isogonic lines or compass roses; use of transit lines, azimuth and amplitude to determine compass error; Ability to lay off true course between two positions; Ability to find the distance between two positions; Knowledge of distance measurement on nautical chart.</p>
<p><b>Ability to determine the ship's position by use of landmarks; aids to navigation, including lighthouses, beacons and buoys; dead reckoning, taking into account winds, tides, currents and estimated speed</b></p>	<p><b>Effect of wind and current</b>  Ability to calculate the speed between two positions; Definition of set, rates, drift and leeway due to wind; Definition of ship's speed, effective speed, course and distance made good, applied leeway; The allowing for effects of wind and tide; the problem of combining vectors of wind, current, tidal effect and course to steer to arrive at course made good; Ability to find the course and distance made good with a tidal stream or current; Ability to find the course to steer, allowing for tidal stream or current; Ability to find the set and rate of tidal stream or current; Ability to find the set and rate of tidal current that may be expected at a given point from information given in tide and current table or on the chart and awareness of the possibly of a significant effect of weather on the reliability of the information so obtained ; Explain the term running fix and use the method to plot a position; Ability to find positions by running fix in a tidal stream or current</p> <p><b>Theory of Tides</b>  Definition of tidal terms in common use in CHS and United States tide tables as spring tide, neap tide, height of tide, high water, low water, mean high water springs, mean high water neaps, mean low water springs, mean low water neaps, range, chart datum; General understanding of tidal phenomena necessary for the comprehension of tidal terms; The methods of predicting tides; The non-astronomical component of sea level; Other irregularities of the tide.</p>
<p><b>Knowledge of principles of construction of the different types of charts and their use</b></p>	<p><b>Charts construction and projections</b>  Basic knowledge of chart projections; Definition of natural scale of a chart; large scale charts show a small area in greater detail than small-scale charts; numbering and mode of presentation of information on charts; the cause of chart distortion; The requirements for a chart appropriate for marine navigation; The principles of construction, properties and limitations of the Mercator chart; Ability to classify chart projections by construction methods, properties and characteristics; The values, limitations and purposes in practical navigation of conformal (orthomorphic), Gnomonic, Polyconic, Mercator, Transverse Mercator projections and the Universal Transverse Mercator System; Reliability of charts; indications by which reliability may be judged (e.g., date of original survey and possibility of subsequent surveys, adequacy of recorded soundings, with corrections having been made to date); ECDIS and other electronic chart systems meeting IMO performance standards may substitute for traditional charts.</p>

Subject	Knowledge required
<p><b>Thorough knowledge of and ability to use nautical charts</b></p>	<p><b>Chart Usage</b>  Ability to use charts of various projections in common use and produced by the Canadian Hydrographic Service, including Mercator, Polyconic and gnomonic charts; the use of charts in the practice of coastal navigation and on ocean passages; the transfer of positions from a chart of one projection to another of a different projection; care and upkeep of charts; Ability to make chart corrections; The replacement of superseded editions; possessing and using latest available charts and publications, including large-scale charts of the pilotage area duly corrected to date; chart catalogues and numbering.</p> <p><b>Information from charts</b>  Ability to recognize and to demonstrate the use of the symbols and abbreviations on a chart, especially lighthouses, buoys, beacons, radio beacons and other navigational marks; Ability to identify the characteristics and range of lights; Ability to recognize coastlines, coast and radar-responsive targets; Ability to interpret coastline contours, bottom topography, depths and nature of bottom; Ability to use the tidal information given on a chart; Ability to recognize traffic lanes and separation zones; Ability to recognize the different type of charts overlaid with lattice charts; Ability to use lattice charts; The danger of placing implicit reliance upon floating navigational aids; The danger of approaching navigational aids too closely; Demonstrate simple passage planning and execution; The use of clearing marks and horizontal and vertical danger angles; Ability to recognize suitable passages, approaches and anchorages in clear weather and thick weather, using radar-responsive targets.</p>
<p><b>Keeping a log</b></p>	<p>Knowledge of the record of navigational activities and incidents to be kept in accordance with the SOLAS Convention and the Navigation Safety Regulations; common practice regarding keeping a log; Knowledge of the proper keeping of different kinds of log during ocean passages, coastal navigation and in port; the duty of the OOW to maintain an accurate log.</p>
