-SQA-SCOTTISH QUALIFICATIONS AUTHORITY

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NATIONAL CERTIFICATE MODULE DESCRIPTOR

-Module Number- **0068661** **-Session-1986-87**
-Superclass- **ZF**

-Title- **PRINCIPLES OF NAVIGATION 2**

-DESCRIPTION-

Type and Purpose

A specialist module which enables the student to develop the knowledge of the principles of navigation acquired in module 08660.

Preferred Entry Level

08660 Principles of Navigation 1

Learning Outcomes

The student should:

1. know the concept of the celestial sphere and of the equinoctial systems of co-ordinates;
2. know the concept of hour angles;
3. know the concept of time and the equation of time;
4. know the reasons for the apparent daily motion of all bodies and the Horizon system of co-ordinates;
5. apply position line theory;
6. use the celestial sphere;
7. know and apply corrections to altitude;
8. know the concepts associated with meridian altitude.

Content/ Context

Corresponding to the Learning Outcomes:

1. Definition of celestial sphere, celestial poles, celestial meridian, equinoctial, obliquity of ecliptic, siderial hour angle, declination and polar distance. Explanation of annual motion of sun, ecliptic and first point of aries. Equinoctial system of co-ordinates. Use of star diagrams in Almanac. Precession, Luni-Solar precession, nutation and their effects.

2. Change of hour angle for all bodies. Definition of GHA, LHA, rate of change of GHA, of True Sun, moon, aries, planets 'v' correction. Use of Almanac for GHA and LHA, Declination (d' correction) for all bodies. Finding GP given GMT.

3. Definition of apparent solar day, siderial day. LHATS and LAT. Requirements for time keeping, True Sun's irregular rate of change of SHA, Astronomical Mean Sun and Dynamical Mean Sun. Definition of equation of time and its components (eccentricity and obliquity). Sketching of graphs of eccentricity and obliquity and combination to give equation of time. Use of Almanac to find equation of time. Definition of GMT, LMT, Zone Time and Standard Time.

4. Definition of rational horizon, zenith, nadir, vertical circles, prime vertical, elevated and depressed poles, upper and lower celestial meridian, true altitude, azimuth and true zenith distance and amplitude. Proving altitude of elevated pole equals observer's latitude. Identification of apparent daily paths of all bodies showing rising and setting points, azimuth, quadrantal and 360 notation. Explaining circumpolar motion and the conditions required for a body to be circumpolar or for a body to cross the prime vertical. Maximum azimuth, PZX triangle and solution of PZX triangle using haversine formula and Napier's rules.

5. Geographical position of body, relationship between celestial and terrestial triangles, TZD and CZD. Intercept, bearing and direction of position line and intercept. Explanation of the relationship between arc of the position circle on which observer is situated and its celestial counterpart. Comparison of ITP, longitude where P/L cuts DR latitude and latitude where P/L cuts DR longitude. Avoidance of high and low altitude bodies for working sights. Conditions necessary for an observation of latitude and for longitude.

6. Drawing of figures on plane of rational horizon and observation of celestial meridian using the equidistant projection to illustrate navigational problems and principles.

7. Reason for altitude correction. Definition of visible, sensible and rational horizons, sextant altitude, observed altitude and true altitude. Explanation of dip, refraction, semi diameter and parallax and application of these corrections, including augmentation of moon's semi diameter. Application of index error. Illustration of the effect of terrestial refraction on the dip and distance of sea horizon. Use and understanding of all the altitude correction tables in the Nautical Almanac.

8. Position line running 090/270, TZD plus/minus declination giving latitude. Maximum and meridian altitudes, time of meridian altitude (all bodies). Observation of bodies below pole.

Suggested Learning and Teaching Approaches

Active learning and teaching approaches should be used throughout.

Films, videos, planetarium visits, diagrams and models should be used as extensively as possible.

Film and video should be used to stimulate discussion, not simply to convey information.

Group investigations and projects would be useful techniques to employ in this module.

Assessment Procedures

Learning outcomes 1-8 inclusive should be assessed as follows:

(I) a series of short answer questions;

(ii) a series of calculations using information and data obtained from relevant source documents;

(iii) a series of sketches.

Satisfactory performance would be respectively:

(I) a score of 70% or better depending on the difficulty of the test set;

(ii) a score of 70% or better depending on the difficulty of the test set;

(iii) production of clearly labelled sketches with appropriate proportions, application of correction factors, etc, with an oral description of each sketch.

Testing should take place no later than 2/3 of the way through the module to allow time for remediation and retesting.