<p><b>Thorough knowledge of and ability to use up-to-date publications</b></p>	<p><b>Sailing directions</b>  Familiarity with the contents of preface to Sailing Directions, the important general navigational information contained in the preamble and opening chapter of these volumes.</p> <p><b>Tide tables</b>  Ability to calculate tides and heights and low water at reference and secondary ports, and the calculation of depth of water at those times; Use of the calculated depth of water at high and low water to determine the height of water at a given charted position; Ability to determine the predicted time for a given tide level; Ability to estimate set and rate of tidal currents by reference to tidal current tables and by actual observation; The tentative nature of tabulated tidal current values and the need for caution in using them; The use if tidal stream charts; The zero level of the charts.</p> <p><b>Charts and Nautical Publications Regulations</b>  General knowledge of the Charts and Nautical Publications Regulations.</p> <p><b>Monthly Notices to Mariners and Annual Edition of Notices to Mariners:</b>  Familiarity with the contents; Correction of charts and publications; The importance of chart corrections being kept up to date.</p>
<p><b>Subject</b></p>	<p><b>Knowledge required</b></p>

<p><b>Thorough knowledge of and ability to use up-to-date publications</b></p>	<p><b>Symbols, abbreviations and terms (Chart no.1):</b> Familiarity with chart symbols and abbreviations published in the Canadian Hydrographic Service Chart No. 1.</p> <p><b>Radio aids to marine navigation:</b> Nature of content.</p> <p><b>List of lights:</b> Familiarity with light characteristics, colours and sound signals used as aids to navigation; Use of Lists of lights, buoys and fog signals; the terms used to define the power of lights; (e.g., geographical range, luminous range, charted range computed range, nominal range, computed visibility; use of a luminous range diagram); Knowledge of factors controlling the range of visibility; The effect of abnormal refraction fog signals of different types, anomalies of sound propagation in fog, notices regarding lights, lighthouses and buoys; Ability to calculate the distances of sighting lights and dipping distances.</p> <p><b>Ice navigation in Canadian waters:</b> Nature of content</p>
<p><b>Ability to navigate in confined waters</b></p>	<p>Altering course; transits; leading marks and bearings; Recording the vessel's progress; Making allowance for height of tide; Preparatory details to be attended to in entering confined waters (e.g., a review of the relevant sections of the sailing directions, ready availability of large-scale charts of the area with proposed track drawn to indicate distances, courses and near dangers noted); Navigational aids with their characteristics to be identified, clearing lines, marks and bearings to be used during the passage to be drawn in, pre-calculation of tidal heights where critical depths of water may be encountered; The maintenance of a record of the vessel's progress on both charts in logbook, including times of passing successive points, course's compass error, speed, weather; Fixing the vessel's position by relative and true bearings, transits; Dead reckoning position, estimated position and observed position.</p>
<p><b>Competence:</b></p>	<p><b>Plan and conduct a passage and determine position</b></p>
<p><b>Knowledge of the use of navigational aids in pilotage situations</b></p>	<p><b>Pilotage</b> Thorough knowledge regarding preparations for pilotage; possessing and using latest available charts and publications, including large-scale charts of the pilotage area duly corrected to date, latest sailing directions, Notices to Mariners, Lists of Lights, Traffic Zone Regulations (as applicable), tide tables, copy of Charts and Publications Regulations, Radio Aids to Marine Navigation and chart catalogue; Familiarity with bridge practices and procedures in pilotage situations; the requirement to continue the practice of good navigation procedures by the OOW and ship's personnel generally, and the realization that the presence of a pilot on the bridge does not absolve the ship's personnel from their continuing responsibility for the safe navigation of the ship; The duty of the officer of the watch to ensure that the pilot's advice is understood and effectively carried out; The extent to which reliance is placed on buoys.</p>
<p><b>Thorough knowledge of the Canadian system of buoyage</b></p>	<p>Knowledge of the Canadian System of Buoyage in detail; Difference between lateral and cardinal systems; Use of Sailing Directions for determining other buoyage systems in use; Principles and rules of the International Association of Lighthouse Authorities Maritime Buoyage System, Systems "A" and "B"; Understanding of the basic principles employed in the lateral and the cardinal buoyage systems; The importance of consulting the applicable volume of Sailing Directions for details of buoyage system in-force locally prior to entering unfamiliar waters of other countries; Aids to navigation.</p>